Education in the Asia-Pacific Region: Issues, Concerns and Prospects 40

Angela Murphy
Helen Farley
Laurel Evelyn Dyson
Hazel Jones *Editors*

Mobile Learning in Higher Education in the Asia-Pacific Region

Harnessing Trends and Challenging Orthodoxies

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Editors
Angela Murphy
University of Southern Queensland
Toowoomba, Queensland, Australia

Helen Farley
University of Southern Queensland
Toowoomba, Queensland, Australia

Laurel Evelyn Dyson
University of Technology Sydney
Kirribilli, New South Wales, Australia

Hazel Jones
University of Southern Queensland
Toowoomba, Queensland, Australia

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Series Editors' Introduction

This edited volume by Angela Murphy, Helen Farley, Laurel Evelyn Dyson and Hazel Jones, on *Mobile Learning in Higher Education in the Asia-Pacific Region: Harnessing Trends and Challenging Orthodoxies*, is the latest volume to be published in the long-standing Springer book series "Education in the Asia-Pacific Region: Issues, Concerns and Prospects". The first book in this Springer series was published in 2002, with this volume by Angela Murphy et al. being the 40th volume to be published to date.

Mobile devices have rapidly become a key part of social media. As such, they have become an indispensable part of life with regard to enabling individuals and groups to keep in touch with family and friends, listen to music, watch videos, read newspapers and engage in Internet banking. In fact, mobile devices have become an indispensable part of the economic, social and political life of billions of people worldwide, in developed, developing and transition countries.

Mobile devices have important applications that go well beyond the area of social media, and if utilised effectively, they can have major applications in the areas of education and schooling. The use of mobile technologies, including mobile phones, is also an indispensable part of lifelong learning.

This volume provides a comprehensive overview, based on the latest available research evidence, of how best to achieve affordable and sustainable implementation of mobile learning for higher education in the Asia-Pacific region. It addresses important considerations such as shifting attitudes towards mobile devices as indispensable tools for teaching and learning; changes in teaching practices to support young people as self-managed learners; problems faced concerning the inappropriate use of technologies including how mobile technologies can be disruptive technologies, depending upon how they are used; and the use of mobile technologies in support of group learning.

In terms of this Springer book series, in which this volume is published, the various topics dealt with in the series are wide ranging and varied in coverage, with an emphasis on cutting-edge developments, best practices and education innovations for development. Topics examined include environmental education and education for sustainable development; the interaction between technology and education; the reform of primary, secondary and teacher education; innovative approaches to education assessment; alternative education; most effective ways to achieve quality and highly relevant education for all; active ageing through active learning; case studies of education and schooling systems in various countries in the region; cross-country and cross-cultural studies of education and schooling; and the sociology of teachers as an occupational group, to mention just a few. More information about this series is available at http://www.springer.com/series/6969.

All volumes in this book series aim to meet the interests and priorities of a diverse education audience including researchers, policy makers and practitioners, tertiary students, teachers at all levels within education systems and members of the public who are interested in better understanding cutting-edge developments in education and schooling in the Asia-Pacific.

The reason why this book series has been devoted exclusively to examining various aspects of education and schooling in the Asia-Pacific region is that this is a particularly challenging region which is renowned for its size, diversity and complexity, whether it be geographical, socio-economic, cultural, political or developmental. Education and schooling in countries throughout the region impact on every aspect of people's lives, including employment, labour force considerations, education and training, cultural orientation and attitudes and values. The Asia-Pacific is home to some 63 % of the world's population of seven billion. Countries with the largest populations (China, 1.4 billion; India, 1.3 billion) and the most rapidly growing megacities are to be found in the region, as are countries with relatively small populations (Bhutan, 755,000; the island of Niue, 1,600).

Levels of economic and socio-political development vary widely, with some of the richest countries (such as Japan) and some of the poorest countries on Earth (such as Bangladesh). Asia contains the largest number of poor of any region in the world, the incidence of those living below the poverty line remaining as high as 40 % in some countries in Asia. At the same time, many countries in Asia are experiencing a period of great economic growth and social development. However, inclusive growth remains elusive, as does growth that is sustainable and does not destroy the quality of the environment. The growing prominence of Asian economies and corporations, together with globalisation and technological innovation, is leading to long-term changes in trade, business and labour markets, to the sociology of populations within (and between) countries. There is a rebalancing of power, centred on the Asia-Pacific region, with the Asian Development Bank in Manila declaring that the twenty-first century will be "the century of the Asia-Pacific".

We believe that this book series makes a useful contribution to knowledge sharing about education and schooling in the Asia-Pacific. Any readers of this or other volumes in the series who have an idea for writing their own book (or editing a book) on any aspect of education and/or schooling, which is relevant to the region, are enthusiastically encouraged to approach the series editors either direct or through Springer to publish their own volume in the series, since we are always willing to assist prospective authors shape their manuscripts in ways that make them suitable for publication in this series.

Office of Applied Research and Innovation Rupert Maclean
College of the North Atlantic – Qatar
Doha, Qatar
Centre for Research in International Lorraine Symaco
and Comparative Education
University of Malaya
Kuala Lumpur, Malaysia
March 2017

Foreword

In 1999, a team of students at the University of Birmingham in the UK that I supervised strapped a Kodak digital camera to an early tablet computer, added a mobile phone card, wrote software to tie all the devices together and demonstrated on BBC television what was the world's first multimedia smartphone.[1] Today, there are an estimated 2.3 billion smartphone users worldwide.[2] That staggering number is still small compared to the total number of mobile phone users, estimated at 4.8 billion[3] out of a world population of 7.4 billion.

For many, the mobile phone is an indispensable tool to communicate with friends and family, organise a social life, listen to music and watch videos. The WeChat mobile app has over one billion accounts and has become the ubiquitous platform in China for messaging, talking by voice and video, sending money to friends, reading news, ordering taxis and paying for goods in stores. Yet the mobile phone has still not become the universal means of lifelong learning envisaged in that student project 20 years ago (Sharples 2000). What more is needed for the mobile phone to become an indispensable tool for learning?

First, phones and other personal mobile devices need to be accepted into classrooms. In technologically developed countries, the arguments of cost have disappeared – tablet computers are cheaper than pocket calculators were when those became widely adopted in the 1980s. The main problem is that tablets and smartphones are disruptive technologies. They break out of the carefully regulated environment of the classroom and allow students to connect to a world of information and distracting entertainment. They can send offensive messages and take unflattering photos. But the solution to inappropriate use of personal devices is not to ban the technologies but manage their use. Schools and colleges are starting to adopt acceptable use policies for students bringing their own technologies (TeachThought 2014),

[1] Phones with email capabilities were available in 1999, but the first commercial camera phones were introduced in Japan in 2000: http://www.nytimes.com/2009/07/20/technology/20cell.html.

[2] https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

[3] https://www.statista.com/statistics/274774/forecast-of-mobile-phone-users-worldwide/

and some large school districts have adopted a successful Bring Your Own Device strategy (Ullman 2016).

That requires a shift in attitude to see mobile devices as tools for learning and changes in teaching practice to support young people as self-managed learners, carrying out group projects, researching online and connecting with educational resources at home or outdoors. Research evidence for the benefits of mobile devices as tools for learning is still scarce but promising. A meta-analysis by Sung, Chang and Liu (2016) of 110 published journal articles on integrating mobile devices with teaching and learning showed a moderate positive effect (an effect size of 0.5). Greater effects were found for learning in informal settings and for inquiry-led learning. The analysis indicated an urgent need to improve teachers' professional development to help them cope with mobile hardware and software and develop new methods for teaching and assessment with mobile devices.

Second, as well as developing apps that exploit the latest generation of smartphones, there is a need to offer effective education for the more than 2.5 billion people with older non-Internet phones. One successful example is English in Action (EIA), a 9-year project that started in May 2008 and has provided professional development to 51,000 teachers in Bangladesh. The project is a partnership between the Bangladesh government and the UK Department for International Development (DFID). It also involves the Open University, Cambridge Education and the BBC. Teachers are sent multimedia learning materials on micro-SD cards for their low-cost mobile phones, so they can watch demonstrations of good classroom practice and try out communicative methods of teaching English (English in Action, n.d.a). An early evaluation of the project found that teachers' competence in English language improved, they used English most of the time for classroom conversation and they preferred the new communicative classroom activities to traditional English teaching through grammar lessons (Walsh et al. 2012).

Another part of English in Action, BBC Janala, provides adults with daily 3-min audio lessons to improve their English language skills. Anyone with a standard mobile phone can call a short code to hear the lesson, for the cost of 50 paisa (half a penny) a minute. More than seven million Bangladeshis have accessed the audio teaching media on their phones (English in Action, n.d.b).

This project shows it is possible to provide effective teaching on standard non-Internet mobile phones. But it takes a coordinated effort to achieve such success. In Bangladesh, the team had active support from the Ministry of Primary and Mass Education and also negotiated with mobile phone companies for low-cost access to the audio lesson service. As more people gain access to smartphones and fast mobile Internet, they will be able to engage with massive open online courses (MOOCs). The FutureLearn platform[4], based on a pedagogy of learning through conversation, has over 5.6 million learners registered worldwide, with 25 % of them accessing the free courses on mobile devices. There is a wealth of learning available online but only for those who know where to find it, can understand English, and have unrestricted access to the Internet. For others, the journey has not yet begun.

[4] https://www.futurelearn.com/

Third, technology and pedagogy are developing rapidly. New mobile devices include virtual reality headsets and mixed reality glasses (that overlay information on the visual world around), wearable body monitors and devices that sit in the ear and can translate spoken languages. New forms of mobile pedagogy include spaced repetition (where content such as foreign language vocabulary is delivered at timed intervals to reinforce learning), flipped classrooms (with students accessing content online then engaging in problem solving in the classroom), adaptive tutoring (with content matched to the learner's needs and activity), conversational learning (where learners worldwide engage in constructive discussion and facilitated debate), geo-learning about landscape and surroundings (for students on field trips) and citizen inquiry that combines citizen science and inquiry-led learning by exploiting the sensors and media tools in mobile phones.[5]

The author William Gibson is quoted as saying "The future is already here – it's just not very evenly distributed". That is especially true for mobile learning. Those labs that are developing the latest mobile technologies do not necessarily understand how best to use them to support effective learning; conversely, schools and universities that pioneer new modes of teaching have little influence on the design of technologies in research centres and companies. Yet, these technologies will disrupt education.

Consider the emerging technology of in-ear devices. Already, the Waverly Labs Company is developing a "smart earpiece" that will translate between users speaking different languages.[6] Similar technologies could offer a personal audio assistant that adapts to the preferences, behaviour and location of the user. It could whisper information about who or what a person is looking at (by detecting the user's location and head position), enhance a conversation by offering relevant up-to-date information or track head gestures such as nodding to provide feedback to a teacher. Yet, a company (which I shall not name) is marketing similar technology in the form of a tiny invisible earpiece which it claims is "designed to cheat on tests and exams … Go to your exam and once there, call the person that'll give you a helping hand with your test. You'll follow the conversation through the earpiece hidden in your ear, and speak into the microphone in a quiet whisper".

Every mobile device can be used to enhance learning or upset it. Just because mobile phones can now track when, where and how students learn outside class does not mean it is appropriate to do so. Just because students could wear "smart earpieces" that feed them information and detect whether they are nodding or shaking their heads in response does not imply they should be used in that way. As more countries in the Asia-Pacific region gain widespread Internet access, so there is a growing cottage industry of entrepreneurs producing mobile software. Many thousands of educational apps are being developed worldwide for mobile devices, most by people with no expertise in the science of learning or knowledge of effective methods of teaching.

[5] See www.open.ac.uk/innovating

[6] http://www.waverlylabs.com/pilot-translation-kit/

As educators, learning scientists and educational technologists, we have a responsibility to influence the development of mobile learning. We should show the evidence that engaging in active learning is more effective than watching lectures (Freeman et al. 2014), that working together is better than working alone (Johnson and Johnson 2009), that timely feedback can assist learning (Shute 2008) and that all these can be delivered on mobile devices. We should take a stance on the benefits of bringing personally owned devices to connect learning between informal and formal settings. We should engage with leaders in schools, colleges and universities and in government to develop digital learning strategies that are informed by the best evidence of how new technologies can benefit learning. We should propose professional development of teachers and lecturers in how mobile technology can support the future-oriented skills of problem solving, critical thinking, teamwork, global awareness and social responsibility. Most of all, we should work with developers of mobile technology to design new and effective tools for learning, based on deep insights into how people learn in different cultures and settings.

Smartphones and tablets combine computation and connectivity in a powerful portable package. New pedagogies emphasise active, personalised and cooperative learning. Mobile learning has the potential to bring these together for lifelong education. Research has shown that students do not want a "mobile learning organiser" separate from their familiar social and productivity tools (Corlett et al. 2005; see also Chap. 29). How can we enable learning that blends seamlessly into everyday life? The first generation of mobile learning was about exploring what is possible, in delivering content to mobile devices and exploring context-sensitive learning experiences. The second generation has shown how personal devices can support a continuity of learning in classrooms, homes, museums and outdoors. The opportunity now is to offer mobile learning at scale, for millions of people in ways that match their needs, lifestyles, cultures and national resources.

Institute of Educational Technology
The Open University
Milton Keynes, UK

Mike Sharples

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Preface

Higher education in the Asia-Pacific region is experiencing exciting change and unprecedented growth due to the pressures of internationalisation and ambitious targets set by governments in the region to succeed in the global, digital economy. Students are increasingly mobile within and outside Asia-Pacific borders with more than half of cross-border students originating from Asian countries. Innovation in mobile learning has the potential to support student access to quality learning experiences anywhere and anytime. The aim of this handbook is to support educators and policy makers who are investing in innovations in digital education to develop effective and sustainable mobile learning solutions for higher education environments. Authors from 16 countries across the Asia-Pacific region have collaborated to share their experiences with developing and implementing mobile learning initiatives. These projects focus on a variety of aspects of mobile learning innovation from the trial adoption of existing social media platforms on mobile devices and development of specialised applications or mobile learning systems to large-scale cross-university implementation of technologies and pedagogies to support mobile learning. Each chapter addresses challenges and solutions at one or more levels of mobile learning innovation within the education system: the student perspective, the educator perspective, technical processes and policies and organisational strategy or leadership. The book also offers a unique perspective on the integration of mobile learning innovations within the educational, political and cultural environments of Asia-Pacific countries.

Toowoomba, Australia	Angela Murphy
Toowoomba, Australia	Helen Farley
Sydney, Australia	Laurel Evelyn Dyson
Toowoomba, Australia	Hazel Jones

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Part III South-East Asia

About the Editors and Contributors

Editors

Angela Murphy is the learning analytics manager at the University of Southern Queensland (USQ), Australia. She has been employed at USQ as a research fellow in the Australian Digital Futures Institute since 2011 (now Digital Life Lab). Her work included a 3-year USQ-led Collaborative Research Network (CRN) project with the Australian National University and the University of South Australia to develop an evaluation framework for sustainable mobile learning initiatives in higher education environments. Her research involved exploring the experiences of students, educators and leaders in the Asia-Pacific region who were actively engaged in mobile learning or mobile learning innovation.

Helen Farley is an associate professor within the Digital Life Lab at the University of Southern Queensland. Her research interests include investigating the affordances of emerging digital technologies, including virtual worlds, augmented reality and mobile technologies, in formal and informal learning. She led the CRN-funded project to develop a Mobile Learning Evaluation Framework, working with Dr. Angela Murphy. She is passionate about digital inclusion and leads the $4.4 million *Making the Connection* project which recently received an Australian Award for University Teaching for Programs that Enhance Learning. Associate Professor Farley has published extensively and is a featured speaker at both educational technology and corrections conferences. She is also on the ASCILITE executive committee and chairs the community mentoring portfolio.

Laurel Evelyn Dyson is an honorary associate in information technology at the University of Technology, Sydney, and founding president of anzMLearn (the Australian and New Zealand Mobile Learning Group), established in 2009. She has published over 75 papers and books, which include research into the innovative use of mobile technology to enhance student learning and the adoption of mobile technologies by Indigenous people. She has three decades of experience teaching in the university and adult education sector and is the recipient of five faculty, university and national teaching awards, three best paper awards and two Reconciliation awards. Her most recent book is *Indigenous People and Mobile Technologies*.

Hazel Jones is currently an educational designer and a PhD candidate at the University of Southern Queensland, Australia. Her research interests are in higher education and learning analytics, with an emphasis on support for online learning and teaching and for working with academics to provide quality learning environments for their students. She has worked in educational design and development roles at universities around Australia for over 15 years.

Contributors

Peter Albion is professor of educational technology in the School of Teacher Education and Early Childhood within the Faculty of Business, Education, Law and Arts at the University of Southern Queensland, Australia. His teaching and research is in areas related to online learning and the integration of ICT in teacher education. His doctoral work investigated the development of interactive multimedia with a problem-based learning design using materials built around simulated school contexts and delivered in a web browser. More recently, he has worked in online and mobile learning, virtual worlds and technology education. Prior to joining USQ in 1991, he was a teacher and principal in secondary schools for 17 years.

Trish Andrews is the director of Emerging Learning Environments, an educational consultancy based in Brisbane, Australia, and formerly a senior lecturer in higher education (eLearning) and manager of the Technology-Enhanced Learning Group in the Teaching and Educational Development Institute (TEDI) at the University of Queensland. Trish has extensive experience in leading and supporting the innovative use of technology for teaching and learning in higher education. This work includes curriculum development, learning spaces, research, evaluation and capacity building. Trish has been awarded two ALTC awards for programmes that enhance learning. Trish has successfully completed a number of national teaching projects and has a particular interest in the adoption and use of mobile technologies to support everyday teaching and learning activities.

Laurent Antonczak is a multicultural entrepreneur specialising in digital strategies (branding, visual communication, social media, transmedia, information architecture) and emerging technologies (web and mobile phones). He is one of the cofounders of MINA (Mobile Innovation Network Aotearoa), which aims to explore the possibilities of interaction between people, content and the emerging mobile industry. He lectures and supervises students in new media and visual communication mainly at postgraduate level (on-campus and online delivery) at AUT University.

Lidwina Sri Ardiasih is a lecturer in the Faculty of Education and Teacher Training of Universitas Terbuka. She holds a bachelor's degree in English language education from Sanata Dharma University, Yogyakarta, Indonesia. In 2011, she pursued her master's degree in education at the University of Western Australia, with the scholarship from the Directorate General of Higher Education. Her research interests include English language education, eLearning and ODL.

Shamsul Arrieya Ariffin is a senior lecturer in the Faculty of Art, Computing and Creative Industries and also holds an administration post as a deputy director of the International Affairs Division at Sultan Idris Education University (UPSI), Tanjung Malim, Perak, Malaysia. He has also 20 years of working experience in various ICT fields. Prior to joining UPSI, he worked with various international companies, including software engineering, system engineering and IT training in Malaysia. He received his PhD from the University of Technology, Sydney, Australia. His research specialises in mobile learning with the aim being to bridge the digital gap between the cultural and technology aspects in which ICT is involved.

Tian Belawati holds a doctor of philosophy in adult education (University of British Columbia, Canada) and a master of education in management of distance education (Simon Fraser University, Canada). She has served lifetime professional contributions to open and distance learning (ODL) and is currently serving her second term of office as the rector of UT. Her professional achievements have led to her appointments as secretary general (2007–2009) and then president (2009–2010) of the Asian Association of Open Universities (AAOU) and as president (2010–2015) and then member of the board of trustees of the International Council for Open and Distance Education (ICDE) starting in 2017.

Chris Campbell lectures in learning innovation in the Centre for Learning Futures at Griffith University, Brisbane, Australia. As an emerging research leader, she has been involved in numerous grants and projects around digital technologies and mobile learning. Her skills in implementing and trialling new technologies are documented in over 60 publications where she has conducted research in online tools in educational settings, including LAMS, Second Life and Assistive eXtra Learning Environments as well as research in technology integration, mobile learning and augmented reality. In 2016, Chris was awarded a Queensland-Smithsonian Fellowship where she investigated the Smithsonian Learning Lab and implications for teachers. Chris has a keen interest in mobile learning and has published various papers pertaining to TPACK and mathematics education.

Sanjeet Chand is an assistant learning system developer in the Centre for Flexible and Distance Learning at the University of the South Pacific. His interests are in the areas of eLearning, mLearning and web and mobile applications.

Horn Mun Cheah is currently the Dean, School of Human Development and Social Services at the Singapore University of Social Sciences. He was Director of the Educational Technology Division at the Ministry of Education, Singapore, from 2008 to 2013. His then responsibilities included planning and implementation of the 3rd ICT Masterplan for Education. Prior to this, he was Dean of Foundation Programmes at the National Institute of Education, taking charge of all initial teacher preparation programmes. He received his PhD for research work on high-temperature superconductivity from Cambridge University. His present research interests include the effective integration of ICT into education and assessment of twenty-first-century skills. He was a member of the Horizon K12 advisory board, the ATC21S executive board and the NEXT-TELL International advisory panel.

Mahdi Choyekh is currently a third-year doctoral student at the Department of Naval Architecture and Ocean Engineering, Graduate School of Engineering, Osaka University, Japan. His research is about the development of an autonomous underwater robot called SOTAB-I for tracking and monitoring spilled oil and gas from seabed.

Thomas Cochrane is an academic advisor and senior lecturer in educational technology at AUT University's Centre for Learning and Teaching (CfLAT). His research interests include mobile learning, web 2.0 and communities of practice. Thomas has managed and implemented over 45 mobile learning projects, with a recent focus on Android and iOSsmartphones and the iPad as catalysts to enable student-generated content and student-generated learning contexts, bridging formal and informal learning environments.

Ramiza Darmi is a senior lecturer in the Department of English within the Faculty of Modern Languages and Communication at Universiti Putra Malaysia since 2015. She obtained her PhD from the University of Southern Queensland, Australia. She teaches undergraduate and postgraduate courses for bachelor of arts in English language, master in English language and master in applied linguistics. Her research interests include English language learning, second language learners/learning and technology-enhanced language learning. Currently, she is a member of the Mobile Learning Association of Malaysia, the Australian and New Zealand Mobile Learning Group (anzMLearn), the Asia-Pacific Association for Computer-Assisted Language Learning (APACALL), the Asia Association of Computer-Assisted Language Learning (Asia CALL), the Malaysian English Language Teaching Association (MELTA) and Asia Teaching English as a Foreign Language (Asia TEFL).

Rosseni Din is currently an associate professor of eLearning and computer education with Universiti Kebangsaan Malaysia where she teaches technology and education as well as instructional design. Her fields of research include developmental research method, structural equation modelling, eLearning and computer in education. Rosseni Din is also the deputy director of the university's information and technology centre.

Mohamed Amin Embi is a professor of technology-enhanced learning at the Faculty of Education, Universiti Kebangsaan Malaysia. He is well known in Malaysia as a professional educator, academic leader and innovator in teaching and learning especially in the area of eLearning and mobile learning. He is the recipient of the distinguished ISESCO Science Laureate 2010 for his contributions to technology (eLearning). He is also the first recipient of the most prestigious National Academic Award 2006 for Teaching introduced by the Ministry of Higher Education, Malaysia. Professor Amin is also the president of the Mobile Learning Association of Malaysia.

Rona Finiasi is a multimedia developer in the Centre for Flexible and Distance Learning at the University of the South Pacific (USP). He has a bachelor's degree in computing science and information systems and is currently pursuing his postgraduate diploma in information systems.

Cécile Gabarre is currently an assistant professor with the University of Nizwa (Oman). Her dual field of expertise in instructional design and language teaching led her to develop MALL environments supporting immersive and personalised learning. Her current interests include pedagogical approaches for MALL, teacher training, action research, technological literacies, language classroom management, engagement dynamics and language acquisition.

Serge Gabarre is an assistant professor with the University of Nizwa (Oman). His research interest focuses on the integration of social networking sites with mobile devices in French as a foreign language classroom. His previous publications deal with mLearning, eLearning, language acquisition and online collaborative tasks. Together with Cécile Gabarre, Serge has conducted several teacher training seminars across Asia with a focus on incorporating technologies in the language classroom.

Alison Gee is with Voluntary Service Overseas (VSO) working in partnership with UNICEF in Bangladesh. She was formerly with SMS Story, VSO India, and before that was a volunteer on the SMS Story project with VSO in Papua New Guinea.

Martie Geertsema has been teaching English for the last 16 years and has worked with adult learners in the UK, Turkey and Australia. She has extensive experience in teaching English for general and for academic purposes. Since 2007, she has been working as a Cambridge CELTA trainer and has also worked on TKT courses with a wide variety of colleagues from different countries, cultures and linguistic backgrounds. In 2013, she completed her master of educational studies at the University of Queensland with a double major in leadership and literacy. She loves working with novice teachers and takes a special interest in finding ways to increase digital literacy in English language classrooms.

Matthew Guinibert has been an educator for 8 years working in various roles as a lecturer, supervisor, consultant, curriculum writer and course supervisor. Presently Matt is exploring the potential of mobile HUDs such as Google Glass as an augmented reality mLearning tool for learning visual literacy competencies.

Boris Handal is an associate professor in ICT in education at the University of Notre Dame, Australia, where he is also higher degree by research coordinator in the School of Education. Prior to entering academia, Boris was a classroom teacher and worked as a senior learning design officer at the NSW Centre for Learning Innovation producing interactive web-based resources in science and mathematics. Coming from this background, Boris' research naturally focuses on the interface between delivering the curriculum and eLearning technologies. Boris has published over 60 papers, conference articles and book chapters. In 2005, he was awarded the NSW Minister of Education's "Excellence in the Integration of Information and Communication Technologies" award and in 2010 was the recipient of the Macquarie University vice-chancellor's "Award for Programs that Enhance Student Learning".

Olivia Idrus is a lecturer in the Economics Faculty of Universitas Terbuka. She holds a bachelor's degree in accounting from the University of Trisakti, Jakarta, Indonesia. In 2008, she received a scholarship from the Ministry of Communication and Information of the Republic of Indonesia to pursue her master's degree in management in the University of Groningen, the Netherlands. Her research interests include accounting, management and ODL.

Umera Imtinan is a PhD graduate from the School of Information Systems, Curtin University, Australia. She has been working in COMSATS Institute of Information Technology, Lahore, Pakistan, as assistant professor for 10 years. Currently, she is working as sessional academic in the University of Western Australia and Curtin University. Her research interests include mobile learning, eLearning, blended learning, design and development of educational technologies, gamified mobile learning, MALL, information systems, human-computer interaction, and technology innovation in education. During her PhD, Umera worked on developing a mobile learning framework for universities of Pakistan. She has published in peer-reviewed journals and conference proceedings in the field of mobile learning, blended learning, and education technologies.

Marshall Jauk is a senior staff member with Voluntary Service Overseas in Papua New Guinea in the education programme. He contributed ideas into the design of SMS Story, assisted with sending out daily text messages and led a team of researchers in the field.

Soo Yuen Jien received his PhD degree from NUS in 2006 and since joined the School of Computing, NUS, as an educator track staff. He has received a number of teaching excellence awards at the faculty and university level. In 2012, he was inducted into the NUS Teaching Academy. His research interests are in computer architecture and technology-aided teaching. Yuen Jien is currently actively involved in the development of a number of web-based/mobile-based teaching systems in the area of technology-aided mastery learning and large-scale classroom response.

Richard Jones is an international education and development consultant who specialises in teacher education, curriculum development and education programme design. From 2010 to 2015, he was the senior education programme manager with VSO in Papua New Guinea and designed and managed SMS Story.

Nasiib Kaleebu is a programme officer (monitoring and evaluation) with the United Nations Development Programme, Uganda Country Office. He was formerly a volunteer researcher on the SMS Story project with Voluntary Service Overseas (VSO) in Papua New Guinea. He is an economist with cutting-edge knowledge of programme design and evaluation.

Bimal Aklesh Kumar is the head of the Department of Computer Science and Information Systems at Fiji National University. He graduated with MSc, PGDip and BSc from the University of the South Pacific. He has more than 12 years of work experience both in industry and academia. He is an active researcher in the field of mobile computing and has published a number of research articles.

Raneel Kumar is a user consultant for the School of Computing, Information and Mathematical Sciences at the University of the South Pacific in Fiji. His research interests are in the areas of eLearning, mLearning, cloud computing and cyber security. He is currently pursuing his master of science degree in computing science.

Kenneth Y.T. Lim works within the intersection of cultural anthropology, the learning sciences and cognitive psychology. He conceptualised the Six Learnings framework of curriculum design for fictive worlds and virtual environments. Most recently, he has edited a book on maker culture and makerspaces, which was published in 2017. In relation to this work, his team has designed a field-based inquiry curriculum, called Maker Motes, and they are translating this approach to urban and peri-urban schools in the Association of Southeast Asian Nations (ASEAN) region. Kenneth has been a visiting scholar at the Hong Kong Institute of Education and was invited as a plenary speaker at the 2016 United Nations Educational, Scientific and Cultural Organization (UNESCO) Conference of the Asia-Pacific Programme of Educational Innovation for Development. His work has helped him posit a theory of learning around the notion of disciplinary intuitions, which he discusses in his book, *Disciplinary Intuitions and the Design of Learning* (2015).

Tyneth Ly is a soil and water science researcher at the Cambodian Agricultural Research and Development Institute. He lectures in soil science at the Royal University of Agriculture, Cambodia.

Daniel Madigan taught science for many years, both in NSW and Mexico, with a special interest in the use of technology in the teaching of physics and chemistry. He currently lectures future secondary school teachers at the University of Notre Dame, Australia. His research interests range over areas as diverse as theology and science, including participation in a project using technology in the study of cosmic rays entering the Earth's atmosphere conducted through the University of Sydney.

David Marcovitz is an associate professor in the School of Education and director of graduate programmes in educational technology at Loyola University Maryland. Prior to coming to Loyola University, Dr. Marcovitz taught in the educational technology programme at Florida Atlantic University. He was hired by Loyola College in 1997 to develop a master's programme in educational technology, the programme which he coordinates and for which he teaches many of the classes. His scholarly interests include support for technology in the schools and multimedia design by teachers and students.

Priya Mohite obtained her MTech degree from Gogte Institute of Technology, Belgaum, India, in 2013. She is currently working as a lecturer in the Department of Computing Science at Fiji National University. Her research interests include mobile computing and other related fields.

Kousuke Mouri is currently an assistant professor at Department of Computer and Information Sciences, Tokyo University of Agriculture and Technology, Japan. He received the PhD degree from the Graduate School of Information Science and Electrical Engineering, Kyushu University, Fukuoka, Japan. His research interests include computer-supported ubiquitous and mobile learning, language learning, learning analytics and educational data mining. For more details, please visit https://sites.google.com/site/mourikousuke.

Danielle (Danni) Mulrennan is a lecturer in journalism at Auckland University of Technology. Her research interests are in journalism studies where she is particularly interested in the application of mobile social media within journalism education and the relationship between the culturally deaf and the television broadcast news media.

Ravishel Naicker is a graduate programmer at the Faculty of Science, Technology and Environment at the University of the South Pacific. His interest is in the areas of mLearning, cloud computing and network security.

Norazah Nordin is currently the dean of the Faculty of Education, Universiti Kebangsaan Malaysia (UKM) (Malaysia National University). Her research areas include mobile learning, integrating ICT in education and lifelong learning and instructional design in online learning. At the national level, she is a committee member of the Critical Agenda Project (CAP) (eLearning), Ministry of Education, Malaysia, and also a member of the Council of the Malaysian Public HEIs e-Learning

Coordinators. Her latest projects with the ministry include the development of a prototype of massive online open courses (MOOCs) and its guidelines, development of the blended learning standard and rubrics and review of the National e-Learning Policy. She is also one of the co-founders and the honorary secretary of the Mobile Learning Association of Malaysia. At the university level, she is one of the UKM ICT Council members, who are responsible for promoting mobile learning, blended learning and flipped classroom at the university. Her current projects are iTunesU and iBook initiatives with Apple Education Development, Malaysia.

Helmi Norman is a senior lecturer at the Department of Teaching and Learning Innovations, Faculty of Education, Universiti Kebangsaan Malaysia (UKM). He is also an associate research fellow at the Centre for Teaching and Learning Technologies, UKM. He is currently on the board of directors of the International Association for Blended Learning, where the association aspires to transform global education through blended learning. He was previously appointed as a visiting scholar at the Swartz Center for Computational Neuroscience, University of California, San Diego, and has been awarded a visiting postdoctoral fellowship by Erasmus Mundus at the Faculty of Science and Technology, Bournemouth University. During his PhD, he was also awarded the Global Student Mobility Partnerships programme for a research attachment at the e-Learning Lab, Center for User Driven Innovation, Learning and Design (eLL), Aalborg University, Denmark. His latest projects include cross-continental projects such as learning spaces with Australia's Innovative Research Universities and national projects such as the Malaysia Massive Open Online Courses Initiative. He is also an educational technology consultant for Apple where he is involved in projects for higher and secondary education in promoting 1:1 pedagogical and learning approaches using the Apple ecosystem.

Hiroaki Ogata is a full professor at the Academic Center for Computing and Media Studies and Graduate School of Informatics (Social informatics) at Kyoto University, Japan. His research interests include computer-supported ubiquitous and mobile learning, CSCL (computer-supported collaborative learning), CSCW (computer-supported collaborative writing), CALL (computer-assisted language learning), CSSN (computer-supported social networking), knowledge awareness, mobile learning analytics and computer-human interaction. For more details, please visit https://sites.google.com/site/hiroakiogata.

Azraai Othman is a PhD candidate at Universiti Putra Malaysia.

Satoru Ozawa was born in Tokyo in 1948. After finishing his doctorate in physics at the Optical Research Institute, Tokyo University of Education, in 1977, he obtained an academic position at Ibaraki University. He was an invited professor at the University of Heidelberg (1993–1994) and a visiting professor at the University of Leeds. He also worked as a JICA expert (1998–2003) and contributed to JICA projects in Poland and the Ukraine. He conducted several projects including the

KISSEL project which is now running. He has published many journal papers and books concerning computational physics, eLearning, computational sociology and so on. He has organised international symposia and seminars on these topics.

Dewi Padmo is currently vice rector for finance and general affairs of Universitas Terbuka (UT). Her career at UT started in 1987 as a lecturer in the Faculty of Education. She got her master of arts in educational technology at Concordia University, Montreal, Canada. Upon her return to UT in Indonesia in 1992, she was appointed as head of Multimedia Production Center – UT. Following from her work at the Multimedia Production Center, Padmo served as head of the Institute for Learning Material Development, Examination, and Information System in 2005–2008. Padmo got her doctor of philosophy in instructional system at Florida State University, USA, in 2012. Upon returning to Indonesia, Dewi was assigned as the head of the Institute for Research and Community Services of UT.

Ebrahim Panah is currently a PhD candidate in TESOL at the Faculty of Education, Universiti Kebangsaan Malaysia (UKM) (Malaysia National University). He obtained his master's degree in TEFL from the University of Guilan and bachelor's degree in English literature from the University of Shiraz, Iran. His research interest is in the areas of mobile learning, flipped classroom, blended learning, Google-informed learning and massive online open courses (MOOCs) with many book chapters on blended learning, flipped classroom and MOOCs and articles on Google-informed language learning. His current project is on Google Scholar--informed writing improvement.

David Parsons is the national postgraduate director at The Mind Lab by Unitec, Auckland, New Zealand. He holds a PhD in information technology and a master's degree in computer science and has wide experience in both academia and the IT industry. He is the founding editor in chief of the *International Journal of Mobile and Blended Learning* (IJMBL) and author of a number of texts on computer programming, web application development and mobile learning. His work has been published in many international journals, including *Computers & Education*, *IEEE Transactions on Learning Technologies* and *Software: Practice and Experience*. He chaired the Conference on Mobile Learning Technologies and Applications in 2007 and was co-editor of *Innovative Mobile Learning: Techniques and Technologies* (Information Science Reference, 2009). He also edits the annual compilations of papers from IJMBL that are published as a regular series of books. He is a member of the International Association for Mobile Learning and a professional member of the British Computer Society.

Aaron W. Pooley is a PhD candidate in the field of linguistics at the University of Southern Queensland, Australia. He is currently a lecturer in the department of English language and literature at Soonchunhyang University in the Republic of Korea. His research interests include sociolinguistics, global mobility, language contact, mobile technologies and mobile instant messaging.

Yew Siang Poong is a researcher in the Global Scientific Information and Computing Center in Tokyo Institute of Technology (Tokyo Tech). He received a doctor of engineering degree in international development engineering from Tokyo Tech in 2016. His research interests include information technology management, technology for sustainable development in developing countries and application of mobile technology for learning, education and health promotion. He holds a master of engineering degree in international development engineering from Tokyo Tech, a master of philosophy degree and a bachelor's degree in information systems engineering from Multimedia University, Malaysia. He has 10 years of research experience, in addition to 5 years of teaching experience in computer science and IT management domains in Multimedia University and Taylor's University, Malaysia. His current research focuses on technology implementation to promote World Heritage Site preservation under the collaboration between Japan and Laos.

Varunesh Rao is a learning systems administrator based with the Centre for Flexible Learning (CFL) at the University of the South Pacific. His role in CFL is around the administration of USP's eLearning and mLearning services. His interest and research areas are around learning management systems, mobile learning and data analytics. Varunesh is part of the USP mLearning team which seeks to investigate and promote the use of mobile devices in flexible learning methods. He is also a committee member of the South Pacific Computer Society (SPaCS), a society which seeks to promote ICT capacity building in the South Pacific.

Xiang Ren is a research fellow in the Australia-China Institute for Arts and Culture and a member of the Institute for Culture and Society at Western Sydney University. His research interests include digital/open publishing, open access, eLearning and Chinese digital media. He has published widely in these areas in both international scholarly journals and leading Chinese media outlets. Xiang completed his PhD at Queensland University of Technology in 2013, receiving the university's outstanding doctoral thesis award. Prior to his academic career, he has spent more than a decade working in the Chinese publishing industry, including involvement in the electronic schoolbag projects as an educational publisher.

Robert Ritter is the director of the Centre for Mathematics, Science and Technology Education at the University of Alberta, Canada.

Vernon Rive joined the Auckland University of Technology Law Faculty in 2009 after over 14 years of private practice, latterly as a partner in the environmental/resource management team at the national law firm Chapman Tripp.

Carol Russell is a senior lecturer in higher education at the University of Western Sydney (UWS). She has 15 years of experience in Australian campus universities, supporting academic staff in using learning technologies. Carol has been coordinating the evaluation of UWS's blended and mobile learning initiatives and providing support for curriculum development around this. Carol's first degree was in applied physics, and she worked for several years in engineering before moving into higher education – initially in distance education, with the UK's Open University (1988–2000), throughout the shift from print resources to digital media and online study. She also studied for an MBA at the Open University Business School. One of her enduring interests has been in systems thinking and in particular how human--technological systems develop and evolve. Her PhD (2008) was in eLearning adoption in campus universities – focusing on how discipline and institutional contexts influence teachers' decisions about using learning technologies.

Tenku Putri Norishah Tenku Shariman is a lecturer on media art studies in the Faculty of Creative Multimedia at Multimedia University, Malaysia. She has published articles on digital literacy and its relevance to learning, whether in formal or informal contexts. She is the deputy chairperson of the Centre of Interactive Media, Multimedia University, which focuses on pursuing creative, critical and experimental practices in research that employ the use of technologies in interactive environments besides being a member of the Mobile Learning Association of Malaysia. Her research and publication interests include the impact of new technologies on literacy and learning and the development of interactive applications that have an impact on the lives of individuals.

Bibhya Sharma is an associate professor of mathematics at the University of the South Pacific (USP). He has also been the associate dean for learning and teaching within the Faculty of Science, Technology and Environment at USP since 2010. He is a member of a number of professional mathematics societies and unions and has published more than 70 articles and book chapters in the fields of mathematics education, robotics, biologically inspired processes and the TLPs of higher education. He champions adaptive works and innovations in the areas of eLearning and mLearning for higher education.

Vineet Singh is an assistant programmer at the Faculty of Science, Technology and Environment at the University of the South Pacific. His interest is in the areas of eLearning, mLearning, web/mobile applications and artificial intelligence. He is currently managing all the ICT-driven projects of the faculty and is part of the mLearning team of the university.

Helena Song is an academic lecturer at the Faculty of Creative Multimedia, Multimedia University, Malaysia, and has been actively involved in several research projects in emerging technologies including mobile technology for teaching and learning. Helena's research interests include empowering disabled persons with emerging technologies, technology-enhanced teaching and learning in higher education and interactive and expressive digital art.

Ann Starasts is a research fellow with the National Centre for Engineering in Agriculture at the University of Southern Queensland. Her research explores how digital technologies and science outputs can be better integrated into rural and regional communities to help build capacities to enhance participation in education and learning. She works on an Australian Centre for Agricultural Research (ACIAR) project in Cambodia and Laos in conjunction with staff associated with the National University of Laos and the Royal University of Agriculture in Cambodia. She is an agricultural education and information specialist.

Caroline Steel is a strategic educational consultant with Blackboard International for the Asia-Pacific region and holds an adjunct academic position with the University of Queensland. Her work as a consultant, a university teacher and a researcher is focused on helping learners, teachers and institutions get the best pedagogical outcomes from their technology use. Caroline is past president of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE).

Jun-ichi Takada received BE and DE degrees in electrical and electronic engineering from Tokyo Institute of Technology (Tokyo Tech) in 1987 and 1992, respectively. He was a research associate at Chiba University in 1992–1994 and an associate professor at Tokyo Tech in 1994–2006. He has been a professor in the Department of International Development Engineering, Tokyo Tech, since 2006. His research interests are wireless communication technology and ICT applications for international development. He has been chairing the "Engineering and International Development" study group in the Japan Society for International Development (JASID) during 2011–2015. He is a fellow of the Institute of Electronics, Information and Communication Engineers in Japan, a senior member of the Institute of Electrical and Electronics Engineers in the USA and a member of JASID.

Othman Talib is a senior lecturer at the Department of Science and Technical Education, Faculty of Educational Studies, Universiti Putra Malaysia. He holds a bachelor of science degree in chemistry from the National University of Malaysia, a master of science degree in pedagogy from Universiti Putra Malaysia and an EdD degree in pedagogy from the University of Adelaide, Australia. His specialisation is in the area of science education. Originally trained as a chemistry teacher, his interests range from educational research to educational animation in chemistry. Othman Talib has developed a courseware for teaching electrochemistry and a computer--aided assessment courseware for organic chemistry. His current focus is on the development of a mobile learning application for teaching organic reaction mechanism named OCRA (Organic Chemistry Reaction App).

Emelyn Tan received her PhD from the University of Canterbury, New Zealand, in 2006 and is currently a senior lecturer at the National University of Singapore (NUS). She teaches extensively within the chemistry undergraduate and postgraduate programmes at the Department of Chemistry, Faculty of Science, NUS, and has received teaching excellence awards for her efforts. Dr. Tan's interests and experience are in creation, implementation and evaluation of technology-enhanced educational tools specifically mobile apps and molecular-scale animations. She is invigorated when popular gadgets like drones, 3D printers, Google Glass and smartwatches are used for the teaching and learning of chemistry.

Triet La Thanh is an English language lecturer in the Department of Foreign Languages, Ho Chi Minh City University of Foreign Languages and Information Technology, Vietnam. He has been actively involved in language education as a lecturer, exam trainer, academic manager, and examiner. He holds two master's degrees in education from the University of Southern Queensland, Australia. His research interests include learners' motivation, learning autonomy, and technology education.

Svetlana Titova is vice dean and professor of the Foreign Languages Methodology Department, Lomonosov Moscow State University, and research professor of the School of Education, Far Eastern Federal University, and has over 25 years of experience in EFL teaching, training and publishing in foreign language education, and eLearning. She is a material developer and a tutor of online professional development courses on IT and mobile competence of FL teachers. Her research areas are ICT integration into EFL classroom, mobile learning, and professional development of foreign language teachers. She coordinates several research projects including Mobile Devices in Language Classroom: Theory and Practice and two international projects supported by SIU (Norway), Enhancing Technology Awareness and Usage of m-Learning in Russia and Norway and MOBILL, with Norwegian partner Sør-Trøndelag University (Trondheim). Up to now, she has published more than 90 articles and books; she is an author and a coordinator of the educational website Learning and Teaching with the Web which aims at facilitating the process of implementing ICT and mobile technologies into a learning experience. She is a member of international professional organizations such as EUROCALL, IATEFL, and NATE.

Philip Townsend recently completed a PhD in the School of Education at Flinders University, Adelaide, South Australia. His thesis is titled "Travelling together and sitting alongside: How might the use of mobile technologies enhance the professional learning of Aboriginal and Torres Strait Islander school educators in remote communities?" Prior to commencing his PhD, Philip had 27 years of extensive cross-cultural experience in remote contexts. This time included 3 years (1984–1986) at a bilingual school in the Anangu Pitjantjatjara Yankunytjatjara Lands in South Australia, followed by many years in remote locations in the Western Province of Papua New Guinea (1987–2009), primarily in bilingual adult religious education with a Christian denomination. In 2010–2011, he completed a 6-month contract for the Indigenous Scripture Support Division of Bible Society Australia. Since 2005, Philip has given presentations at several international educational conferences. Philip was the recipient of a doctoral scholarship from the Cooperative Research Centre for Remote Economic Participation (CRC-REP) and was a member of the CRC-REP Remote Education Systems research project.

Edna Temese Ualesi is a senior lecturer at the National University of Samoa, in the Faculty of Science, Department of Computing. She graduated with a PhD in engineering at the Ibaraki University in Japan. Her main research is eLearning and mobile learning. She has already published some journal papers and conference papers on eLearning, ICT and sustainability sciences. She also developed a few mobile applications for learning targeting not only Pacific learners but worldwide. She is now teaching computing undergraduate and postgraduate courses in the Faculty of Science and is conducting further research on mobile learning in higher education.

Noriko Uosaki is currently an associate professor at the Center for International Education and Exchange, Osaka University, Japan. Her research interests include MALL (mobile-assisted language learning), seamless learning, CALL (computer--assisted language learning), computer-supported ubiquitous and mobile learning, CSCL (computer-supported collaborative learning) and TESL (teaching English as a second language). For more details, please visit https://sites.google.com/site/norikouosaki.

Henriette van Rensburg is an associate professor (special education) and programme coordinator in the Faculty of Business, Education, Law and Arts, at the Toowoomba campus of the University of Southern Queensland, Australia. Her research interests include linguistics and rural and remote as well as postgraduate education. Henriette has published research about Afrikaans speakers in Australia, rural and remote education and the postgraduate and higher degrees journey. Her PhD research was in the specific field of computer-aided education for milieu-deprived learners in mathematics in the senior primary phase.

Amanda H.A. Watson is a visiting fellow with the State, Society and Governance in Melanesia Program of the Coral Bell School of Asia Pacific Affairs at the Australian National University. Dr. Watson oversaw the SMS Story research project in her capacity as mobile communications research consultant with the Economic and Public Sector Program in Papua New Guinea. She completed her PhD at Queensland University of Technology on the responses of rural villagers to the early spread of mobile phone networks throughout Papua New Guinea. Her research focuses on strategic use of mobile phones across a range of sectors, including health, education, justice and governance. For more details, please visit www.ahawatson.com.

Jocelyn Wishart is currently a senior lecturer in science education at the University of Bristol, UK, specialising in teacher training and in the use of new technologies in teaching. She became involved in mobile learning through her interest in using handheld devices to support teacher trainees on placement in schools. She is membership secretary for the International Association for Mobile Learning and first published on ways forward for dealing with the multiple ethical concerns that so often arise when using mobile devices at the international MLearn Conference in 2008.

Andrew Withell is head of discipline product design at Auckland University of Technology and has an MFA in industrial design from the University of Illinois at Urbana-Champaign, USA. Andrew's research focuses on exploring and developing innovative approaches to learning and teaching in higher education, specifically in the areas of design thinking, sustainable design, product design and additive manufacturing.

Maiyer Xiong is an agricultural economist with the National University of Laos where she lectures and researches in socio-economics and rural sociology.

Shinobu Yume Yamaguchi is professor at the Global Scientific Information and Computing Center, Tokyo Institute of Technology (Tokyo Tech). She serves as a council member of the university while working as a planning officer for the International Office at Tokyo Tech. During her 15 years of experience overseas, she received her PhD from Columbia University, New York. Before taking up her appointment at Tokyo Institute of Technology, she worked for the United Nations Educational, Scientific and Cultural Organization (UNESCO) as programme expert. She was mainly involved in the development of the education system in China, Mongolia, Indonesia and Pakistan, with a particular interest in distance education to promote human resources development. She is currently active in conducting research in the areas of application of ICT for the management of the World Heritage Sites as well as comparative analysis of twenty-first-century skills in the Asia-Pacific. She is teaching graduate courses at the Department of International Development Engineering at Tokyo Tech and also has served as an invited lecturer at the Foundation for Advanced Studies on International Development and many universities in Japan. With her international background, she works with the external agencies as a committee member to promote international activities and comparative educational studies, including the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Ministry of Foreign Affairs (MOFA), Japan International Cooperation Agency (JICA) and Japan Society for the Promotion of Science (JSPS).

Reviewers

The editors would like to thank and acknowledge the effort of the reviewers who provided anonymous feedback and detailed commentary on the contributed chapters.

Peter Albion School of Teacher Education and Early Childhood, University of Southern Queensland, Toowoomba, Australia
Trish Andrews Emerging Learning Environments, Brisbane, Australia
Amy Antonio Faculty of Health, Deakin University, Melbourne, Australia
Laurent Antonczak Auckland University of Technology, Auckland, New Zealand
Shamsul Arrieya Ariffin Computing Department, Faculty of Arts, Computing and Creative Industry, Sultan Idris Education University (UPSI), Perak, Malaysia
Chris Campbell Centre for Learning Futures, Griffith University, Australia
Eva Dakich Faculty of Education, La Trobe University, Melbourne, Australia
Ramiza Darmi Faculty of Modern Languages and Communication, Universiti Putra, Malaysia
Laurel E. Dyson Queensland University of Technology, Sydney, Australia
Jessica Frawley Technology Education Design and Development Lab (TEDD), Faculty of Engineering & IT, University of Technology Sydney, Sydney, Australia
Belma Gaukrodger Flexible Learning Team & Teacher Education, Nelson Marlborough Institute of Technology, Nelson, New Zealand
Henk Huijser Academic Enhancement Centre, Xi'an Jiaotong-Liverpool University, Jiangsu Province, P R China
Umera Imtinan School of Information Systems, Curtin University, Perth, Australia
Chris Johnson Research School of Computer Science, The Australian National University, Canberra, Australia
Nick Kelly Science and Engineering Faculty, Queensland University of Technology, Brisbane, Australia
Megan Kek Student Learning and Development, University of Southern Queensland, Toowoomba, Australia
Tim Klapdor uImagine Digital Learning Innovation Laboratory, Charles Sturt University, Australia

Neil Martin Digital Life Lab, University of Southern Queensland, Toowoomba, Australia

Jenny Ostini School of Linguistics, Adult and Specialist Education, University of Southern Queensland, Toowoomba, Australia

Aaron Pooley Soonchunhyang University, Department of English language and literature, Asan, Republic of Korea

Shirley Reushle University of Southern Queensland, Toowoomba, Australia

Karen Scott Discipline of Child and Adolescent Health, Sydney Medical School, University of Sydney, Sydney, Australia

Xiang Ren Western Sydney University, Parramatta, Australia

Philip Uys Division of Student Learning, Charles Sturt University, Orange, Australia

Jocelyn Wishart Graduate School of Education, University of Bristol, Bristol, UK

Serge Gabarre University of Nizwa, Nizwa, Sultanate of Oman

Amanda H.A. Watson Australian National University, State, Society and Governance in Melanesia Program, Coral Bell School of Asia Pacific Affairs, Canberra, Australia

Helena Song Faculty of Creative Multimedia, Multimedia University, Cyberjaya, Selangor, Malaysia

Thom Cochrane Auckland University of Technology, Auckland, New Zealand

Philip Townsend School of Education, Flinders University, Adelaide, South Australia, Australia

Boris Handal ICT in Education, The University of Notre Dame, Sydney, Australia

Abbreviations

BYOD	Bring Your Own Device
CMC	Computer-mediated communication
COP	Community of practice
DFL	Distance and flexible learning
HEI	Higher education institution
ITE graduates	Initial teacher education graduates
LMS	Learning management system
MALL	Mobile-assisted language learning
MIM	Mobile instant messaging
MSM	Mobile social media
OERs	Open educational resources
SA	South Australia
SMS	Social media service
SNS	Social network site/social networking service
TAM	Technology acceptance model
QLD	Queensland

Part I
Asia-Pacific Regional Perspectives

Chapter 1
Introduction: Supporting the Sustainable Implementation of Mobile Learning for Higher Education in the Asia-Pacific Region

Angela Murphy and Helen Farley

Abstract The Asia-Pacific region has become a growth centre for digital innovation and economic prosperity, with innovations in mobile technologies and applications acting as a vehicle for disparate populations to gain greater access to education and other essential services. The successful integration of innovations that leverage the potential of mobile technologies for learning is therefore high on the agenda for higher education leaders from the Asia-Pacific. This book brings together discussion papers and case studies from authors in 16 countries within the Asia-Pacific region including China, Japan, the Republic of Korea, Malaysia, Indonesia, Laos PDR, Cambodia, Singapore, Vietnam, Pakistan, Russia, Australia (including regional and remote areas), New Zealand, Papua New Guinea, Samoa and Fiji. Each chapter highlights the personal experiences or insights obtained from pioneers who are developing and implementing mobile learning initiatives as either pilot projects or as part of a cross-institutional strategy within learning institutions or Asia-Pacific communities. The chapters also address the implications of mobile learning for the four levels of stakeholders within higher education institutions. This introductory chapter provides an overview of each of these levels that form a framework to guide the implementation of sustainable mobile learning solutions for teaching and learning in the Asia-Pacific region.

A. Murphy (✉) • H. Farley
Scholarly Information and Learning Services, University of Southern Queensland, Toowoomba, Australia
e-mail: angela.murphy@usq.edu.au; Helen.Farley@usq.edu.au

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1.1 Introduction

The internationalisation of higher education and the rapid socio-economic changes experienced over the past two decades have placed great pressure on higher education institutions to compete against each other for worldwide rankings and funding. Across much of the Asia-Pacific region, higher education institutions are viewed as essential to the economic and social progress of developing countries. As a result, there is significant government support available in the form of financial investment and resources for enhancing graduate degree enrolments and research output (UNESCO 2014). These factors along with the increasing importance of technology and a focus on delivering quality, personalised learning experiences have resulted in more Asia-Pacific universities experimenting with new forms of instructional delivery (Asian Development Bank 2011).

Although the importance of education for economic development is well understood, many countries in this region are hindered by geographical isolation coupled with small and dispersed populations which negatively impacts participation in and the delivery of formal education. In addition, large discrepancies in equitable access to education remain for families from lower socio-economic groups (UNESCAP 2010). Broadband Internet penetration remains poor in most of the Asia-Pacific region, and as a result of limited access to the Internet, and in some cases even electricity, many e-learning initiatives have met with limited success. Chapter 8 emphasises the challenges experienced by lecturers and students in Laos and Cambodia who lack sufficient access to both mobile and tethered networked technologies, mobile or e-learning resources and suitable training to support the adoption of these initiatives. Despite the poor availability of technology, mobile phones are more frequently used to access learning content than computers, and more students have access to these technologies than to computers. Students who have access to mobile devices use them to communicate with lecturers through email or phone calls, access social media and store learning content. The impact of poor Internet bandwidth on the delivery of education is demonstrated in Chap. 27 which explores the current use of mobile technologies for learning at the National University of Samoa. The Pacific islands are highly distributed and connected through microwave connections which are being replaced by submarine optical fibre cables. Current Internet bandwidth is poor in the region, which has resulted in difficulties delivering online learning for universities such as the National University of Samoa that has a large student body dispersed across various islands. This case study concluded that most students have access to the Internet on their mobile devices, and students are already using mobile technologies to access learning materials, with a preference for greater use of mobile technologies for further learning purposes.

The fast growth, low cost and sophistication of mobile technologies in the Asia-Pacific region offer one potential solution to providing a less expensive means for supporting distance education and instructional delivery. Even though mobile devices and subscriptions still present a significant cost for many people, mobile technologies are more affordable than both broadband Internet and desktop or laptop computers. In addition, learners who are geographically remote from physical campuses are able to benefit from study options offered by mobile learning initiatives, enabling learners to fit study around work or carer commitments (Chun and Tsui 2010). Consequently, a number of institutions, particularly those providing distance education, are exploring strategies to support mobile learning opportunities for students at either an institutional or a pilot level. For example, the Universitas Terbuka in Malaysia (Chap. 9) has invested in the development of infrastructure and specially designed content to enable mobile learning across various operating systems. The University of the South Pacific (Chap. 28) supports some satellite campuses and has also begun the integration of a mobile learning programme including mobile course modules and tablet-based learning to enhance delivery of distance learning programmes to remote regions.

Mobile learning has made learning more flexible and accessible. 'Anytime, anywhere' access to course resources afforded by the increasingly transportable nature of mobile devices has enabled students to fit studies in and around work and other lifestyle commitments and has enabled increased access to higher education (Burton et al. 2015). The ability for users to choose between face-to-face and online components of blended learning adds another level of flexibility (Taylor and Newton 2013). The improvement in the provision of online courses has resulted in higher-quality learning experiences for students who may be geographically isolated or need to overcome other barriers to access more traditional education experiences (Redmond 2015). As technology advances, there is an increased expectation for educational institutions to provide flexible and personalised learning experiences which make use of ubiquitous mobile technologies (Conole and Alevizou 2010). Despite the potential for mobile learning initiatives to increase access to education within the Asia-Pacific region, there are a number of critical success factors required to effectively incorporate mobile learning into education. These include a high market penetration of mobile devices and a corresponding expectation of sufficient access to appropriate technologies; adequate technological infrastructure, including a wireless network and mobile applications; and appropriate professional development for teachers on the effective design and adoption of mobile learning initiatives (So 2012). Educators need to address the blending of formal and informal learning and incorporate initiatives that support collaborative and authentic learning opportunities for students from communities and cultures for whom mobility and connectedness are implicit. The case studies presented in this book showcase initiatives where educators and higher education institutions are paving the way to ensuring successful implementation of mobile learning.

A willingness to embrace mobility is widely considered to be a prominent characteristic of the peoples of the Asia-Pacific region, not purely from the perspective of the widespread adoption of mobile technologies and dispersed populations but as a result of the impact on modern youth growing up in digitally enabled environments. In more developed countries such as Australia, Singapore, Japan and South Korea, mobile phones have become integral to everyday life, and large proportions of the population have access to the Internet, particularly in metropolitan areas. However, even in these regions, the inequality of access to technology and connectivity is significant and concerns about the emergence of a 'digital divide' feature frequently in discussions about education policy. In less developed countries such as China, Vietnam and Laos, the dichotomy between those who have access to technology and connectivity and those who do not is more pronounced. Research focused around the youth in these regions has revealed an equal enthusiasm for new media in common with their global counterparts, becoming heavy users of inexpensive and low-end technologies including low-cost, low-end mobile devices sold at decreased prices and relying heavily on short message services (Tao and Donald 2016). They frequently become prolific users of social networking applications such as Facebook and Twitter.

In 2010, the populations of Indonesia, the Philippines and Singapore were among the top ten Twitter users in the world. Similarly, the Philippines and Indonesia were among the top ten markets for unique Facebook users, ranking third and fourth, respectively. With usage so common among a population, it allows for the features of social networking such as discussion boards, the ability to broadcast announcements to select groups, share photos and videos and so on to be leveraged for mobile learning. Anecdotal evidence would suggest that groups of students frequently form Facebook groups to offer mutual support and discussion opportunities in specific courses and programmes. The use of Web 2.0 tools to collaborate is becoming increasingly popular in this region (Tsai and Hwang 2013).

The use of mobile technologies for learning and teaching has a number of significant implications for pedagogy, infrastructure and policy in higher education institutions. When considering whether or not to implement mobile learning initiatives, it is easy for leaders and administrators to become fixated on the challenges and anticipated benefits from a financial, logistical or technological point of view. Cost, adaptability and scalability are most frequently cited as the drivers of adoption of mobile technologies in learning environments (Patten et al. 2006), and frequently the potential pedagogical potential of these devices is given less consideration. Though ICT infrastructure, levels of technical support and appropriate skill sets of staff to adjust their pedagogical approaches are significant considerations when planning the deployment of learning technologies, the student voice is also important and is very frequently overlooked (Gosper et al. 2007). When designing mobile learning initiatives in an area as culturally diverse as the Asia-Pacific, the rules and roles of the social relationships in the mobile learning space must be made explicit. Also, when designing mobile learning initiatives across cultural boundaries, special care must be taken to accommodate the cultural differences between designer and learner (Teal et al. 2014). Regional factors must be considered when designing for the learning behaviours of students. Each country has its own unique economic, political and cultural context which may impact on how students can learn (Tsai and Hwang 2013). Instead of just using mobile devices for generic learning activities, as far as possible, cultural learning and recognition must be incorporated into activities; for example, use mobile learning for cultural or social studies programmes (Tsai and Hwang 2013).

As significant as the barriers and challenges are, this book highlights some of the successful initiatives undertaken by educators in the diverse contexts of the

Asia-Pacific. As infrastructure to support these and other similar initiatives is built and the cost of technologies and access continues to decrease, there is likely to be a burgeoning of mobile learning initiatives and their widespread and sustained adoption across institutions. If mobile technologies are to be effectively used for education delivery, a key question becomes how do we best implement sustainable mobile solutions for teaching and learning? This book was compiled with the aim of presenting practical suggestions for the implementation of policies, processes and design strategies to enable mobile learning within the Asia-Pacific higher education landscape. Each chapter presents a discussion paper or a case study that demonstrates the lived experiences of mobile learning pioneers, educators and decision makers who share the strengths, challenges and opportunities experienced in their journeys to design mobile learning initiatives that meet the needs of their students and institutions.

1.2 A Framework to Guide the Implementation of Sustainable Mobile Learning Solutions for Teaching and Learning in the Asia-Pacific Region

The authors in this book have presented practical suggestions for the implementation of policies, processes and design strategies to enable mobile learning at their institutions at the four levels identified within the education system:

1. *Pedagogical (Learning)*: At this level, the current expectations around mobile learning from the student perspective are explored, offering insight into the current formal or informal mobile learning practices in order to identify any gaps in services and student learning needs. This level also accounts for the demographic and social contexts of students to allow for the consideration of issues of equity and access and digital literacy in the design of mobile learning strategies.
2. *Pedagogical (Teaching)*: The practices and perspectives of educators around mobile learning are investigated at this level. It allows for the reflection on the strengths and inefficiencies of these practices. At this level, barriers and critical success factors that impact on the adoption of mobile learning initiatives are identified.
3. *Technical*: It is at this level that the supporting technical infrastructure and availability of technical support as well as the priorities, standards, policies and protocols that potentially impact on the success of mobile learning initiatives are identified.
4. *Organisational*: Clarification of the institutional policies and practices that currently support or hinder the implementation of mobile learning initiatives and the role of leadership support and management in ensuring the success of mobile learning initiatives are the focus of this level.

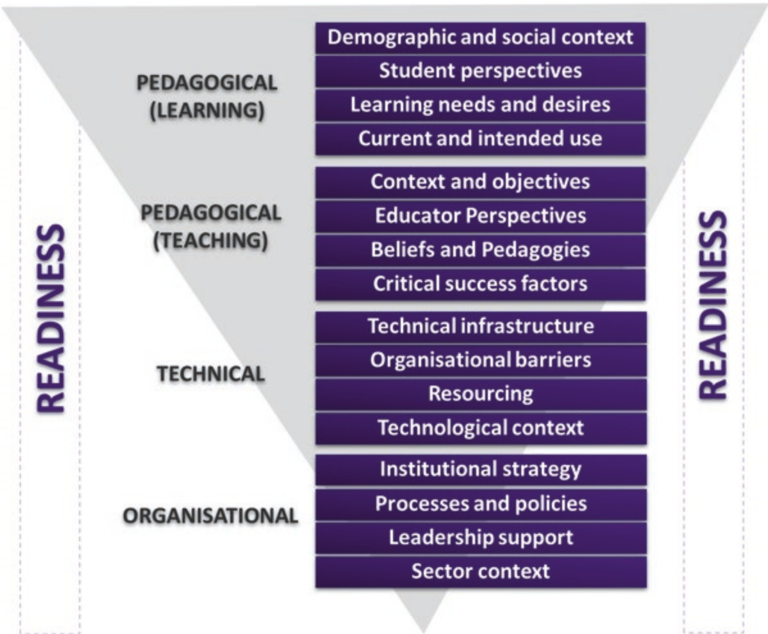

Fig. 1.1 The mobile learning evaluation framework (Adapted from Murphy and Farley 2012)

The framework adopted for this book is outlined graphically in Fig. 1.1 and explained in detail below.

1.2.1 Pedagogical (Learning)

The pedagogical (learning) level of the framework emphasises the voice of the student by exploring their expectations around learning mobility and insights into current learning practices. Identifying potential gaps between available services and technologies and student learning needs will enable institutional leaders to develop initiatives that will be more readily adopted by student cohorts. The demographic and social contexts of students, particularly in Asia-Pacific countries, are of paramount concern as the readiness of students to undertake mobile learning activities effectively is influenced significantly by these contexts. Students who have had less exposure to mobile technologies or technology in general will require more support to realise the full benefit of mobile learning initiatives, in turn impacting on resource allocation and training considerations.

The countries of the Asia-Pacific region boast the fastest growing rate of adoption of mobile technologies and have the largest mobile Internet user base globally. In 2016, the region passed four billion mobile subscriptions which is three times greater than regions such as the Middle East and Africa (Adhikary 2016). Smartphone connections accounted for 45% of total connections in the region, which is expected to increase to 63% by 2020 (GSMA 2016). Despite the high growth in the use of smartphones and mobile technologies, there are still inequalities in the region with regard to digital access, particularly as countries such as Myanmar (38%), India (47%) and Nepal (53%) still have relatively low subscriber penetration compared to New Zealand (92%), South Korea (92%) and Japan (90%) (GSMA 2016). Research conducted by the GSMA (2015) revealed that the major barriers to mobile adoption in Asia-Pacific countries include poverty and affordability, a lack of locally relevant content and, most importantly, a lack of digital literacy and an understanding of how to use the Internet. These factors are important considerations for educators and policy-makers when deciding on optimal strategies for mobile learning implementation. Issues of equity and access to technologies, Internet connectivity and the digital skills required to optimally utilise mobile technologies for learning may significantly hinder the sustainability of mobile learning innovations.

Issues of equity and access are emphasised in Chap. 30 which describes the challenges of supporting teacher training and enhancing reading literacy of school students in remote and rural areas of Papua New Guinea (PNG) using mobile learning. In this project, researchers attempted to enhance low reading literacy levels at elementary schools in villages that typically have no electricity and few resources, including few or no reading materials. Nearly all (92%) teachers at these schools reported owning mobile phones, yet these consisted mostly of basic feature phones with only 6% owning smartphones. Furthermore, in most areas of PNG, only second-generation (2G) mobile networks are available which do not support Internet access, social media or email. Researchers, Kaleeby, Gee, Watson, Jones and Jauk, devised culturally relevant and engaging fiction narrative texts (stories) and lesson plans of increasing complexity which were sent to participating teachers from two remote areas of PNG in the form of daily standard text messages. The study found that SMS was an effective technology for engaging students and teachers in these settings with the receipt of these SMS stories resulting in improvements in the classroom activities of teachers and reading skills of students. This project demonstrated the relative ease with which simple and inexpensive mobile learning solutions could be used to overcome inequalities in access to educational resources while taking into account the limited availability of advanced mobile technologies or Internet access in regional and remote or disadvantaged areas.

Previous research studies have demonstrated that students easily integrate mobile technologies into their learning practices to support access to written and multimedia learning content, engage in search activities and facilitate administrative learning tasks (Farley et al. 2015). The greatest value of mobile devices for supporting learning, however, extends beyond the delivery of content to mobile screens. Cochrane, Antonczak, Guinibert, Mulrennan, Rive and Withell in Chap. 2 argue that the real potential of mobile learning lies in the capacity to act as a catalyst for pedagogical transformation. Mobile learning not only enhances flexibility in learning and access to multimedia resources but also offers the opportunity to include student-centric, personalised and social learning experiences (Brown and Mbati 2015; Chen et al. 2015; Cochrane 2013; Cota et al. 2014). Mobile learning initiatives that encourage interactivity, collaboration and creativity in learning settings are more likely to engage students in the learning process (Wang et al. 2009). This, in turn, results in improved learning outcomes for learners and increased retention and completion rates.

Research conducted by Farley et al. (2015) revealed that students who have access to mobile technologies such as smartphones and tablet devices readily explore the use of these devices to support learning, particularly in collaboration with their peers. Despite examples of spontaneous mobile learning undertaken by students, the study found that current learning management systems were poorly designed for the use on mobile devices and interacting with other students. Furthermore, none of the students surveyed were participating in educator-led mobile learning initiatives. An earlier study (Murphy et al. 2014) explored the learning activities undertaken by students using mobile technologies without formal direction by educators and found that students mostly used mobile devices to access learning content (such as video or audio recordings of lectures or downloading course documents) and communicate with peers or lecturers. Few used these technologies to create new learning content independently or collaboratively. These findings support assertions from digital literacy theorists who argue that mobile literacy is not a skillset acquired naturally but one that needs to be explicitly developed. Students need to be taught to use the applications and affordances of mobile technologies to interpret and contribute information to the mobile web, collaborate effectively and learn optimally (Pegrum et al. 2013).

In Chap. 8, researchers Starasts, Xiong and Ly investigated the current practices and readiness of students from two universities, the National University of Laos (NUOL) in Lao PDR and the Royal University of Agriculture (RUA) in Cambodia, to participate in mobile learning. The study found that although a large proportion of students have access to smartphones, students are restricted by the poor availability of Internet access. The spontaneous student use of mobile technologies to support learning was mostly limited to email and social media for communication with lecturers or peers or access to course materials shared electronically by lecturers. Many students, however, originated from poor rural areas with little access to laptops or mobile technologies resulting in a significant gap in digital access and the digital literacies needed for learning, presenting a significant barrier to the development of innovations to support mobile or even online learning. The impact of cultural perceptions and beliefs on readiness to adopt mobile learning was raised in Chap. 10. Authors Poong, Yamaguchi and Takada used the technology acceptance model (TAM) to explore mobile learning acceptance in Lao PDR and found that social influence had a significant impact on beliefs about perceived usefulness and perceived ease of use of mobile technologies. The authors reasoned that this was possibly due to the high collectivism society which emphasises group identity and goals over those of the individual.

Case studies that highlighted initiatives that successfully harnessed the technologies spontaneously used by students to support their learning mostly incorporated collaborative communication technologies such as social media platforms. Pooley in Chap. 6 used a grounded theory approach to explore the use of mobile instant messaging (MIM) to enable intercultural communication between international and domestic students utilising dissimilar languages. The use of MIM was found to support the understanding of cultural and linguistic practices of the host country for international students during a short one to two semester stay in Korea. In one-to-one and group MIM chat rooms, international students were able to learn their host country's language informally through authentic, learner-driven contexts. Mobile learning methods in this instance were able to assist students with overcoming language barriers and cultural misunderstandings which were considered to be the most significant hindrance to direct interactions between international and Korean students.

In Chap. 12, Gabarre, Gabarre and Din highlighted how they effectively integrated the use of Facebook to support English language learning for students at a Malaysian public university. Issues of online privacy were highlighted in this case study as researchers initially adopted a public Facebook page for the pilot trial. Students were not comfortable engaging with learning activities in a public space which could be viewed on their own personal Facebook sites or by the general public. The success of the initiative was enhanced after the adoption of a private group within Facebook to engage with students, allowing researchers to harness the collaborative power and ease of use of social media for students, yet still offer a private space where students could engage and make mistakes without fearing public exposure or embarrassment. The use of Facebook for a case study with students in Vietnam, presented by van Rensburg and La Thanh in Chap. 18, was less successful as some students felt uncomfortable using social media and mobile phones for learning purposes. This suggests that student readiness to engage in mobile learning, particularly using personal technologies, requires sufficient consideration during the design of mobile learning projects. Concerns about online privacy, particularly when students are encouraged to make learning processes visible in online formats, were also addressed in Chap. 2 where one case study incorporated the use of WordPress blogs as a reflective learning tool. In this instance, students found expressing opinions and reflections in a public way to be intimidating and challenging.

The lack of availability of locally relevant content has been noted by some authors as a barrier to adoption of mobile learning. Arrifin in Chap. 16 reported on the poor availability of mobile content applications for the Malay culture. Arrifin notes, however, that this created an opportunity for students to engage in content creation rather than simply content consumption. In Chap. 28, Sharma et al. described an 'app' (mobile application) developed by the University of the South Pacific in order to offer students a customised and contextualised learning experience which leverages the popularity of game-based learning applications and the importance of Fiji tradition and culture. Some elements impacting the pedagogy (learning) level identified in the chapters presented in this book are summarised in Fig. 1.2.

Fig. 1.2 Implications of findings from case studies for the pedagogy (learning) level

1.2.2 Pedagogical (Teaching)

The pedagogical (teaching) level of the framework is aimed at exploring the perspectives of educators towards the value of adopting mobile learning innovations and readiness to engage with mobile learning initiatives. A further purpose of this level is to support the disruption of didactic and teacher-centred perspectives towards teaching and learning using mobile learning principles and devices. The educational potential of mobile technologies in higher education is yet to be fully realised, not the least because faculty and teachers in higher education institutions are often ill-prepared for the challenge of utilising them in their courses (Herrington et al. 2010), face-to-face or online. Identifying challenges and barriers experienced by educators within their learning environments and their teaching philosophies and practices will assist with the development of appropriate training and support as well as the allocation of suitable resources when considering the development of university-wide mobile learning strategies.

Mobile learning, at the most basic level, presents educators and students with an alternative mode for delivering and receiving learning content and knowledge that is untethered to traditional lecture formats or paper-based learning materials. The portability of mobile technologies also enables students to engage in learning activities outside the boundaries of brick-and-mortar learning institutions, without being tethered to stationary desktop or laptop computers. There is a risk, particularly in those early investigations into the adoption of mobile learning initiatives, of viewing mobile learning as simply a different mode for delivering existing learning content. Rethinking education in order to embrace mobile technologies requires adjustments to the roles of both teachers and learners (Conole and Alevizou 2010). The mobile social media framework developed by Cochrane and colleagues in Chap. 2 emphasises that the effective use of these technologies for learning involves a conceptual shift from away from teacher-directed pedagogies towards those that are student-centred and, ultimately, student-directed or where students are active participants within authentic and professional learning communities. Rather than simply adopting mobile technologies in the classroom to support resource sharing or access to content, mobile learning is most effective as a tool to facilitate transitioning educators from being content deliverers to becoming facilitators of authentic experiences. A corresponding change in the role of the student sees them transition from passive participants to active co-constructors of knowledge (Cochrane 2012).

In implementing mobile learning, pedagogical approaches need to be leveraged that encourage problem-solving and higher-order thinking rather than simply making use of low-level features of mobile devices, such as email, Internet searches and messaging (Herrington et al. 2010). Educators harnessing the benefits of mobile learning technologies will need to be adaptable and ready to take on the role of supporting and guiding students to use a wide variety of instructional tools, to navigate through personalised learning pathways and to interpret and make the best use of the feedback they receive from multiple sources. The new multifaceted role of the educator includes that of coordinator, mentor, translator, learner and expert (Shaffer et al. 2015). Educators still need subject matter expertise, but in addition to this, they will need the ability to use new technologies effectively, and this will require ongoing learning and professional development.

Arrifin in Chap. 16 described an effective approach to encourage authentic student-centred learning using mobile technologies by encouraging students to generate content for the study of local culture. Students enrolled in Local Cultural Studies (LCS) were instructed to use their mobile devices to develop multimedia content including photos, audio and videos during the completion of their coursework assignments. Findings from the study identified that students felt empowered through the process of creating their own cultural content. They developed new multimedia creation and editing skills and achieved better learning outcomes. Additional benefits included enhanced self-exploratory learning, for example, the self-directed learning of software skills for video editing, and greater collaboration between peers to produce content and solve technical problems. Students also provided assistance and support for fellow students who were less skilled with the use of mobile technologies for the development of content. An additional benefit reported by Arrifin was that fellow academics became more aware and consequently more open to the use of mobile technologies for the creation of student-generated content, which demonstrated the transformative potential of this approach not just for the students involved but for other educators in the institution.

A project to develop and test a life-logging technology called System for Capturing and Reminding of Learning Log (SCROLL) to support language learning, presented by Uosaki, Ogata, Mouri and Choyekh in Chap. 5, is the second example of a case that incorporated consideration of pedagogical principles into the planning and design of the technology. SCROLL leverages the affordances of smart mobile devices to offer educators and students the ability to monitor learning and promote retention and metacognition by using mobile and context-aware technologies. Learners were able to record learning in specific contexts and share and reuse the information in future settings. The authors concluded that the use of the SCROLL technology alongside pedagogies such as flipped classrooms and additional creative and collaborative technologies such as blogs or social media sites enabled educators to maximise opportunities for students to learn outside of formal classroom environments.

The perspectives of educators presented in this book originate from a diverse range of countries which differ in their systems of government and economic systems, cultural dynamics and social beliefs. Cultural-pedagogical norms and challenges are often overlooked or poorly researched and can lead to the failure of educational institutions to accomplish intended goals when designing and implementing technology-based products and services (Masoumi and Lindstrom 2012). Many educators from this region still observe conventional approaches to teaching and learning which emphasise knowledge transmission and uniformity of assessment. In Chap. 19, Imtinan explored the perspectives of educators from three Pakistani universities on the potential inclusion of mobile learning in university education. Findings revealed that educators from these universities still adopted highly lecturer-centric perspectives about the role of educators in the learning and teaching environment. Participants considered the teacher to be responsible for regulating the learning environment, and strict controls on the use of mobile devices were considered to be necessary to prevent distraction or wasting of resources. Dyson, Wishart and Andrews in Chap. 3 described beliefs held by educators and leaders in education institutions in countries such as Sri Lanka, Malaysia and Hong Kong that providing students with access to mobile devices, particularly with Internet access, would result in misuse of the technologies and the wasting of time.

The potential for innovations in mobile learning to disrupt established views about teaching and learning has been demonstrated in some of the scenarios presented in this book. Ren in Chap. 4 described the tension created between the e-Schoolbag initiative of the Chinese government for secondary and tertiary education and the traditional approaches of educators and parents towards demonstration of academic achievements through exam scores. According to Ren, educators in China generally prefer conservative teacher-centric pedagogies based on knowledge transfer and are largely resistant to learner-centric, constructivist and personalised teaching methods. Educators and parents also believe that the capabilities of mobile technologies to access social networks and online or game-based entertainment are a potential source of negative distraction for students and consequently electronic devices for digital entertainment are frequently banned in homes and schools. Authorities in China have dealt with the potential distractibility of mobile technologies used in schools by encouraging the use of the restricted or closed-system e-Schoolbag technologies. This however limits the ability of educators to customise the use of these technologies and incorporate constructivist pedagogies that include interactivity and collaboration. Furthermore, although educational reform and digitisation of learning and teaching are set as a government priority, no resources have been allocated to support culture change in learning and teaching. Finally, regulatory and administrative contexts are often unfriendly to disruptive innovations.

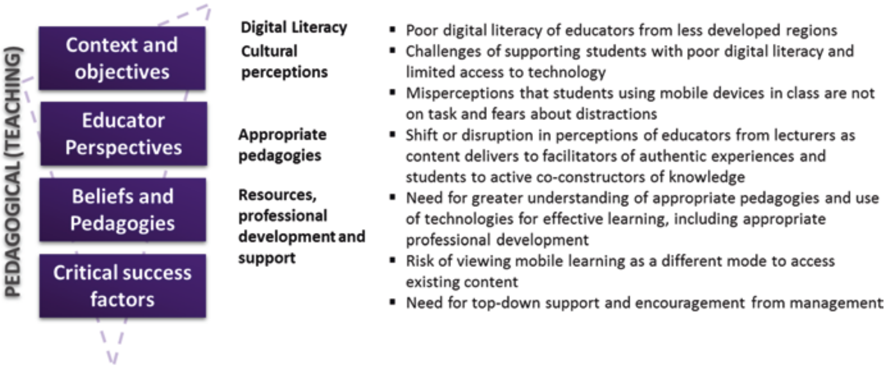

Fig. 1.3 Implications of findings from case studies for the pedagogy (teaching) level

In addition to the dominant cultural perceptions about the role of the educator or student and emphasis on instructivist principles still held by many, educators in these regions also struggle with poor digital literacy levels and little support in the form of resourcing or training from universities that are still struggling with the basic implementation of e-learning services. In Chap. 27, Ozawa and Ualesi explored the perspectives of teachers at the National University of Samoa that could influence the adoption of a planned university-wide mobile learning system. The university was still in the early stages of moving from the paper- and pencil-based provision of distance learning materials towards using e-learning environments. Although there was a high level of interest in mobile learning by educators within the university, most were concerned that they did not have the training or experience required to create suitable materials or use mobile technologies effectively. Starasts, Xiong and Ly describe similar challenges in Chap. 8 in an example from the National University of Laos which faces challenges of poor digital literacy for both educators and students, with both groups requiring significant training and support before the widespread use of technologies to support learning is possible. Students at the Royal University of Agriculture (RUA), Cambodia, have a higher proportion of students owning mobile phones with Internet access, yet students use their technologies mostly to access university-provided learning materials, and educators have not been provided with formal training or support to incorporate mobile learning practices effectively into their teaching.

Some elements impacting the pedagogy (teaching) level identified in the chapters presented in this book are summarised in Fig. 1.3.

1.2.3 Technical

The technical level of the framework is aimed at encouraging awareness of the technical infrastructure required to support mobile learning adoption at various levels of implementation, as well as the technical support and resources required to ensure the ongoing success of such initiatives. The effective deployment of mobile learning initiatives across institutions requires careful consideration of the technical infrastructure and resources available at multiple levels within a university as well as accompanying changes in processes and policies. The level of deployment of mobile learning initiatives will determine the extent to which universities will need to adjust current systems. For example, the deployment of mobile technologies within individual courses or classrooms for face-to-face teaching will require different considerations in comparison to functional changes to university learning management systems to enable mobile compatibility. The technological context of the region also has an impact on the successful implementation of mobile learning within universities. Regions that are more technologically advanced and have good Internet connectivity will present fewer challenges in comparison to regions where Internet connectivity is poor or users have poor access to technology and low levels of digital literacy.

A historical review of mobile learning research conducted by Nordin, Embi, Norman and Panah in Chap. 7 identified that there was a significant lack of research into the mobile learning infrastructure available in most countries in the Asia-Pacific region. The authors identified that although some of the more advanced economies in countries such as Australia, South Korea, Taiwan and Hong Kong have a high mobile and Internet penetration, this drops to less than 10% for countries such as Nepal, Timor-Leste and Papua New Guinea. There is also a dearth of research on the impact of the diverse learning contexts and cultures and pedagogical perceptions in most regions on the readiness of those regions to support mobile learning practices. During the compilation of this book, the editors themselves experienced this lack of research on mobile learning when attempting to source chapters demonstrating mobile learning adoption in less developed countries.

A recent survey of more than 1000 educators from 13 countries across the Asia-Pacific region revealed that the majority of educators are highly supportive of the use of mobile technologies for learning and teaching (Adobe 2015). Support for the use of mobile technologies for learning was highest in Southeast Asia and South Korea, with 85% of educators in those countries, and 80% in Greater China, believing in the potential positive impact of mobile learning in education, whereas educators in Australia and New Zealand are less convinced (69%). The greatest barriers identified by this study to the integration of mobile technologies in the classroom were budget allocation (39%) and low integration with existing infrastructure (27%). Poor resourcing and poor policy support were also identified as major barriers in some regions (Adobe 2015). This study suggests that although there is evidence of readiness for educators to embrace mobile learning, much still needs to be done by institutions to support the effective integration of suitable resources to support the adoption of mobile learning, including adequate access to training, resources and technologies.

For universities with large, well-resourced and sophisticated infrastructure and staff and student populations, it is far more feasible to develop infrastructure to support mobile learning, but for many Asia-Pacific universities that are still coming to terms with basic online or technology-enabled learning, student-centred approaches to learning and teaching and socio-economically disadvantaged student populations, progress is much more difficult. In many less developed countries in the region, the implementation of even basic technological innovations to support learning and teaching is still in their infancy. In Chap. 8, Starasts, Xiong and Ly provide examples of the National University of Laos which has developed an online learning management system that is not able to be used formally to provide students with access to lecture content as most students do not have access to computers. Students hand in assignments mostly in written hard copy and conduct research for assignments using books in the library. Although mobile phones offer some students access to the Internet to support information searching or accessing additional study materials, many students do not have access to mobile devices. As a result, lecturers are not able to adopt the use of mobile technologies in classrooms without suitable university funding and support to ensure equitable access for all students.

The impact of poor-quality access to the Internet is demonstrated by authors Ozawa and Ualesi who present a case study from the National University of Samoa in Chap. 27. The university provides distance education to students residing on a large number of islands in the Pacific Ocean and until recently has only had access to microwave satellite connection systems to transmit limited audio and visual materials to students. Installation of submarine fibre-optic cables has opened up possibilities for enhancements to the provision of online learning including the potential to use multimedia resources. The university is also undertaking pilot studies to determine the viability of implementing infrastructure to enable mobile learning due to the limited availability of computers and the overwhelming ownership of mobile technologies among the dispersed student bodies.

Mobile technologies offer unique opportunities for learners to engage with new technologies and communicate with each other through various channels both in synchronous and asynchronous situations, but harnessing the potential of new platforms often requires significant course redesign to allow for meaningful collaborative interaction between students and active engagement in the learning (Burton et al. 2015). In Chap. 19, Imtinan conducted interviews with university administrative stakeholders including information technology managers, campus directors and instructional designers. This cohort raised a number of perceived usability issues with mobile devices which they considered to be barriers to adoption including small screen size and inappropriate screen resolution. Imtinan argued, however, that the majority of these issues would be reduced substantially if learning resources were appropriately optimised for access and display on mobile device interfaces. Some elements impacting the technical level are summarised in Fig. 1.4.

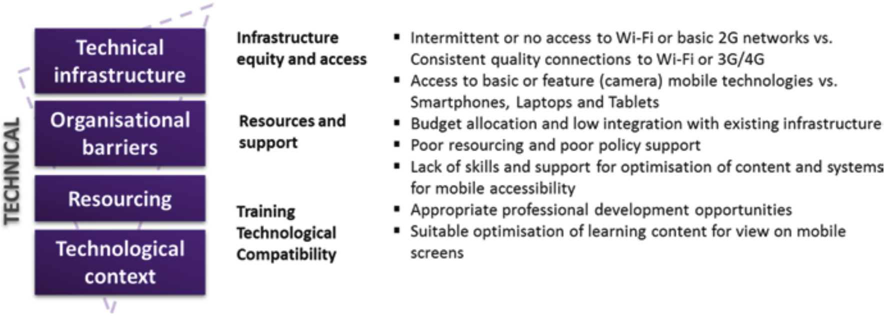

Fig. 1.4 Implications of findings from case studies for the technical level

1.2.4 Organisational

Most mobile learning initiatives and projects in the Asia-Pacific region are implemented on a small-scale and ad hoc basis (So 2012), yet without wider buy-in from the institution, these projects are rarely sustainable in the long term (Jisc infoNet n.d.). The organisational level of the framework emphasises the importance of clear vision and strategy as well as leadership and management support to the successful implementation of initiatives that are sustainable in the long term. The effective university-wide implementation of mobile learning strategies requires clarity on the anticipated role of mobile learning within the university infrastructure as well as change management programmes that incorporate appropriate technical support, professional development opportunities for staff and students, budget and resource allocation and detailed implementation plans. This level of the framework also encourages consideration of the institutional policies and practices required to support mobile learning implementation that focus on the learner context, pedagogy and technical resourcing.

Authors, Tan and Soo in Chap. 11, emphasised the importance of both financial and leadership support from higher education institutions to spark mobile learning innovation. These authors, both educators within the chemistry discipline at the National University of Singapore, embarked on the development of an app to support dynamic and interactive learning experiences in an undergraduate chemistry subject. According to the authors, Singapore, like most countries in the Asia-Pacific region, has a top-down management culture with staff and students more receptive to direction from top management. Their app development project was therefore made possible by funding from a top governing body of the university to pay app programmers and leadership support from multiple divisions within the university. Tan and Soo also stressed that inter-department collaboration is essential in cross-expertise projects such as app development. As a result of organisational support from senior leaders within the university, the authors were able to obtain assistance from in-house ICT professionals rather than outsourcing the development of the app to an external provider. This ensured greater cost-effectiveness and long-term maintenance.

Within many higher education institutions, there is a lag between the adoption of mobile technologies for learning and policies or standards governing ethical and appropriate use. Park et al. (2016) surveyed national education representatives in 22 Asia-Pacific countries finding that more than half of the surveyed countries have not introduced suitable policies about the safe and responsible use of ICT to their national curriculum and just over half have no policies about children bringing mobile devices to school. Chapter 3 presented eight vignettes that demonstrated ethical challenges and barriers that potentially impact on the broader adoption of mobile learning across the Asia-Pacific region and the implications of these for policy development. Authors, Dyson, Wishart and Andrews, identified that in both developed and developing nations in the region issues of equity and access required careful consideration, particularly for populations traditionally excluded from mainstream education opportunities. Some examples of the potential for mobile technologies to overcome social or educational inequities were presented, for example, use with illiterate women in Pakistan, rural schoolchildren in Fiji and Aboriginal children in remote regions of Australia. The authors also demonstrated that issues of inequity in student access to technologies or the Internet could be overcome when bring your own device (BYOD) policies include pedagogical considerations that take equity issues into account.

Some countries such as China (Chap. 4) have turned to commercial companies to design and develop highly customised and primarily closed hardware and software to support digital and mobile learning initiatives in education. This includes devices that limit user permissions and restrict Internet connections with the aim of reducing issues with privacy, security and technological compatibility. The unfortunate consequence of using closed systems developed by commercial organisations is that educators are limited in their ability to use the devices innovatively or adapt the use of the devices to their unique environments due to severe restrictions on the ability of the end-user to customise applications. Handal, Marcovitz, Ritter and Madigan in Chap. 23 argue that BYOD policies that grant students total freedom in selecting their devices will result in learning environments that are more student-centred and foster greater creativity and imagination. In comparison, locked-down models encourage approaches that are educator-centric and limit the scope for problem-solving and student choice.

Four of the chapters in the book present cases from institutions that have implemented university-wide mobile learning strategies. Padmo, Belawati, Idrus and Ardiasih discuss the mobile learning infrastructure of the Universitas Terbuka in Indonesia in Chap. 9. At this university, mobile learning is an integral component of the online learning system which includes a mobile-interface website that allows students to access all university administrative and learning materials using mobile devices. Challenges experienced with the implementation of such large-scale systems include the need for high-quality Internet access, the need for significant improvements to the learning management system to ensure user-friendliness and extensive training for technical personnel, lecturers and students in the use and

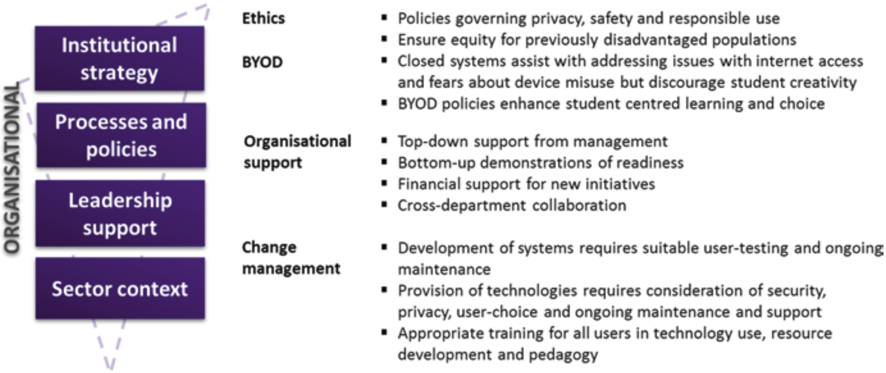

Fig. 1.5 Implications of findings from case studies for the organisational level

development of appropriate mobile learning content. Russell in Chap. 22 describes the highly effective strategy of Western Sydney University to provide iPads to all first-year undergraduate students and all teaching staff. During the implementation process, the university invested substantially in technical infrastructure and professional development for staff members which included upgrades to campus Wi-Fi and learning spaces and a range of training and support services to facilitate the use of iPads in teaching.

Over a 5-year period, the University of the South Pacific incorporated a range of mobile learning initiatives including learning tools such as SMS notification services and SMS quizzes, learning support tools such as mobile apps (edutainment) and a tablet learning project and administrative tools. Challenges faced during the implementation of these initiatives, described by Sharma et al. in Chap. 28, include difficulties with conversion of learning content to be suitable for use with mobile technologies, difficulties with poor network reception and the high costs of mobile data in the Pacific region and issues with maintenance of mobile technologies provided by the university to students. The fourth example, presented by Kumar and Mohite in Chap. 29, is a less successful case of cross-university implementation of a mobile learning system. Fiji National University developed a mobile learning facility for distance and flexible learning students called MLearn. A mobile app was developed by the university in 2015 which provided students with access to lecture notes, tutorials and other information on their courses. User satisfaction with the app was found to be low, and a number of complaints were received from students that the app was difficult to use. Findings from a usability study revealed that a number of changes to the functionality of the app were required to improve ease of use and usefulness.

Some elements impacting the technical level are summarised in Fig. 1.5.

1.3 Organisation of the Book

The chapters have been organised according to the five major regions within the Asia-Pacific, commencing with a section that addresses those issues transcending regional boundaries. Each one of the chapters reflects on the experiences of educators or leaders who have undertaken projects to introduce mobile learning into their learning institutions.

The following organising questions were used to guide the structure of the chapters:

- What are the different ways of conceptualising, identifying and evaluating mobile learning initiatives in higher education in the region?
- What do effective and sustainable mobile learning initiatives look like in different educational settings and sites across the Asia-Pacific?
- How do contemporary educational issues reflect different and sometimes contradictory expectations by students, educators, administrators, policy-makers and other stakeholders at each of the four levels of the framework in relation to mobile learning?
- How do regional mobile learning initiatives reflect contemporary educational issues and differ from previous practices?
- What are the key issues and key design principles that institutional leaders need to consider in order to support the implementation of sustainable mobile learning initiatives and innovations?
- What do the educational challenges of the Asia-Pacific region suggest about possible future mobile learning practices in higher education?

The majority of chapters discuss the implementation of mobile learning initiatives for higher education, but in a number of instances, relevant community or secondary education strategies that impact on higher education have been included. The projects take the form of pilot projects such as refining the design processes involved in developing apps designed to support specific subjects or the experiences of educators using existing mobile applications including social media apps to support learning in classroom settings or institution-wide application of mobile learning systems. Authors of the chapters share key insights for managing the implementation of mobile learning from the perspective of the student or educator, at a technical or process level or at a university leadership or strategic level. Regional specific perspectives that share insights into the economic, cultural and political aspects of each country that have the potential to impact on the sustainability of mobile learning innovation have also been explored by each of the authors. We hope that these insights will guide your own journey into sustainable and effective mobile learning.

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Chapter 2
A Framework for Designing Transformative Mobile Learning

Thomas Cochrane, Laurent Antonczak, Matthew Guinibert, Danni Mulrennan, Vernon Rive, and Andrew Withell

Abstract In this chapter we outline five mobile social media projects in a variety of educational contexts to explore what works, and what doesn't, providing examples of learning designs that utilise a maturing framework for creative pedagogies using mobile social media. The case studies are drawn from a variety of faculties and departments across one New Zealand University. The context of these mobile social media projects includes Journalism, Product Design, Graphics Design, Digital Media and Law. Our framework is informed by six critical success factors that we have identified and addresses the four levels of institutional stakeholders as defined by this book. In this chapter we attempt to answer two of the key questions addressed by this book: What do effective and sustainable mobile learning initiatives look like in different educational settings and sites across the Asia-Pacific Region? What are the key issues and key design principles that institutional leaders need to consider to support the implementation of sustainable mobile learning initiatives and innovations? The first question is addressed by our example case studies, while the second question is discussed in relation to implementing a framework for designing mobile learning across these case studies.

T. Cochrane (✉) • L. Antonczak • M. Guinibert • D. Mulrennan • V. Rive • A. Withell
Auckland University of Technology, Auckland, New Zealand
e-mail: thomas.cochrane@aut.ac.nz; laurent.antonczak@aut.ac.nz; matthew.guinibert@aut.ac.nz; danni.mulrennan@aut.ac.nz; vernon.rive@aut.ac.nz; andrew.withell@aut.ac.nz

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2.1 Introduction

Cook (2009) and Sharples (2009, 2010) characterise the development of mobile learning research according to three general phases:

1. A focus upon devices (e.g. Handheld Computers in Schools (Perry 2003))
2. A focus on learning outside the classroom (e.g. MOBIlearn (O'Malley et al. 2005))
3. A focus on the mobility of the learner (e.g. MyArtSpace (Sharples et al. 2007), CONTSENS (Cook 2010))

However, it is the ability of mobile learning to act as a catalyst for pedagogical change that we find most interesting. This has informed the development of a design framework for mobile learning that is based upon a social constructivist pedagogy that enables learner-generated content and learner-generated contexts. Thus rather than being merely technology centric, we argue that the potential of mobile learning is in being a catalyst for pedagogical transformation (Kukulska-Hulme 2010). Mobile learning presents the opportunity to design learning that moves beyond delivery of content to small-screen devices. Mobile learning enables the design of learner-directed collaborative projects providing learners with authentic experiences of active participation within the community of their chosen profession. In order to do this, we have found that a culture change process is required, or as Balsamo (2011) puts it, our higher education institutions need 'an epistemological upgrade and reboot' (Balsamo 2011, p. 183). This involves a refocus from teacher-directed pedagogy towards student-directed pedagogy and the framing of learning and teaching around the building of authentic learning communities. We argue that the convergence between social media and mobile devices provides a toolkit for designing authentic social constructivist learning environments (Cochrane and Antonczak 2015a, b). We term the convergence of social media with mobile devices through the development of mobile applications (app) and mobile formatted web interfaces as 'mobile social media' (MSM).

2.1.1 Critical Success Factors

From our experience of implementing multiple mobile learning projects, we compared successful projects (Cochrane and Withell 2013) with those that did not demonstrate a significant impact (Cochrane 2012), from which we identified six critical success factors (Cochrane 2014).

1. The pedagogical integration of the technology into the course and assessment
2. Lecturer modelling of the pedagogical use of the tools
3. Creating a supportive learning community
4. Appropriate choice of mobile devices and Web 2.0 social software
5. Technological and pedagogical support

6. Creating sustained interaction that facilitates the development of ontological shifts, both for the lecturers and the students

The six critical success factors are predicated upon a commitment to social constructivist pedagogy. They are informed by a range of new pedagogical frameworks that include Laurillard's (2001, 2007) conversational framework, learner-generated contexts (Luckin et al. 2010) and communities of practice (COPs) (Lave and Wenger 1991; Wenger 1998; Wenger et al. 2009).

2.1.2 *Developing a Mobile Social Media Framework*

The limiting factor in applying new pedagogical strategies to learning and teaching is the lack of practical examples of the types of learning and teaching activities and assessments that match the unique affordances of the new technologies being utilised. This often leads to the default strategy of shoe-horning old pedagogical strategies into new technologies and the ultimate conundrum of the no significant difference phenomenon (Reeves 2005). Reeves argues that the substitution of new technologies in education leads to no significant difference in learning outcomes as there is no change in the types of activities and assessments integrated into the curriculum. To maximise the use of new technologies, we should design course assessments and activities that make the most of the unique affordances of the new technologies. Therefore, based upon our six critical success factors, we have developed a simple framework for using MSM for creative pedagogies that focus on enabling pedagogical change from a teacher-directed paradigm (pedagogy) towards student-centred (andragogy) and student-directed paradigms (heutagogy). Borrowing from the work of Luckin et al. (2010) on the Pedagogy-Andragogy-Heutagogy (PAH) continuum, we outline our MSM framework in Table 2.1.

Our framework utilises the PAH continuum (Luckin et al. 2010) to demonstrate how educators can scaffold pedagogical change (or transformation) across the duration of the curriculum and the types of activities and assessment approaches that match the unique affordances of MSM as these are integrated into the curriculum. The framework maps the PAH continuum onto Puentedura's concept of pedagogical transformation described in the SAMR model. The SAMR model defines pedagogical transformation as a process of moving from the use of educational technology as substitution (S) of prior activities and tasks to augmentation (A), modification and finally redefinition (R) where tasks and activities that were previously impossible or difficult with prior pedagogical approaches become possible through the use of educational technology. This pedagogical transformation is achieved through three complementary conceptual shifts leading to exploring relevant changes in pedagogical practice. The first conceptual shift involves an ontological shift in the understanding of the nature of MSM – moving the use of MSM from a purely social domain to an educational domain. This involves the dimensions of professional development for lecturers to effectively use MSM within authentic professional

Table 2.1 A framework for using mobile social media for creative pedagogies

	Pedagogy	Andragogy	Heutagogy
Activity types	Content delivery	Teacher as guide	Teacher as co-learner
	Digital assessment	Digital identity	Digital presence
	Teacher-delivered content	Student-generated content	Student-generated contexts
	Teacher-defined projects	Student-negotiated teams	Student-negotiated projects
Locus of control	Teacher	Student	Student
Cognition	Cognitive	Metacognitive	Epistemic
SAMR (Puentedura 2006)	Substitution and augmentation	Modification	Redefinition
	Portfolio to ePortfolio	Reflection as VODCast	In situ reflections
	PowerPoint on iPad	Prezi on iPad	Presentations as dialogue with source material
	Focus on productivity	New forms of collaboration	Community building
	Mobile device as personal digital assistant and consumption tool	Mobile device as content creation and curation tool	Mobile device as collaborative tool
Creativity (Sternberg et al. 2002)	Reproduction	Incrementation	Reinitiation
Knowledge production	Subject understanding:	Process negotiation:	Context shaping:
	Lecturers introduce and model the use of a range of MSM tools appropriate to the learning context	Students negotiate a choice of MSM tools to establish an ePortfolio based upon user-generated content	Students create project teams that investigate and critique user-generated content within the context of their discipline. These are then shared, curated and peer-reviewed in an authentic COP
Ontological shift	Reconceptualising MSM: from a social to an educational domain	Reconceptualising the role of the teacher	Reconceptualising the role of the learner
Self-perception (Danvers 2003)	Learning about	Learning to become	Active participation within a professional community

Modified from Luckin et al. (2010)

scenarios and the initial establishment of MSM as the basis for student-owned ePortfolios. The second conceptual shift involves building learning communities where lecturers become participants alongside learners in exploring the unique affordances of MSM within their specific course contexts. The third conceptual shift involves students taking responsibility for building their own project teams and becoming active participants within an increasingly professional-focused commu-

Table 2.2 Matching institutional perspectives to an MSM framework

Institutional levels	Critical success factors	Key MSM framework elements
The student	1, 2, 3	Scaffolding ontological reconceptions via active participation in learning communities
The teacher	1, 5, 6	Scaffolding pedagogical and ontological reconceptions via building learning communities
Process and policy	4, 5	Establishing a supporting infrastructure
		Acceptable use policies
Strategy	2, 4	Development of a BYOD strategy
		Professional development strategy

nity (Danvers 2003). It is at this third level that lifelong world views are developed, and the unique affordances of MSM can be leveraged to redefine (Hockly 2012; Puentedura 2011) new approaches and ideas (Sternberg et al. 2002) to real-world problems and goals.

2.1.3 *Four Levels of Institutional Perspectives*

Implementing our MSM framework requires engagement with all four institutional levels of the mobile learning evaluation framework (Murphy and Farley 2012) as illustrated in Table 2.2: the student perspective, the teacher perspective, processes and policies and institutional strategy.

These are illustrated in the following case studies and examined in more depth in the discussion section of this chapter.

2.2 Case Studies

We have implemented our MSM framework within a variety of tertiary education disciplines, which we present here as a multiple case study. Each of the five following case studies illustrates the implementation of our MSM framework within a specific curriculum context at one university in Auckland, New Zealand. Each case study followed a common methodology informed by the researchers' six critical success factors:

- Each project began with the establishment of a collaborative community of practice (COP) of departmental lecturers and an academic advisor.
- The participating lecturers were supplied with mobile devices.
- A range of mobile social media platforms were explored by the COP.
- A collage of mobile social media platforms were chosen that were appropriate to each curriculum context.

- These were then integrated into the curriculum activities and assessment strategies of a specific class of students utilising a BYOD approach to student mobile device ownership.

Ethical consent procedures were followed in ensuring informed consent from the participating students in each case study. The common research question was exploring the potential of MSM to transform the design of the curriculum towards more authentic student learning experiences. Data collection procedures included face-to-face semi-structured interviews, collation of mobile social media via a project hashtag and online surveys. Participants were asked to create a professional profile and portfolio comprised of a variety of social media networks, including a reflective blog, and participation within a group discussion forum such as a Google Plus communities. Data analysis procedures included a mix of qualitative and quantitative measures, using thematic content analysis via triangulation of interviews, surveys, focus groups and participants' use of social media analysed via archived posts and comments as well as visual conversational analysis tools such as TAGSExplorer (Hawksey 2011) for Twitter.

In each case, these were longitudinal projects that have been initiated by the development of a collaborative COP between small groups of course lecturers and academic advisors. These COPs are effectively peer support groups with the academic advisors taking on the role of technology stewards of mobile learning as core members of the COP, rather than the traditional role of an external expert. In part, the development of a new professional development strategy has both enabled and been informed by this COP approach, with institutional funding providing both access to mobile technologies and time release for the participating lecturers in these projects. This partnership has also enabled working with the institution's IT department to enable the roll out of a supporting Wi-Fi and audio-visual presentation system infrastructure throughout the university. As these case studies have attracted recognition from institutional leaders, the projects have also informed institutional strategy. In each case study, we highlight the impact of our MSM framework at the four institutional levels.

2.2.1 Product Design

A COP of product design lecturers was established in 2012 to explore ways of enhancing the Atelier design studio environment adopted by the programme by integrating the utilisation of MSM for student-owned ePortfolios and collaboration (Cochrane et al. 2012). A strength and limitation of the design studio environment was its focus upon a specific physical collaborative studio for each student cohort. While this model enabled a highly interactive physical learning environment, it tended to shelter students from interacting with authentic learning environments and limited collaboration with clients and remote student groups. Student portfolios were a combination of paper-based evidence and an institutionally hosted online

Mahara ePortfolio system. One of the outcomes of the COP was the ‘prototyping’ of the integration of new social media tools and mobile devices within a learning environment (course). This included the use of the WordPress.com online blogging tool as a way for students to effectively document their individual or collaborative design process and as a reflective learning tool. Another development at the infrastructure level was the design and construction of portable wireless screen mirroring systems for mobile devices, nicknamed MOAs or MObile Airplay screens (Cochrane et al. 2013b).

Impact on students	Many students enjoyed documenting and reflecting more ‘freely’ about how they were going throughout the design process via their WordPress blog. Some students, however, found expressing opinions and reflections in such a ‘public’ way a little intimidating and challenging at first. It was important to provide students with a recognised model, and a set of associated questions, to support their reflective process. The WordPress blog did provide an effective mechanism for students to report on, review and collaboratively reflect on their entire design process at the end of the project. The MOAs were particularly effective in assisting students to work in small teams and easily share and discuss videos and images of their research work that was undertaken in an authentic context, outside of the studio environment.
Impact on pedagogy (the teacher)	The COP provided a supportive platform for product design staff to begin to engage with, and explore the opportunities afforded by, social media and mobile devices to augment and enhance the physical studio learning environment. This included opportunities to better support student collaboration, better support the documentation and sharing of design work throughout the design process and the ‘bridging’ of the physical studio environment with authentic learning contexts, such as ethnographic research undertaken by the students. While some of the lecturers were relatively sceptical at first regarding the use of social media in a learning environment, the ‘hands-on’ experiences and discussions within the COP helped shift initial assumptions and preconceptions. This resulted in an ontological shift in the lecturer’s understanding of not only how the physical learning space can be augmented and enhanced but also how student-generated content and student-generated learning contexts could be enabled. This represented a move along the continuum from Andragogy towards Heutagogy.
Impact on departmental process and policy	The work was undertaken in the COP, the ‘prototyping’ of innovations within the learning environment, and the ontological shift in the lecturer’s understanding delivered the product design department with a framework for implementing broader pedagogical change across the programme. For example, the use of WordPress blogs as a core documentation, sharing and reflection platform was implemented across all product design studio courses. In addition, this prompted a revision of assessment and feedback practices by the lecturing staff, which subsequently included more responsive use of social media and assessment of blogs and other online work. The production and refinement of the MOAs, and the uptake of them in other programmes, also demonstrated the transferability of the MSM framework (Cochrane and Withell 2013).

Impact on institutional strategy	In 2013, students were supplied with an iPad mini each to use as their own mobile device throughout the length of their third year of the course. Combined with the development of mobile wireless screen mirroring technologies (MOAs), the 2013 iPad project informed a subsequent student-owned BYOD mobile device strategy.

2.2.1.1 Journalism

Ever since the impact of MSM on the events described as the 2011 'Arab Spring', it has been evident that the nature of journalism and news dissemination has been radically affected by MSM (Hirst 2011; Rusbridger 2011). As a response, we began exploring ways of integrating the authentic use of MSM into the Journalism curriculum in late 2011 and have iteratively built upon this over the last 3 years (Cochrane et al. 2013a, b).

Impact on students	Students began with *some* knowledge of MSM and gained an understanding of the academic and critical framework behind it, which informed their practical exercises and assessments. The students responded well to the heutagogical (student-determined) teaching approach, and some outstanding course work was achieved. The lecturers found critical success factors (Cochrane 2012) of modelling use of the tools, creating supportive COPs within the tutorial groups, and creating sustained interaction that facilitated the development of ontological shifts (particularly during online digital identity assessment) most effective.
	Pivotal to the successful integration of mobile and social media into the Journalism curriculum has been the development of an undergraduate Mobile Journalism course that has augmented the way the students were engaging in news conversations through social media with newsmakers and audiences or 'users'. Students studied social media theories applied to 36 differing mobile and social media tools within the context of news gathering and communication studies. The traditional newsroom production terminology of 'researching, reporting and publishing' was substituted with 'capture, curation and sharing', and these were applied to the weekly generation of content that was curated and shared in a 'Storify' for assessment at the end of the semester.
	Through theory and practice, students who were already engaged in a number of social media learned to identify how these tools could enable them to gain stronger connections with the news agenda and broaden their reach to potential audiences. For example, one student critiqued and modified his profile information and began using hashtags in order to participate in political conversations on Twitter. Before the end of the 12-week semester, the student was being 'followed' by the Prime Ministers of both New Zealand and Australia. Another student became 'friended' by the daughter of Hollywood A-lister, Bruce Willis, where they shared thoughts on the cultural differences between New Zealand and America on a gender-related issue. In this way, mobile and social media was used to broaden students' geographical reach and connect with participants they would not previously have had the confidence nor ability to gain access to.

Impact on pedagogy (the teacher)	Lecturers followed a heutagogical approach whereby students would determine how the social media tools were applied to meet prescribed marking criteria. For example, an assessment required the production of eight pieces of social media content featuring any tool they wished to choose, but the marking criteria required the content to demonstrate '... differing forms of mobile social media. Content should be location/GPS enabled, tagged, and feature keywords where necessary. Your content is to be "shared" with others and demonstrating the receipt of "likes" or "comment". These pieces of content will be curated into a Storify with a *total* of 1,000 words giving context and analysis on the social media tool you have used, and how it has enabled the production of the item. Your submission should feature academic citations and references; APA referencing is required' (Assessment criteria 2013).
	Lecturers gained insight into the students' learning experiences throughout the semester, through the use of reflective blog posts shared between the student and their lecturer to archive their thoughts and experiences. In addition, a live blogging tool, 'TodaysMeet', was accessed during all tutorials, and students were encouraged to post live comments, queries or suggestions, which were referred to at various times throughout lectures and tutorials. This has been effective as, in our earlier research, it had been identified that students who demonstrate a reluctance to participate in open verbal discussion in a classroom environment often prefer using backchannel live blogging tools such as 'TodaysMeet' to contribute to discussion as they appear to feel more confident online.
Impact on departmental process and policy	The archiving of processes and learning outcomes achieved within the Mobile Journalism course has informed a plan and strategy for the development of implementation of mobile and social media throughout the Journalism curriculum (Cochrane et al. 2016). An international collaboration with a visiting scholar from the Missouri School of Journalism has enhanced a mobile-first focus among student work. We continue to rework an entire curriculum to be anchored in mobile and social learning and the principles of heutagogy informed by our MSM framework (see Table 2.1).
Impact on institutional strategy	The redesign of the entire Journalism curriculum around a focus upon integrating MSM and a heutagogical pedagogy provides a powerful example for the wider institution.

2.2.1.2 Graphic Design

In 2012 we invited a group of Graphic Design lecturers to participate in a COP that explored nine different MSM apps. The MOBCOP (mobile community of practice) met over 6 weeks to explore the pedagogical potential of these apps, and then the participants brainstormed ideas for curriculum integration of these tools, designing course activities and assessments that were relevant to their specific course contexts (Cochrane and Antonczak 2013). The following observations are drawn from an ethnography-based approach and analysis via mainly participant observations and qualitative inquiry conducted via written or oral discussions.

Impact on students	The following is a summary of benefits acknowledged by students via their personal blogs or in situ conversations of the redesign of the curriculum around our MSM framework:
	The development of international exposure via student MSM ePortfolios (Behance, Vimeo, YouTube) and building up confidence in this global ecosystem.
	The immediacy of feedback and conversations via MSM around student work (Twitter, FB, Google+).
	A focus on direct collaboration (Google Drive) and indirect/mediated collaboration (posts, likes).
	Facilitating peer support via both direct and indirect critique (posts, likes).
	A curriculum redesign based upon heutagogy implemented via student negotiation of the decision-making process and being an active participant in a learning community through the use of tools such as Google Drive and Google Hangouts.
	Two of the key recommendations are to support students to move beyond their personal habits and Facebook environment and to have an ongoing discussion about online ethos and collaborative values from the beginning of the course to its end.
Impact on pedagogy (the teacher)	This is the most crucial point of impact of the MOBCOP group that acted as a transformation agent in delivering more pertinent and timely content and feedback to students. The following is a summary of the key changes:
	Developing a more efficient teaching model utilising MSM (YouTube, Google+, Bambuser).
	Facilitation of more class participation and student empowerment.
	Facilitating flexible presentation technologies (MOAs, AirServer).
	Scaffolding students to go beyond their prior experience and comfort zones in education within confined, bounded classroom environments.
	In order to enhance this success, it might be strategic to use a mixed model of face-to-face and live interaction with online and asynchronous contributions. To do so, one approach is to use generic tools for iOS, Android and Windows devices within a bring your own device (BYOD) strategy.
Impact on departmental process and policy	While it is difficult to clearly identify the changes in terms of departmental modus operandi and ethics, we noticed several key impacts:
	There was more collegiality developed among the MOBCOP members.
	The gap between research and teaching was reduced. MOBCOP became a catalyst for developing the scholarship of teaching and learning.
	MOBCOP has been perceived as an investment for future research collaboration and publications among staff also.
	MOBCOP helped develop flexible delivery and feedback processes (*Hangouts* or online support – beyond the classroom) for lecturers.
	The important point is to get colleagues or staff on board first. Therefore, setting up a series of short demo or hands-on sessions will create a space for mentorship and advocacy. Once staff and colleagues feel more at ease, they are able to model the professional use of these tools to students also.

Impact on institutional strategy	MOBCOP was an excellent strategic fit and contribution to the development of the university's research profile nationally and internationally, such as:
	The development of a mobile social minor programme (https://goo.gl/I2gwhV).
	It led to an increased awareness of MSM as a creative tool.
	It developed a new digital productivity workflow.
	MOBCOP has led to a continuous development and capacity building strategy.
	To summarise, the MOBCOP benefits are various and had multiple impacts for the Graphic Design curriculum in general (student and staff). It enhanced the mobile learning experience via MSM and fostered both students and staff personal development as well as consolidated their professionalism and their mobile production portfolio.

2.2.1.3 Digital Media

In 2013 we formed a COP of digital media lecturers with a specific focus on building student ePortfolios via WordPress and enhancing face-to-face classes with online learning communities using Google Plus communities (Cochrane et al. 2014). Given the nature of the courses offered within digital media and the myriad variety of digital publishing tools in use, focus was given to increasing collaboration and self-directed learning among students. To do this, common criteria were established for assignment submissions across a number of courses. Formerly based around the institutional learning management system (LMS) and paper-based submissions, the criteria expanded the department's existing submission practices by including additional information around background research, weekly work-in-progress updates and rationale, all posted to a student's WordPress blog. Learners were required to comment on their peers' WordPress blogs on a weekly basis. The Google Plus communities acted as a collaborative learning space for learners to ask and answer questions in a more dynamic and mobile-friendly environment than the LMS discussion forums. Students could install the WordPress and Google Plus apps on their smartphones and update their progress from anywhere, while also receiving mobile notifications of comments and course-related updates.

Impact on students	The use of Google Plus saw responses to questions answered much faster, as students could often answer each other's questions.
	Google Plus communities were implemented at the individual course level. This created a more consistent experience for learners across a course in different streams with different lecturers.
	Questions were answered in a public forum, meaning all students benefitted from answered questions, creating a virtual FAQ (frequently asked questions) database.
	The use of WordPress let the students see their peers' work progress and their finished assignments, adding a form of competition and benchmarking.
	The ability to document work in progress provided a feedback loop. This saw students get much more formative support and guidance.
	The ability to post and monitor work in progress through regular blog posts helped prevent students leaving assignments to the last minute.
	The documentation of work in progress also saw plagiarism cases drop dramatically, as it makes plagiarism in practice-based assignments very difficult.
Impact on pedagogy (the teacher)	Learning shifted from being teacher-centred to student-centred and collaborative.
	The Google Plus communities provided a means for course leaders to provide input at a student level.
	Google Plus also removed the walls between streams within the same courses, allowing students and lecturers alike to learn and input beyond their own streams, creating the sense of participating within a larger learning community.
	Office visits from students were drastically reduced. This can be attributed to the Google Plus communities providing additional support. The larger the course, the more potential for help exists within the community.
	Rates of students' contesting marking dropped. As all assignment work is submitted through a channel visible to all students within a course, students have a fairly good idea of the level of their work in relation to the rest of the class.
Impact on departmental process and policy	The use of WordPress and Google Plus is now part of most courses offered.
	The use of work-in-progress posts is now part of most courses offered and is now called upon in any case of marking disputes or plagiarism.
	Staff are seeking new technologies and techniques to improve learning and teaching within the department. The university has begun allocating funds to support this.
	Staff have been offered means to seek accreditation as educational technologists or mobile learning providers in recognition of the work completed.
Impact on institutional strategy	The digital design integration of MSM across the curriculum has provided a model approach that has subsequently been showcased to other discipline contexts across the university.

2.2.1.4 Law

Traditionally a very textual case study-based discipline, we wanted to explore ways of bringing Law pedagogy into the post Web 2.0 era. This involved moving beyond hosting case study materials as PDFs and lecture PowerPoint slides on the institution's learning management system (LMS). The foundation of a Law mobile COP was established in 2013 and expanded in 2014 by exploring the synergies between new pedagogies in Journalism and Law in 2014.

Two projects were piloted: the first involving the introduction of course materials for a second-year compulsory law course *Judicial Review* through a collection of mobile-accessible multimedia content uploaded to the student LMS in a dedicated electronic folder 'iMaterials' and the second involving student-led creation of personal WordPress websites as an integral component of the course research requirement for a third/fourth year elective course *International Environmental Law*.

For the *Judicial Review* iMaterials, approximately half of the course content was made available to students on an Apple iBook platform. iBook chapters were developed containing the relevant week's reading materials including embedded PDF copies of judicial decisions, text and video commentary and links to dynamic online content such as law blogs and law commentary websites together with an introductory video podcast from the law lecturer. An alternative version of the electronic materials in conventional PDF format was made available for students without IOS devices. The pilot project initially developed in 2014 was extended in 2015 to cover approximately three-quarters of the course content, and the iBook platform evolved to a generic e-book platform accessible to students with both IOS and Android mobile devices.

The *International Environmental Law* elective provides an introduction to theories of international environmental law, including concepts of state sovereignty, and jurisdiction and liability in the area of international environmental protection. Topics include the international law framework for climate change, law of the sea, biodiversity protection, nuclear testing and international trade and environment. These inherently global subjects lend themselves particularly well to student-led online research platforms, where fellow class members and members of the international environmental community alike are able to interact online, exchanging information and views through the comments facility on WordPress-hosted websites and other MSM platforms such as Twitter.

As part of a compulsory research component, students could opt to develop their own online research websites to supplement text-based research activity. Approximately 75% of the class chose to develop their own WordPress websites which became an important part of their research activities, also allowing a much greater degree of interaction between students on their self-selected research topics.[1]

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[1] For examples of class websites, see https://ielsustainableenergy.wordpress.com/; https://ashbarwood.wordpress.com/

Impact on students	Students in both classes responded very well to the initiatives. *Judicial Review* students reported an increased understanding and level of engagement in the (sometimes challenging) course content, which was also reflected in higher and more informed participation in class discussions. After getting over the 'hump' of technical challenges of the development of their personal research websites in the *International Environmental Law* course (a majority of the students had never attempted to create or operate their own website before), students demonstrated an impressive degree of initiative and creativity in the presentation of material relevant to their chosen research topics, aligned with a heutagogical redesign of the assessment. More importantly, the online platform allowed a greater degree of interaction, which in turn supported the overall learning objectives for the course.
Impact on pedagogy (the teacher)	The initiatives had positive impacts on pedagogy in different ways for the two initiatives. The act of development of digitally based course content in an iBook/e-book platform for *Judicial Review* forced the lecturer to distil complex and wide-ranging materials (such as lengthy judicial decisions and jargon-laden legal commentary) into clear and succinct summaries, benefiting both students and the lecturer in and outside of the classroom. For *International Environmental Law*, the need to model website structure and content for students (the main LMS for the course was also contained on a WordPress website) allowed the lecturer to share the experience of dynamic online interaction on the topic, through regular Twitter activity as well as commentary on class websites, thus modelling the professional use of these tools.
Impact on departmental process and policy	Working with other members of the law school, lecturer involvement in these two projects contributed to ongoing law school innovation in pedagogy. Although the impact on departmental processes were modest, the modelling of digital and MSM facilities appears to have planted seeds of ideas in colleagues which, in time, are expected to reach fruition through dissemination of these techniques in other courses.
Impact on institutional strategy	Again, while impacts of these projects on institutional strategy are likely to be modest, the modelling of innovative techniques contributes in a small way towards wider institutional awareness of the opportunities associated with digital and MSM technology in what has traditionally been a very conservative discipline.

2.3 Discussion

Transformative mobile learning is not automatically the result of simply implementing a BYOD strategy across an institution. Of itself a BYOD strategy provides flexible anytime, anywhere access to traditional course content and activities but no significant difference in learning outcomes. The identification of six critical success factors for transforming pedagogy via mobile social media provides the starting point to support and inform curriculum redesign. Designing for transformative teaching and learning using mobile devices requires a redesign of course activities, assessments and most importantly a reconception of the role of the teacher and the learner. Our MSM framework explicitly scaffolds these reconceptions and focuses upon the affordances of MSM to enable building authentic learning communities within specific learning and professional contexts. Each of the preceding five case studies illustrates our attempts to put this framework into practice within a variety of curriculum contexts, with varying degrees of development along the Pedagogy-Andragogy-Heutagogy (PAH) continuum (Luckin et al. 2010). In this section we highlight the impact of our framework for designing transformative learning experiences using MSM from our case studies across the four institutional levels.

2.3.1 Impact on Students

Designing transformative mobile learning requires a focus upon student-owned devices, and this necessitates learning environment designs that are accessible via a wide range of platforms (iOS, Android, Windows, OSX, Chrome, etc.). We argue that the convergence of mobile devices and social media provides a platform-agnostic solution to supporting a wide range of student-owned devices, allowing for student-determined learning (heutagogy) and minimising the 'digital divide' by enabling students to use the devices they already choose to own. Our framework scaffolds a reconception of MSM from a purely social domain towards students developing professional social media practices and portfolios. The nature of this portfolio depends on the discipline context – for example, graphics design students established Behance portfolios (an online graphic design professional network), while product design students preferred to use WordPress as a portfolio hub. This flexibility of choice of MSM platforms enables a cost-effective approach to support the development of student professional portfolios within the Asia-Pacific Region where educational budgets tend to be more limited than the resources available through the European Union- or US-specific funding models.

2.3.2 Impact on Pedagogy (The Teacher)

Lecturers need support structures and realistic timeframes for learning how to integrate mobile devices and MSM into their own workflows and into the curriculum. This is complicated by the exploration of new pedagogies that are often foreign to many lecturers as they leverage the unique affordances of MSM for collaboration and student-centred pedagogies. We have found the formation of sustained COPs made up of departmental lecturers and a supporting technology steward an effective way of scaffolding these cultural and ontological shifts. The establishment and nurturing of departmental COPs is a fundamental critical success factor within our MSM framework.

2.3.3 Impact on Departmental Process and Policy

We embed our MSM framework within departmental COPs. This has two main outcomes: Firstly, the collaborative curriculum redesign process is nurtured and sustained over at least a year and in many cases several years. Secondly, the COP creates a snowball effect drawing in other members of the department from the periphery of the project to engage with new pedagogical strategies. Thus the strategies developed through the COP become a model for wider adoption and policy throughout the department. As every COP is fundamentally unique – comprised of a unique group of lecturers and an academic advisor – this represents a transferable strategy that can be implemented within virtually any discipline context. Within the Asia-Pacific context, this is relevant to the mix of many cultural groups that are fundamentally collaborative and social constructivist.

2.3.4 Impact on Institutional Strategy

The institution needs to invest in a robust wireless infrastructure to support student-owned device connectivity. We have found that the number of student-owned devices connecting to our university network doubles every semester, so investment in wireless network infrastructure is critical. Institutional AV systems also need to be redesigned for mobile devices rather than fixed desktop presentation machines. This represents a significant change for institutional IT departments, from controlling and rolling out desktop images for computer-lab based classrooms to empowering student-owned device connectivity and cloud-based platforms. This is particularly relevant to the Asia-Pacific Region where many institutions are exploring large-scale student BYOD strategies (Coyne 2015; National Library of New Zealand 2014; Sweeney 2012; Venaruzzo and Saliba 2016).

2.4 Conclusions

Designing transformative mobile learning requires more than reformatting course content for mobile devices which is what Puentedura (2006) describes as a substitutionary process. Rather the transformation of learning involves redefining what is possible. Supported by the formation of communities of practice as a foundational strategy, our framework provides a guideline for designing new assessment types and course activities that can trigger a redefinition of student learning around student-generated content and student-generated contexts using their own mobile devices and MSM. This represents a 'move along the PAH' continuum from teacher-directed pedagogies towards student-determined heutagogy. In the five case studies, we illustrate the design of learning environments that leverage the collaborative and contextual affordances of MSM based upon a framework developed to meet six identified critical success factors. This framework is effectively a pragmatic mashup of several interrelated models of learning, including the PAH continuum, the SAMR framework, the concept of three levels of creativity and ontological pedagogies. The five case studies illustrate that the framework is not limited to a specific discipline context. Our five case studies also highlight the impact of mobile learning across the four institutional levels of student, pedagogy, process and policy and strategy – a unifying thread throughout this book. While our framework is illustrated within a New Zealand context, we believe the framework can be applicable to wider cultural contexts, particularly across the Asia-Pacific Region where many cultures are inherently collaborative and social, but where educational strategies carry a legacy of traditional teacher-directed pedagogies.

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Chapter 3
Ethical Issues Surrounding the Adoption of Mobile Learning in the Asia-Pacific Region

Laurel Evelyn Dyson, Jocelyn Wishart, and Trish Andrews

Abstract Mobile technologies are increasingly part of the everyday life of people in the Asia-Pacific Region and are used to support a range of work, life and learning activities. In spite of the high penetration of mobile phones into all socio-economic groups, many educational organisations, from primary school to higher education, have been slow to adopt mobile learning. In large part, this is due to concerns about ethics and possible misuse of these devices. Examples include fears of students being distracted if they bring their mobile phones to the classroom, concerns over cheating and worries about the use of personal information. Mobile devices tend to be associated with play, not work, leading to misperceptions by others that students are not on task when seen using their mobile device in an educational setting. In addition, there are equity issues if not all students have access to the technology. However, vignettes presented in this chapter also demonstrate how mobile learning is being used to overcome major educational inequities in the region. The authors propose strategies for fostering a proactive approach, taking into account local

L.E. Dyson (✉)
University of Technology, Sydney, Australia
e-mail: Laurel.E.Dyson@uts.edu.au

J. Wishart
Graduate School of Education, University of Bristol, Bristol, UK
e-mail: J.M.Wishart@bristol.ac.uk

T. Andrews
Emerging Learning Environments, Brisbane, Australia
e-mail: trishandrews84@gmail.com

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contexts and cultures. These include student education regarding responsible behaviour, professional workshops for teachers based on ethical scenario development and the development of institutional and national guidelines.

3.1 Introduction

Ownership of mobile devices is very high in many parts of the Asia-Pacific Region, but there is also a great diversity. For example, at the end of 2014, there were on average 90.6 mobile phone subscriptions per 100 inhabitants in the Asia-Pacific (International Telecommunications Union [ITU] 2015a). Eighteen countries in the region achieved more than 100% subscription rate, with some such as Macau and Hong Kong having the highest penetration rates in the world (ITU 2015b). However, it should also be noted that a number of countries lag well behind.

Despite the generally high adoption of mobile technology, only South Korea, Malaysia and Singapore really stand out as having included mobile learning in their wider ICT and education policies or implementation strategies (So 2012). For the most part, mobile learning has been introduced on a small-scale, ad hoc basis, even in those countries with extremely high rates of mobile ownership. So (2012, p. 6) describes mobile learning in the region as in an "emerging and experimental stage".

No doubt there are many reasons for the slow adoption of mobile learning, yet Vosloo (2012, p. 40) sees the adverse views of major stakeholders in the education system as the key to understanding the phenomenon:

> Negative social attitudes towards mobile phones are perhaps the biggest barrier to the increased adoption of mobile learning. These attitudes, held by some policy-makers, administrators, teachers and parents, generally stem from a lack of knowledge about the educational uses of phones and an overgeneralised perception that mobile devices are distracting and disruptive. … mobile phones are often regarded as undesirable or harmful because learners have used them for cheating, cyber-bullying, "sexting" – sending sexually explicit messages or photographs via SMS – and accessing inappropriate content or dangerous people online.

So (2012, p. 24), in considering barriers to mobile learning in Asia, adds Internet and gaming addictions to this list, along with concerns by some about harmful effects to students' physical and psychological well-being, such as "eye strain, fatigue, lack of concentration and an inability to stay focused on tasks". Indeed Ariffin and Dyson (2013), in interviews with Malaysian academics and university students, found that most academics interviewed banned their students from using mobile phones in class except for emergencies or by disabled students. They were concerned over inappropriate use of mobiles in class and thought that students would lose focus or waste time and that there would be plagiarism or breaches of security if students installed spyware on their phones or even that they might video their lecturers and use the recordings to ridicule them. In some ways, the students agreed with the academics; they saw that surfing the Internet while a lesson was being taught would be inappropriate and would result in a loss of focus on the subject matter. However, they also recognised a generation gap in how elders viewed younger people's use of mobile devices. Instead, the university students believed that they could self-regulate their behaviour with mobile phones even if school students could not.

Deriquito and Domingo (2012) reported theft of smartphones as a problem experienced initially in one mobile learning programme in the Philippines but also noted how mobile learning can be used to promote approaches to teaching and learning which result in positive outcomes. For example, the Boat School in Bangladesh allayed river-dwelling parents' fears over their children's safety by bringing education right up to people's houses, and SMS sent directly to students by the University of the Philippines Open University protected learners' privacy, avoided public embarrassment over poor results and removed any fears about making mistakes in public (Deriquito and Domingo 2012).

Apart from these few examples, the ethical issues surrounding the adoption of mobile learning in the Asia-Pacific Region are much underexamined. It is the aim of this chapter, therefore, to bring this topic into focus. Ethics are concerned with how people decide what is right and what is wrong (Driver 2013). They range from "the legal and regulatory aspects of our actions, utterances and behaviour to informal expectations about etiquette, expectations, protocols and norms" (Traxler 2010, p. 157). They are approached from different standpoints depending on the cultures of the individuals involved (Saunders and Lockridge 2009), which vary according to age, religion and gender (Reynolds 2003) and across social class (Traxler 2010). Ethics includes both rules of conduct (e.g. ethical policies or rules of classroom behaviour) and principles against which the rules are evaluated (Tavani 2007), for example, justice or equity, the right of personal autonomy, harm minimisation or the desire to do good (Wishart 2013). Ethical concerns have arisen in mobile learning initiatives because mobile devices provide multiple opportunities for access to personal information, including still and video images; their portability creates issues with boundaries, such as those between home and study environments; they link to both real and unforeseen virtual contexts; and the full range of their capabilities is often poorly understood and information shared unwittingly (Wishart 2013).

We see that there are many potential situations of misuse of mobile technologies in education and thus seek to provide strategies for fostering a proactive approach to dealing with them. This discussion will address the key stakeholders: students, teachers, administrators and policy makers. Because of the diversity of the region – culturally and historically, in terms of technological infrastructure and educational environments and in relation to economic resources and population constraints – these strategies will necessarily need to be adapted to the varied contexts.

However, like Deriquito and Domingo (2012), we do not see the ethics of mobile learning purely in terms of dealing with misuse but also as a potent agent of change. This region is marked by huge social disparity, poverty and educational inequality which represents a serious ethical issue which mobile learning has the potential to address. The possibility for mobile learning opportunities to be used to achieve a greater good will also be considered in order to provide access to learning for those previously unable to participate.

The core of this chapter consists of a series of eight vignettes, which represent examples illustrating common ethical issues associated with mobile learning in the Asia-Pacific Region. The vignettes derive from programmes in which the authors have been personally involved or which their postgraduate students have studied as part of their research or projects described in the literature in which the authors have a particular interest. They stem from work across the region including countries in Asia and the Indian subcontinent, Australia and Pacific Island nations and relate to ethical issues in school and higher education, including those related to work-based learning and vocational training. We see mobile learning in schools as relevant to readers of this book as initial teacher education is part and parcel of higher education.

The vignettes begin with two focusing on work-based training and clinical placements in Indonesia and Hong Kong. We then describe a case from Sri Lanka, in which teachers' concerns over the potential disruption of mobile devices and students' issues with sharing their personal information are discussed. Two vignettes are then presented from Australia, the first dealing with how to avoid issues of inequity and distraction in a Bring Your Own Device (BYOD) approach, and the second discussing ethics and mobile learning for Aboriginal Australians. The sixth and seventh vignettes analyse the opportunities but also the challenges of overcoming educational disadvantage in the poorer countries in the region, specifically through the One Laptop Per Child programme in Niue and Fiji in the Pacific, and improving women's literacy in Pakistan using mobile learning. The final vignette, which comes from India and Thailand, illustrates the waste of resources and discouragement to further participation that can be involved in large, poorly planned projects. The ethical issues illustrated by the vignettes will be discussed, and they will be compared with ethical problems seen more widely. This chapter will conclude some recommendations for strategies to deal with ethical issues arising in mobile learning, with particular emphasis on the Asia-Pacific.

3.2 Mobile Learning Vignettes Illustrating Ethical Issues in the Asia-Pacific

3.2.1 Developing Mobile and Online Learning Approaches for Mine Inspector Training in Indonesia: Issues Around Distraction, Cheating and Access

Regulation of mines and mining is a significant issue in Indonesia, where such activities are undertaken by a wide range of businesses and individuals. Mine inspector training is provided by a government agency responsible for all training in relation to resource management. The mine inspector training is a postgraduate programme that consists of several courses and up until now has been provided in intensive face-to-face sessions at the training centre in Bandung, Indonesia. Concerns about the quality and timeliness of the training have been an issue for the centre for some time.

In early 2015, in an attempt to provide high-quality and cost-effective training to potential mine inspectors, who are located all over Indonesia, the centre began a collaboration with the International Mining for Development Centre (IM4DC) to develop an online learning course to be available to students in a number of ways, including mobile learning. The centre staff have worked closely with an educational developer and a Moodle developer to design a course suitable for mobile learning and to minimise concerns around the use of mobile devices. This course is the first of a suite of courses to be provided to support the fieldwork. Despite the widespread availability of mobile devices and the challenges created in providing high-quality, uniform training in a country of multiple islands and remote areas, this is the first of its kind to be offered in Indonesia.

Ethical considerations take into account distraction, cheating and access. As students will be undertaking the course more flexibly than in the past, fears around cheating were of particular relevance. Strategies to address concerns include developing extensive banks of quiz questions for self-directed learning activities which will significantly reduce the likelihood of students encountering the same set of questions and sharing answers. In addition, the design of assessment activities in the fieldwork component that require individual responses will lessen the ability of students to copy others. The use of text-matching tools such as Turnitin was discussed, but this was considered unviable at this stage. To overcome issues with access for those who may not have mobile devices, providing loan mobile devices for undertaking the training courses is being considered. Furthermore, most government offices have computers where trainees can access course materials, thus allowing for flexibility in provision, and blended learning approaches.

3.2.2 Mobile Learning for Nurse Trainees in Hong Kong: Issues Around Perceptions of Private iPod Use in Clinical Placements

This vignette is taken from a case study set up in 2014 by a doctoral student to evaluate the use of mobile learning among university nursing students in Hong Kong during their compulsory clinical practicum in local hospitals (Charm and Wishart 2015). The practice of using mobile devices with nursing students originated from the need to keep records of their progress with clinical skills and the university's decision in 2013 to issue the students with iPod touches as personal digital assistants (PDAs) to support this recording. However, more recently, fewer staff in hospitals have been available to oversee the students and answer their questions due to larger student cohort sizes and an increased clinical workload. It was realised that the mobile devices issued to students (the iPods) could be used more widely to enable them to access the detailed information they needed on the spot. Therefore, students are now expected to use the university-issued iPods to search for information about medical terms or abbreviations, nursing diagnoses, nursing procedures or drug information from downloaded teaching materials. They can also use them or their own smartphones for taking notes, audio recording, making calculations or as a dictionary or phonebook.

The students interviewed were mostly very satisfied with these mobile learning opportunities but had a number of concerns, the most frequently reported of which related to how mobile devices are perceived. They reported their fear of a misunderstanding of the role of the mobile device amongst the clinical staff or patients. In particular, that being seen using the device meant they were not on task during the clinical practicum:

> It easily gave the wrong impression that I was playing on my phone and not being serious.
>
> I only used the iPod (Touch) during my meal time […] I am afraid that the clinical staffs or patients misunderstand that I am playing the games in the device (Charm and Wishart 2015).

However, in reality, the university only very rarely received complaints about the students using mobile devices on the ward inappropriately. Students were aware of the importance of patient privacy and knew that misuse of the device could lead to possibly failing their practicum. It appears, though, that the perception that mobile learning is not a serious task has led to nursing students in Hong Kong not making the most of the rich, mobile learning opportunities available to them.

3.2.3 Science Teaching Using Mobile Phones in Sri Lanka: Issues Around Disruption and Personal Information

> I have never learned about how to use mobile phones in teaching. However, last year there was a flower in our home garden called "Kidaran". When I saw that I took a photograph. Because I know that most of the pupils haven't seen that because it is not a very common flower. So later in one of the lessons […] I used that image (anonymous teacher quoted by Yatigammana Ekanayake 2011).

The above excerpt was taken from the responses to a survey set up in 2008 as part of the research of a doctoral student (Yatigammana Ekanayake 2011) to explore Sri Lankan science teachers' views about using mobile phones in their teaching. From this survey, it was also evidenced that, not only image capture but also video, SMS and Internet access functions of their mobile phones had been used by teachers for teaching science, and they were interested in how students could do the same to support their learning. However, even though the teachers identified educational potential for mobile phones, for example, in enabling personalisation and visualisation in science learning opportunities, they had concerns about the possible misuse of mobile phones by students, thus creating issues for classroom management and reaching the goals of the lesson. Teachers highlighted possible misuse such as students sending unnecessary SMS messages, talking on the phone to others, off-task browsing of the Internet and capturing unnecessary images and videos. Furthermore, the disturbance due to the noise of notifications for incoming messages as well as disruptive ringtones was a worry. Concerns such as these led, in 2009, to the national government in Sri Lanka banning the use of mobile phones by students in schools (BBC News 2009).

Thus, in order to continue her doctoral research into the educational opportunities created by using mobile phones in teaching and learning, the doctoral researcher had to negotiate with a cell phone network provider to supply a set of mobile phones that were connected to a private Wi-Fi network for the classes participating in the study. As these mobile phones did not have SIM cards and were not connected to a public mobile network, students could not send SMS or access the Internet. Furthermore, through the server of the private network, the teachers could monitor the activities in which students were engaging. It was found that teachers were happy about this approach as it minimised their concerns about lesson disruption and they went on to redesign four lessons from the Sri Lankan secondary school science curriculum to use mobile phones. These lessons were then implemented in real classrooms and reviewed. During the review, the teachers emphasised the importance of the support of the image capture and video functions of the mobile phone to learning in enabling them to bring the outside world into the classroom and so allowing them to conduct the lesson in a context that was known to the students. For example, in one of the lessons, students brought photos of household chemicals taken at home saved in their mobile phones to the classroom. They then sent the images to the teacher's desktop computer via Bluetooth so the teacher could screen these images for the whole class via a multimedia projector and conduct the lesson around them rather than impersonal, textbook examples.

However, this raises concern over the possibility that this focus on the personal context may become too personal. One teacher pointed out how using the images that the students' brought in had the potential to create distress, as they could represent the students' socio-economic status. The teacher said that she came to know from some students that they were a bit upset to expose what they used in their house to their peers.

Also, while this approach was welcomed by both students and teachers and eliminated the possible misuse of mobile phones, there remain concerns as it restricted the educational possibilities of using mobile phones in the classroom. Why are students not able to use their own phones to get the opportunity to access vast amounts of information available on the Internet with the support of their teacher's presence? How can teachers be able to monitor their students' online activities more closely?

3.2.4 A BYOD Approach in Australia: Issues Around Equity and Distraction

In 2007–2008, the Australian university of one of the authors developed a web-based system called *mInteract* to improve interactivity in large lectures. The system provides similar functionality to "clickers", or personal response systems, but allows students to use their own Internet-enabled mobile devices – either 3G (third-generation) mobile phones, laptops or tablets – to answer questions in class, followed by a display of the compiled class responses on the large screen in the lecture theatre and a discussion of the answers given. The academics from the faculty of information technology and the business school who developed the system wished to avoid the large cost to the university of buying clickers, which would have amounted to hundreds of devices to cover all the students attending their lectures and also did not want the logistics nightmare of handing out and then collecting the clickers at the beginning and end of each lecture. The choice of a BYOD approach came from the realisation that most university students in Australia would own a mobile device with Internet connectivity.

Systems like *mInteract* relying on the BYOD model raise various potential ethical issues. These centre mainly around equity: Firstly, what happens if not all students own a suitable device to take part in the learning activity and, secondly, what if students cannot afford to pay for interactions? Another issue is that of distraction: once students are sitting in class with their mobile device switched on, will they waste time and be distracted from taking part in the learning activities by texting friends, sending emails or surfing the Net?

To address the equity issues, two strategies were adopted, one a pedagogic and the other a matter of the design of the technology. The pedagogy adopted from the beginning allowed students to choose whether to answer the questions individually or with the students sitting next to them. In fact, they were openly encouraged by the lecturer to discuss the question with a neighbour and input a group answer. No log-in was ever developed for the system, and no marks have ever been awarded for individual student responses. Furthermore, some students when surveyed noted that they elected to "answer the questions in their head" rather than input an answer into the system. The survey showed a high degree of student satisfaction with the use of the system in lectures, even with students who preferred not to answer electronically, and demonstrated that the change in pedagogy to fostering collaboration through mobile learning and allowing student choice has worked.

Thoughtful technology design has also ensured that equity issues have not impinged on the successful deployment of the system. The cost of interactions was minimised by keeping the web interface with which students interact very plain, with no use of colour or elaborate fonts. Thus, data transmission costs were kept very low: measurements in the first year of operation (2008) showed that even on the most expensive prepaid plans, each interaction cost only 1–3¢, depending on the type and length of the question. With a decline in mobile phone charges over time in Australia, the costs are now so small that they cannot be measured and so are regarded as negligible. Moreover, when smartphones became popular and the option to develop a mobile application (app) was broached, it was decided to keep the initial web-based system, which is just as easy to access provided students bookmark the site in their first lecture as they are instructed to do. An app would have involved more development costs for the university in order to cover the three main smartphone operating systems that are common in Australia and would have excluded students with a 3G feature phone. Not all students yet own smartphones, which are considerably costlier to purchase.

The concern about students becoming distracted in class resolved itself as lecturers accepted that a greater advantage to learning was to be had through using the interactive system than would be derived from banning the use of student devices in class. For example, a progression in the thinking of one accounting lecturer was discernible in the reflective journal he kept in the first semester of system deployment. Previously, he had viewed student connectivity in the lecture theatre as a threat to learning but changed his mind as he saw the advantages of connectivity in opening up the learning space to student interactions:

> Wireless access in lectures is a controversial issue. Up to this point, I have been concerned if access was available students would spend the lectures surfing the net (and I know some do this already). Now of course I would like to open it up (lecturer reflection quoted in Dyson et al. 2009).

Equity concerns by leaders in educational administration at the university took longer to disappear: only after several years of successful and unproblematic use by business and information technology lecturers did they accept the system and promote it across the university.

3.2.5 Mobile Learning for Aboriginal Australians: Issues Around Restricting and Banning of Devices

Indigenous people have a huge presence in the Asia-Pacific Region. Asia has the largest population of Indigenous minorities and tribes of any continent, numbering in the hundreds of millions; most Pacific Island populations are dominated by their Indigenous inhabitants, with the exception of Hawaii and New Zealand, and Australia has more than half a million Aboriginal and Torres Strait Island people (Dyson 2016, p. 3). Rather than try to cover all groups, the authors will focus on Aboriginal Australians, with whom one of the authors has worked for many years at university and in the community.

Given the traditional peripatetic ("walkabout") lifestyle of Aboriginal Australians, it could be said that they are the original "mobile learners". Even in the modern sense of the phrase, opportunities for mobile learning exist in that Aboriginal ownership of mobile phones and other mobile devices (MP3 players in particular, but also tablets and laptops) is much higher than desktop computers or fixed Internet connections. As well, we have observed widespread multimedia production and consumption of user-generated content, access to Internet content, upload of content to Facebook and playing games on mobile phones. This is supported by Kral (2012, p. 246), who has described young Aboriginal people as "fearless of technology".

Some early Aboriginal mobile learning initiatives, such as mobile phone programmes to develop children's mathematics (Aboriginal Economic Development [AED] 2007) and the recording of evidence of prior learning and current competence for the building of m-portfolios to assist adult learners gain skills recognition in the vocational education and training sector (Wallace 2011), were received positively. However, mobile learning adoption, particularly in remote Aboriginal schools, varies widely, and the underrepresentation of Aboriginal students at university compared to their proportion of the population (Welch et al. 2015) means that many miss out on mobile learning altogether.

In some remote Aboriginal schools, laptops from the One Laptop Per Child (OLPC) programme have been successfully implemented. Pegrum et al. (2013) found that the portability and robustness of the devices supported mobile learning in that the younger children – who were not allowed to carry their laptops outside – often moved around the classroom, choosing to work at a desk, on a beanbag or in a corner, while the older children took them into the school's kitchen garden or playground or on school excursions. However, such schools normally do not allow children to take the laptops home, for fear of loss or damage when the devices are out of the school's control (Remote Area Technology Consultant, personal communication). The students, therefore, cannot use them for their homework or for informal learning in their spare time, such as browsing the Web for topics of personal interest.

Where OLPC has not reached, banning of mobile devices in the classroom appears all too common. One principal interviewed by the authors in a very remote school in Cape York, as part of an assessment of mobile technology service provision and use across the community, expressed no interest in mobile learning or in leveraging high rates of mobile phone ownership for a BYOD approach: "Mobile phones aren't an issue. The kids know they can't use them in school, so they don't try". However, mobile phones were used extensively in administration, for example, to contact school teachers out of school hours, many of whom came from the city and only possessed a mobile phone, and to co-ordinate and support the majority of the children when they reached high school age and left the community to attend boarding school. About 85–95% of these boarding school children were reported to own mobile phones, which were used to remain in contact with their parents and to be contactable by the Transition Support Service officer attached to the school. Mobile communication was seen as absolutely essential for success at boarding school and hence the students' access to further education and careers.

3.2.6 One Laptop per Child in the Pacific: Issues Around Overcoming Inequality of Educational Access Using Mobile Devices

OLPC is a program which has sought to give disadvantaged children around the world the "tools that would empower them by teaching them to think, explore, innovate, and create" (Bender and Kane 2012, p. viii). Funded by the not-for-profit organisation OLPC in conjunction with foreign aid donors and the governments of developing countries, the mobile device which is at the centre of the programme is the colourful, rugged, low-cost, energy-efficient, networked "XO laptop", designed to appeal to children and be usable in challenging environments. OLPC has had varying success in the countries in which XO laptops have been deployed, including the Pacific Islands.

For example, in the tiny Pacific nation of Niue, with a population of approximately 1,200, devices were donated to all school children in 2009, but by 2011 the programme had been abandoned because it was too expensive for this small economy to pay computer technicians to service the laptops and to fund the satellite Internet connection (Radio New Zealand International 2011). In addition, a study found that there had been little change in pedagogy as a result of the implementation, and most student use was social rather than educational (Hay 2012). This raises similar concerns to those outlined in the previous vignette about wastage of scarce resources in poor countries and discouragement of further involvement.

In many Pacific Islands, there have been insufficient laptops for the one-to-one computing model envisaged by OLPC. For example, schools in Fiji have an XO laboratory per school rather than an XO laptop per child, with each student working on a laptop only twice a week (Lingam et al. 2015). Cost is obviously a challenge in such fragile economies: one round of funding in Fiji amounted to FJ$1.3 million, sufficient to extend the programme from the initial pilot based on three schools to a further 30 rural primary schools. This represents the price of the technology as well as the expense of providing teacher training. In fact, the experience of OLPC has shown a key success factor in learning equity initiatives such as this to be thoroughly equipping teachers with the pedagogical and technical skills necessary to integrate the XOs effectively into their classrooms. This essential matter of teacher education appears to have been neglected in the failed introduction of laptops to Niue. In Fiji, by contrast, the University of the South Pacific provided training on the XO laptops to teachers at the three test schools for 6 months prior to the launch of the OLPC pilot project. Lingam et al. (2015, p. 340) note anecdotal evidence from the OLPC Fiji Pilot project of "increased attendance, improved behavioural attitudes, … sustained levels of motivation and interest among the children". Though the provision of a laboratory of 30 or so XOs to each school represents a major improvement in ICT access for the children, particularly those in rural areas, it also imposes serious restrictions on informal learning supported by ICT beyond the boundaries of the school gates. How the XO laptops are being used for mobile learning is also unclear: the provision of mobile devices for learning in a laboratory is one thing, but supporting the mobility of the learner, for instance, on school excursions, science field trips or visiting significant cultural sites, is another.

3.2.7 Mobile Literacy Learning in Pakistan: Overcoming the Gender Divide

Literacy is a significant issue in a number of countries in the Asia-Pacific Region. Those worst affected are mostly located in the Indian subcontinent, with adult literacy rates of 62.8% in India, 59.1% in Nepal, 55.9% in Bangladesh, 55.5% in Pakistan and 52.8% in Bhutan (So 2012, p. 12). Gender disparity adds to the problem and represents a social justice issue in its own right.

Pakistan, as well as having one of the lowest adult literacy rates, also has one of the highest gender gaps: whereas the literacy rate for men is 69%, it is only 40% for women (Pegrum 2012, p. 44). To address the gender disparity, the Mobile-Based Post Literacy Programme was introduced in 2009 with the co-operation of UNESCO, the Bunyad Foundation (a local NGO), Mobilink (the mobile network provider), Nokia and Education Committees in the villages. The literacy programme consists of two phases. In the first, women aged 15–30 attend a basic literacy course in their community where they meet 2–3 h per day for 6 days per week for 2 months. Mobile learning then offers the opportunity for the women to consolidate their new reading skills over a 4-month period by providing free text messages based on topics of interest to them, such as religion, health, nutrition, legal and political rights, disaster risk management, beauty tips, recipes and jokes (Miyazawa 2009). Using phones given to them as part of the programme to send text messages, the women respond to questions and texts sent by SMS and communicate amongst themselves. Now the phones also come loaded with a literacy app. The programme has been highly successful in raising literacy rates, motivating learners and providing ongoing reading materials which discourage relapses into illiteracy, a major problem with literacy programs (Pegrum 2012). There is evidence of young women sharing their learning with their mothers and sister, and progress from basic mobile phone digital literacy to computer literacy amongst some. The ongoing work and sustainability of the programme is overseen by the village education committees.

Ethical challenges to the programme include religious and cultural attitudes, particularly amongst male family members, against women receiving an education and against young women being given mobile phones. These were only overcome through the existing respect of the community toward the Bunyad Foundation. A further challenge has been raised by the deteriorating security situation in the country: for example, Islamic extremists, who are opposed to female education, targeted the offices of the UN and its partners during the establishment of the programme in 2008–2009 (UNESCO 2013).

3.2.8 Failure of Large-Scale Tablet Projects in India and Thailand: Issues Around Resource Wastage and Discouragement of Further Participation

As a consequence of the opportunities and excitement envisaged by mobile learning and now tablet computers, there have been several large-scale government-sponsored projects that have been impacted in Asia, such as the Aakash tablet project focusing on university students in India (Tamim et al. 2015) and the One Tablet Per Child (OTPC) project in Thailand (Tamim et al. 2015; Viriyapong and Harfield 2013). While such projects often have high goals and are lauded for their vision, they are also often unsuccessful in achieving their intended aims (Shah 2011). In these cases, as Deriquito and Domingo (2012) point out, while mobile devices may be reaching very remote communities, the educational possibilities envisaged for mobile learning are having little or no impact on these communities in terms of providing educational opportunity.

The reasons for the lack of success in these projects are complex, but in many cases, it appears:

> That the majority of tablet initiatives are launched with a hasty and uncalculated approach, often weak on the educational, financial or policy front (Tamim et al. 2015, p. 21).

In the cases of the Aakash and the OTPC projects, there have been considerable difficulties with supply of the products in the first instance as well as questions about the reliability of the technology and increasing costs over time. Changes in technology, lack of product supply and technical issues have impacted on the roll-out of these schemes (Shah 2011). Where roll-out does occur, lack of teacher training, inappropriate pedagogy, lack of contextual appropriateness, the need in some cases for learners to share devices and lack of electricity pose real issues in providing any meaningful learning experiences or changing life opportunities for the intended recipients (Shah 2011; Viriyapong and Harfield 2013).

Both projects mentioned above have now been closed down. While it is difficult to find information about the Aakash project (Tamim et al. 2015), it appears that the change of government in Thailand in a recent coup altered thinking about the suitability of the tablet project, given the large costs to the government and the limited impact on student learning, particularly for those most in need (Tamim et al. 2015).

While such programs are undoubtedly well intentioned, they skirt challenging ethical territory, and their failure to provide in an environment of high expectation can result in disappointment from their lack of success in achieving the intended changes. The major ethical issues from such failures are, firstly, the waste of resources in an environment of limited funding and, secondly, the disincentive to participate further in such activities on the part of governments in developing countries and the communities and teachers involved.

3.3 Discussion

Drawing on the eight vignettes, it can be seen that there are a number of ethical challenges that either arose or that participants were cognisant of and avoided (Table 3.1). For example, nurse trainees were alert to the need to respect their patients' privacy, and so no infringements were reported during the case study. Likewise, those involved with developing the mine inspectors' training were aware of potential problems with cheating and so ensured that these issues were avoided by developing a large question bank.

Equity of access emerges particularly strongly as an issue: three-quarters of the vignettes describe programs aimed at improving equal opportunity – for illiterate women in Pakistan, for rural school children in Fiji, for Aboriginal children living in remote Australia or (unsustainably) for students in India and Thailand. This is obviously a reflection of the ethical imperative to do good and work for social justice in a region of the world where there is much poverty and inequality. It is also an endorsement of the recognition that mobile devices can bring learning opportunities to previously inaccessible populations. Even in developed nations in the region, such as Australia and New Zealand, there can be inequalities of education and life opportunities for certain segments of the population, particularly the Indigenous populations, which urgently need to be addressed. Furthermore, programmes such as the BYOD personal response system acknowledge that access will always be an issue in that some students may be unable to afford high-end devices or high-cost interactions, and this needs to be taken into account in the way mobile learning is implemented**.**

More concerning are those vignettes which show restrictions to access or outright banning of mobile learning. The science teaching case illustrates how students in Sri Lanka were missing out on being able to access materials on the Internet because of perceptions that they would misuse mobile devices if given open access. Again, a belief that they would be perceived as wasting time and not being serious about their work-based training prevented the nurse trainees getting the most out of their iPod touches. These two vignettes confirm that *perceptions* of wrong doing associated with mobile device use are a serious issue and remain a barrier to more widespread adoption of mobile learning, as highlighted by Vosloo (2012) and So (2012) earlier in this chapter. None of the vignettes presented here showed evidence of students being distracted from their learning, engaging in disruptive behaviour, wasting time, infringing the privacy of others or in fact doing any of the things that the Malaysian academics reported by Ariffin and Dyson (2013) feared their students would do if allowed to use mobile phones in class.

Comparing the ethical issues raised in these vignettes with those commonly reported in the literature, we can see a shift of emphasis. As stated above, there is a much greater focus on using mobile learning to overcome existing social or educational inequity in the Asia-Pacific. Generally, poverty, scarcity of resources, remote location and gender issues loom large. Poverty impacted on the Sri Lankan students in that they felt their socio-economic status might be exposed to their peers if photos

Table 3.1 Ethical issues raised by the vignettes

Vignettes	Ethical issues						
	Ensuring equality of access	(Avoiding) Distraction, disruption, time-wasting	Banning or restricting access	Resource wastage	Discouragement to future participation	Privacy and sharing personal information	(Avoiding) Cheating
Mine inspector training	✓	✓					✓
Clinical placements for nurse trainees		✓				✓	
Science teaching using mobile phones		✓	✓			✓	
BYOD approach	✓	✓					
Aboriginal mobile learning	✓		✓				
OLPC in the pacific	✓		?	✓	✓		
Mobile literacy learning for women	✓		✓				
Large-scale tablet failures	✓			✓	✓		

from home were shown in class. The scarcity of funding made the waste of money in the large-scale tablet projects even more worrying than it might have done in a wealthy nation, however undesirable that too would have been. The remote location of the school children in Fiji and in Aboriginal communities exacerbated the need for better education but also meant that mobile devices, such as the XO laptops, were sometimes scarce and thus kept under lock and key outside school hours: Lingam et al. (2015, p. 352) note the far greater difficulties experienced in remote areas and "the continuous effort required, despite the provision of ICT, for the education sector to grapple with issues relating to student access and equity". Finally, the women's literacy vignette from Pakistan showed how successful mobile learning could be in overcoming the gender divide but also how prevailing patriarchal and religious attitudes provide a constant challenge. These kinds of issues are rarely raised in studies from the developed world: the issues which receive focus elsewhere are mostly those reported by Vosloo (2012) earlier and also infringements of privacy, misuse of data, surreptitious recordings and the capture and posting online of images (Andrews et al. 2015; Dyson et al. 2013).

3.4 Implications for Practice and Policy

Park et al. (2016) surveyed national education representatives in 22 Asia-Pacific countries, as part of a UNESCO review supported by Intel, to take stock of the education sector's readiness and capacity in fostering digital citizenship among children. They found that more than half of the surveyed countries have not introduced safe and responsible use of ICT to their national curriculum and just over half have no policies about children bringing mobile devices to school. Content blocking is widely used, and the country responses focused more on safety and protection against possible risks than the potential benefits of new technology and responsible, ethical behaviour in its use. This demonstrates a major policy void which impacts on various levels of the education system. In order to address this problem, we propose a three-tiered strategy focusing on the education of students about ethical issues and responsible behaviour, teachers' professional development about ethics and mobile learning and policy development in this area.

3.4.1 Students: Fostering an Ethic of Personal Responsibility with Respect to Mobile Device Use

The current situation, as outlined by Park et al. (2016) and supported by the science teaching and Aboriginal mobile learning vignettes, reveals a dislocation between students' free use of mobile technology in their personal lives and the situation at school or university where mobile devices are sometimes banned or their use restricted. If students are not allowed to use mobile technology in their education, where will they learn to use mobile devices and other digital tools responsibly? Educational institutions are the ideal place to teach students digital literacy, including the ethical use of mobile technology and effective tactics to deal with any inappropriate behaviour directed against them. This should go further than avoiding harm and should encourage students to take personal responsibility for unethical actions they see around them, for example, teaching them strategies to assist other students who become the victim of unethical practices such as cyberbullying (Dyson et al. 2013).

3.4.2 Teachers: Professional Development and Collaborative Design of Ethics Frameworks and Scenarios

Educators need support with planning for ethical challenges, as do researchers evaluating mobile learning implementations. It is very noticeable in the vignette comparing the way the OLPC initiative was implemented in two different Pacific Island nations that where teacher professional development was included sustained levels of motivation and interest were apparent amongst the students. The case of the Australian university using *mInteract* shows that BYOD approaches can be successful when equity issues are first addressed by the careful design or choice of pedagogies. There is widespread agreement in the literature for the need for better professional development of teachers adopting mobile learning (Deriquito and Domingo 2012; UNESCO 2011), even if strategies for undertaking this are not always included.

Andrews et al. (2015) recommend supporting pedagogy for mobile learning through professional development involving the collaborative design of ethics frameworks. These frameworks are then used to develop scenarios for discussion with the relevant stakeholders, for example, at workshops for teachers or trainee teachers to be led by a facilitator. Examples of scenarios generated in this way are published by the International Association of Mobile Learning at http://iamlearn.org/?page_id=285 to support mobile learning researchers in planning research around ethical considerations. This approach has the advantage that it takes into account the diversity of cultures in the Asia-Pacific Region and allows teachers to adopt strategies for dealing with ethical issues that are appropriate to their context. Having said that, it is important that the ethics frameworks and workshop discussions be grounded in sound ethical principles, such as those cited from Wishart (2013) previously. Otherwise, as Tavani (2007) notes, we may fall into the trap of moral relativism, by which we accept any behaviour purely because the majority of people in a given culture approve of it.

3.4.3 Policy Development

A clear implication for policy is that there must be one coherent, well-communicated set of national guidelines in each country to support and encourage institutions and teachers to implement mobile learning in a safe and effective manner. Without such policies, institutional leaders and teachers will follow their own instincts, responding either positively or negatively to mobile devices in the classroom, as exemplified by the comment from the school principal quoted in the Aboriginal mobile learning vignette. A stronger focus on educational policy must include better strategies to achieve sustainability and avoid the waste of resources that is exemplified in the large-scale tablet vignette. The policy must be able to evolve rapidly, given the constant evolution of the technology (Traxler 2010). Moreover, it should focus not just on *acceptable* use but *responsible* use in order to support the development of students' personal responsibility with respect to mobile technology noted above (Dyson et al. 2013). On this point, Vosloo (2012, p. 41) argues:

> Responsible Use Policies (RUPs) … are more inclusive than exclusive … To be useful, policies must be restrictive enough to protect learners but open enough for learners to gain the necessary digital literacy skills that will allow them to navigate mobile and online spaces safely on their own.

Because of the great diversity in the Asia-Pacific, it is impossible to be prescriptive, and policy must reflect local circumstance (Shuler et al. 2013; So 2012; Vosloo 2012). Many countries in the region already have ICT in education policies, but, as Vosloo (2012, p. 8) notes, these were "created in the 'pre-mobile' era and generally fail to address mobile technology or the relatively new phenomenon of mobile learning". However, Ariffin and Dyson (2013) note the presence of guidelines for the development of mobile content that the Malaysian government has established in line with commonly accepted standards of behaviour in that country, and suggest these as a starting point in thinking about mobile learning policy. Whether other countries have such guidelines, though, would need investigation. Whatever policy a nation adopts to regulate ethical and responsible use of mobile technologies in learning, it should take account of three "pillars" of effective ICT policy making: a consideration of access to infrastructure, the professional development of teachers and monitoring and evaluation to ensure that mobile learning is indeed transformative (UNESCO 2011, p. 1).

3.5 Conclusion

Improving access to educational resources is a major priority in many developing countries and disadvantaged communities in the Asia-Pacific. Through the vignettes presented in this chapter, we can see that some of the same ethical concerns arise with mobile learning in the Asia-Pacific as in other regions of the world. However, there is also a major difference, with many reflecting the socio-economic challenges of the region and the opportunity for mobile learning to improve access to educational resources for dispersed and/or disadvantaged communities. It appears that the most frequently seen ethical concerns in mobile learning programmes in the Asia-Pacific are ensuring equity of access to educational resources and avoiding disruption or distraction through using mobile devices for off-task behaviour.

Despite the use of mobile learning to do good and potentially transform people's lives, concerns over the unethical use of mobile devices by students can be a major barrier to the greater adoption of mobile learning. Because of this, and the unacceptable waste of resources when large-scale mobile learning programmes have failed, it is essential for governments, educational institutions and teachers in the region to take a proactive approach. We recommend a three-tiered strategy targeted at stakeholder institutions, at supporting teachers and at the students themselves to avoid ethical issues before they happen and to equip stakeholders to deal effectively with any potential infringements of ethical behaviour. This will enable Asia-Pacific nations to build more mobile learning initiatives successfully. It involves the education of students about responsible behaviour in order to equip them as future citizens in a mobile world; teachers' professional development about ethics and mobile learning so that they can design and implement mobile learning to avoid ethical misuse in the first place and deal with it effectively should it occur and national and institutional policy development to support teachers and promote mobile learning more widely. Given the great diversity of the region, a global approach is not recommended. Rather the development of policies and practice must be grounded in local circumstance and take into account technology infrastructure and local culture.

Obviously, the vignettes presented here do not cover every ethical issue connected with mobile learning. Mobile waste (m-waste) was one issue that did not arise in any mobile learning case that we knew of, despite the fact that it is an important ethical issue (Vosloo 2012). In addition, it was not possible to include examples from every country in the region. Further research is needed, including a survey of all countries in the Asia-Pacific which focuses on recording actual cases of misuse, successful strategies to overcome these, and strategies to overcome teachers' and institutions' unsubstantiated ethical concerns surrounding mobile learning.

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Part II
East Asia

Chapter 4
Electronic Schoolbag and Mobile Learning in China: Design Principles and Educational Innovations

Xiang Ren

Abstract This chapter provides an evolutionary review of the design, implementation, and adoption of the Chinese e-Schoolbag (electronic schoolbag) as a mobile learning initiative and through the lens of design principles and educational innovations. At the technological level, this chapter examines the ways e-Schoolbag realises ubiquitous and flexible learning in complex technological contexts and uses mobile technologies to improve learning and teaching. It especially introduces a different design paradigm of mobile learning in the Chinese e-Schoolbag projects, based on specially designed mobile devices (other than iPads or commonly available tablets) and closed systems of software and educational resources, which contrasts with the global trends of BYOD and OERs. At the pedagogical level, this chapter looks at the tension and co-evolution between technology-driven educational innovations and the established educational systems in China. Special attention is given to contradictory expectations of e-Schoolbag by educators, policy makers, administrators, enterprises, and students as well as the stakeholders' quandary between students' academic achievements based on traditional assessments and digital dynamics for pedagogical reforms. It further discusses the implications and inspiration of the Chinese practices for international higher education and summarises key insights for institutional leaders and educators in developing mobile learning.

X. Ren (✉)
Western Sydney University, Parramatta, Australia
e-mail: x.ren@westernsydney.edu.au

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4.1 Introduction

e-Schoolbag (electronic schoolbag) is a popular umbrella concept of a series of eLearning and mobile learning models in China, referring to a dynamic and innovative field of educational technologies. In the past two decades, a large number of e-Schoolbag projects have been implemented in China in both K12 and tertiary education environments, making e-Schoolbag one of the dominant paradigms in designing and implementing technology-driven educational innovations. Mobile learning has been one of the fundamental elements of e-Schoolbag. The original idea of e-Schoolbag was to replace physical schoolbags with eLearning and mobile learning solutions. The current definition of e-Schoolbag varies widely in China, ranging from a personalised portable mobile terminal (Zhu and Yu 2011) to a digital learning space (Wang et al. 2011). The design and implementation of e-Schoolbag suggest a systems approach. Normally, a typical e-Schoolbag system includes a learning management system (LMS), electronic educational resources (e.g. e-textbooks), administrative computing systems, networks and information infrastructure, and portable terminals (i.e. mobile devices that replace physical schoolbags).

Compared with mobile learning developments elsewhere in the world, the design and implementation of Chinese e-Schoolbag have two distinct features: (1) specially designed mobile devices (other than iPads or commonly available tablets) and closed systems of software and educational resources are normally employed, and (2) there is complex interplay between the technology-enabled and technology-inspired educational innovations and the traditional pedagogies built upon China's exam-oriented educational systems.

The design of e-Schoolbag has a preference for specially designed devices with a closed/exclusive system of software and educational resources. This provides an interesting alternative and perhaps contrasts to the global trends of mobile learning based on commonly available devices like iPad, iPhones, or Kindle eReaders; compatible educational apps for Windows, Android, or IOS systems; and increasingly open educational resources (OERs).

The tension between the digital dynamics of mobile learning in reforming and disrupting the established pedagogies and the dominance of exam-oriented educational system is central to the movement to implement and adopt e-Schoolbag in China. Inspired by emerging theories and practices like personalised learning (Hartnell-Young and Vetere 2008) and connectivism (Siemens 2005), the design of e-Schoolbag has significant potential to drive educational innovations in China. However, strong contextual constraints exist in the exam-oriented educational system in China where teaching and learning are primarily and almost solely evaluated by exam scores and students' academic achievements. In adapting to such educational contexts, e-Schoolbag innovation becomes less disruptive and more sustaining. The lack of innovations in practical e-Schoolbag projects is criticised by some leading academics in the field of education studies. They believe that it would be meaningless and even harmful if e-Schoolbag only digitally replicates traditional pedagogies and fails to maximise the innovative potential of digital technologies (Yu and Li 2014a, b). The interplay and co-evolution between digital/mobile technologies and established pedagogies are not unique in China; rather it is a significant educational issue in mobile learning all over the world. The lessons learned from the implementation of e-Schoolbag in China sheds light on the global understanding of digital educational innovations.

This chapter aims to provide an evolutionary review of e-Schoolbag developments in China through the lens of design principles and educational innovations. It especially looks at how the conceptualisation, design, and implementation of mobile learning co-evolve with technological, educational, regulatory, and cultural contexts. Though this chapter introduces some e-Schoolbag practices of K12 education, the issues it raised, in particular, the 'closed' design principles and the tension between technology-enabled innovations and traditional pedagogies, apply to the context of tertiary education as well. It would be inspiring to think about the potentials and limitations of mobile learning through a comparative perspective across different contexts. Likewise, it is not the intention of the author to endorse any 'closed' design principles or, broadly, the Chinese paradigms of mobile learning; rather, the purpose of this article is to introduce the differences and uniqueness of the Chinese case and diverse conceptualisations and models of mobile learning.

This chapter starts with a literature review of mobile learning and e-Schoolbag in China. It is followed by a brief history of Chinese e-Schoolbag, which, through a synthesis of leading e-Schoolbag projects, introduces the framework, stakeholders, and features of the Chinese e-Schoolbag ecosystem and interrogates the role of mobile technologies. This chapter then discusses two characteristics in depth: it analyses the reasons, advantages, and disadvantages of the design principles based on specially designed devices and closed systems, and it explores the complex tension between mobile learning innovations and the Chinese exam-oriented educational system. The chapter concludes with a synthesis of the lessons learned from China's e-Schoolbag and the inspiration and implications for institutional leaders and educators globally in developing mobile learning.

4.2 Literature Review

According to the report by Ambient Insight, the mobile learning revenue in China reached \$1.1 billion in 2014, accounting for 26% of the market in Asia and propelling China to second place in the world (only second to the USA) (Adkins 2015). The rise of mobile learning not only means new market opportunities but also disruptive changes in the educational system. Globally the competition between new and old educational models is facilitated by digital technologies (Johnson et al. 2014). There are also calls for using mobile learning as a catalyst for pedagogical innovations (Cochrane et al. 2014). In China, the government has an ambitious 10-year plan (from 2010 to 2020) for 'educational informationalisation', which aims to not only establish nationwide digital information infrastructure and online educational systems but also reform administration and pedagogies to adapt to digital educational environments (National Ministry of Education of China 2012). As the traditional pedagogies and exam-oriented educational system have been heavily criticised at both K12 and tertiary education levels in China, digital education, including mobile learning, is expected to play a leading role in reforming education. In practice, the implementation of 'educational informationalisation' in China is based on collaboration between government, educational institutions, and commercial companies. In the e-Schoolbag field, particularly in K12 education, the government is the planner, coordinator, and major investor; commercial companies (hardware, software, textbook publishers, etc.) design and implement various e-Schoolbag products and compete for school as clients (Li and Wang 2014). The model that combines governmental leadership and market dynamics helps to build a sustainable system with economies of scale, but it has problems like repetitive construction, administrative intervention, lack of transparency, (over-)commercialisation, and possible corruption.

The design and implementation of e-Schoolbag in China have some unique features, which have not been fully explored by research. Despite the debates on what criteria a device should meet in order to be called as a 'mobile learning device', academic attention has been predominantly attracted by commonly available electronic devices such as iPad, smartphones, Kindle, or laptops, while little research has been done on the educational affordances of the deeply customised and specially designed devices for mobile learning. These devices might include customised mobile operating systems, limit user permissions, restrict Internet connections, or modify/add hardware such as adding handwriting pads. As BYOD (Bring Your Own Device) is a growing trend in mobile learning (de Waard 2014), the design of mobile learning values the openness of the system and students' control over their learning. However, the BYOD and open models have issues like piracy, security, and technological compatibility (Keith 2012). Many Chinese e-Schoolbag initiatives adopt specially designed mobile devices with a closed system of software and educational resources, which, though perhaps seems outmoded, provide an important alternative design paradigm.

The adoption of e-Schoolbag by teachers, students, and parents is a topical and popular research area in educational technologies in China. Lai and Lai (2013) argue that political influence in the adoption of e-Schoolbag is strong. In other words, government policies and administrative intervention are influencing the decision making of individual schools about e-Schoolbag. However, the attitudes of teachers, parents, and educational experts are mixed. Chinese teachers are not supporters or advocates of e-Schoolbag as they are reluctant to spend time on anything that does not directly help to increase students' exam scores. Most predominantly teach using traditional pedagogies. Some Chinese teachers only use e-Schoolbag as a supplementary tool; some even strongly resist such distracting digital educational technologies (Wang 2013). Parents generally have concerns about the potential harm of electronic devices to students' physical and mental health as well as the risk of decreasing cognitive capability and handwriting skills (Liu et al. 2014). Educational experts believe that the successful implementation of e-Schoolbag requires deep convergence between e-Schoolbag, appropriate pedagogies, and the overall educational system, which demands new skills and capacities of teachers and students and a new participative and interactive culture in learning and teaching (Jiao 2012). Though the gap between the potential and expectation of e-Schoolbag in driving educational innovations and the contextual constraints against its adoption has been identified, further constructive research is needed to close the gap in a practical context.

4.3 A Brief History of e-Schoolbag Developments in China

The development of e-Schoolbag in China represents a complex co-evolution of technological advancements, commercial dynamics, governmental policies, and educational innovations. The concept of e-Schoolbag originated in Singapore in 1999 and soon became popular in China. The concept defines the revolutionary potential of digital educational technologies and illustrates the scenario of future eLearning using a vivid and easy-to-understand term. More importantly, 'e-Schoolbag' echoes the ambitions of Chinese government policies and national initiatives in educational informationalisation (*juyu xinxi hua*). In the late 2000, the Chinese National Ministry of Education launched a nationwide initiative 'connecting every school (*xiao xiao tong*)', which aimed to establish national level digital infrastructure for education and provide Internet connections to over 90% of Chinese schools (Li and Ni 2010). The plan also included using digital technologies to facilitate the sharing and uses of online educational resources, cultivating digital literacy, and improving the digital capacity of educational institutions. e-Schoolbag is an important value-added application and the biggest beneficiary of the national digital infrastructure.

The history of e-Schoolbag crosses the pre-mobile and mobile ages. In the first decade of the twenty-first century, the development of e-Schoolbag was experimental and mostly led by commercial forces such as educational publishers and hardware manufacturers. The design of these experimental e-Schoolbag products was preliminary and their educational functions limited. The specially designed portable eLearning devices, which looked like simplified laptops (with lower hardware specification to reduce cost) or tablets with stylus pens but without mobile Internet connections, were launched very early during this period. The scale of e-Schoolbag experiments was at the individual school level, and e-Schoolbag was occasionally used in some exhibition classes showcasing eLearning only. Though the concept of e-Schoolbag was heavily marketed by commercial enterprises, the overall designs did not address the demands of teachers and students, and the products were thus of limited educational value.

The technological revolution of mobile Internet started a new era of e-Schoolbag and led to the second heated wave of developments in China around 2010. The highly functional portable devices, ubiquitous Internet connections, and touch-screen user interface have solved a number of technological bottlenecks of e-Schoolbag developments, which demonstrates the significant potential of profound digital innovations in the future. Further, the decreased cost of mobile devices makes mobile learning increasingly affordable. This is especially true in China due to its advanced manufacturing industry of mobile hardware. For example, the price of a functional Chinese brand tablet for mobile learning could be as low as under 1,000 RMB Yuan (roughly $160).

Globally the theories and practices of mobile learning are rapidly evolving, which inspires and encourages the developments of e-Schoolbag in China. Educational concepts such as blended learning, flipped classrooms, and personalised learning are increasingly used to define new features of e-Schoolbag. Rapidly growing research in eLearning provides theoretical support for the design and practices of e-Schoolbag, which not only helps to envision the future of learning but also, more importantly, academically approves the educational value of this commercially driven initiative. Leading scholars began to publicly discuss and support e-Schoolbag as a catalyst for innovation and education reform since 2010. For example, Prof. Zhiting Zhu from the Huadong Normal University, who was also the then Director of National Committee for Educational Informationisation, published a series of academic articles about the potential of e-Schoolbag for educational innovations, arguing that the focus of e-Schoolbag should transform from 'hard'(hardware plus content) to 'soft' (learning design and pedagogies) in order to build a learner-centred and personalised learning environment (Zhu and Yu 2011).

A growing number of supportive governmental policies were issued. The development of National Education Informationisation that aims to comprehensively increase the levels of information services and digital capacities of Chinese educational institutions has entered a new stage as digital infrastructure building is nearly finished and priority is given to digital educational innovations. e-Schoolbag is valued for such potentials and listed as a prioritised development area. In addition to the Ministry of Education, the National Bureau of Publishing and Press is also keen to facilitate e-Schoolbag developments. The state-owned publishers who have dominated traditional textbook markets hope to continue their monopoly in online education and educational information services. Broadly the Chinese economy is transforming towards service-based and knowledge economies. In 2014, the Chinese government initiated a national level 'Internet plus' strategy, aiming to advance economy through digital innovations. e-Schoolbag is thus valued for preparing digital labour forces and nurturing digital literacies in such policy contexts (Cheng 2015).

e-Schoolbag no longer consists of experimental startups and big enterprises such as technology giant Huawei and telecommunication monopolist China Mobile have entered the market. Large-scale, nationwide cross-institutional collaboration has become mainstream, in which enterprises, government, educational institutions, and schools work together to design and implement e-Schoolbag. The systems approach is widely adopted and enforced, and consequently e-Schoolbag is being reconceptualised as an ecosystem in most products. Figure 4.1 is a typical structure of e-Schoolbag products, which provides comprehensive solutions for educational users, ranging from hardware (mobile devices and servers), learning management

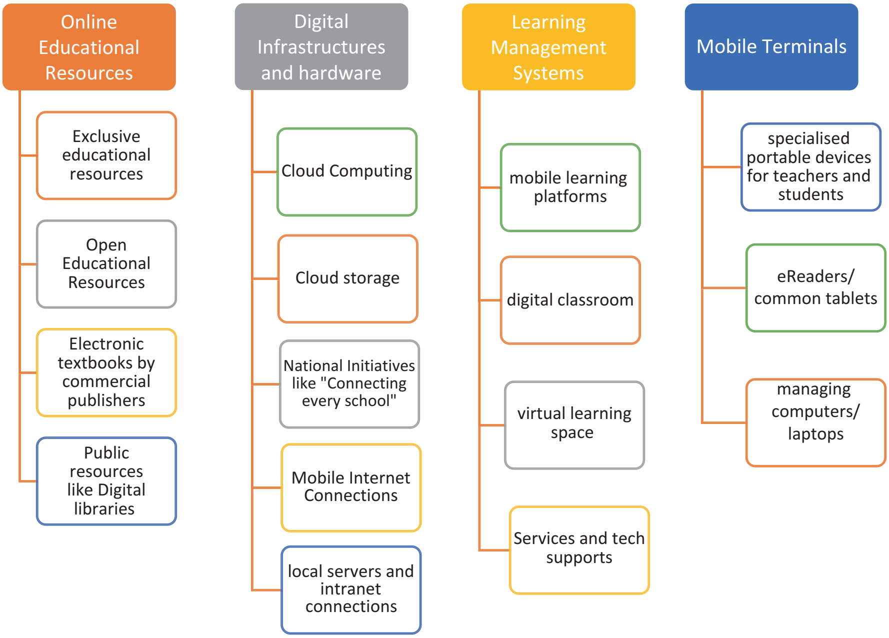

Fig. 4.1 A typical framework of Chinese e-Schoolbag Ecosystem

systems, cloud-based infrastructures, and educational content. Through such a one-stop shop model, e-Schoolbag providers are able to build a closed ecosystem. However, there are still needs for the exchange of resources or collaboration between different enterprises. As such, the development of industrial standards for e-Schoolbag becomes a pressing agenda as the previous fragmented industrial structure and highly diverse technological standards have caused trouble in terms of industry-wide compatibility and interoperability. A national level working group led by Huadong Normal University and the Chinese Ministry of Information and Industry was launched in 2010, which aimed to develop industrial standards for e-Schoolbags. Over 50 enterprises and institutions were involved such as Hanvon, Intel, Dell, Foreign Language Teaching and Research Press, and China Telecom (Wu 2011).

Since 2010, the endorsement and support of national and local governments and the involvement of big enterprises have facilitated the adoption of e-Schoolbag. Over 20 provinces in China have started district-wide or city-wide pilots of e-Schoolbag, often approved and financially supported by local educational administrative institutions. The e-Schoolbag pilots in Hongkou District of Shanghai and Futian District of Shenzhen are representative examples. Moreover, a growing number of e-Schoolbag projects have been launched for tertiary education. For example, the national medical e-Schoolbag project, led by a leading publisher in higher education textbooks, has over 60 member universities (Zhuang 2015). Compared with early school-level experiments, these pilots value educational utility and the effects of

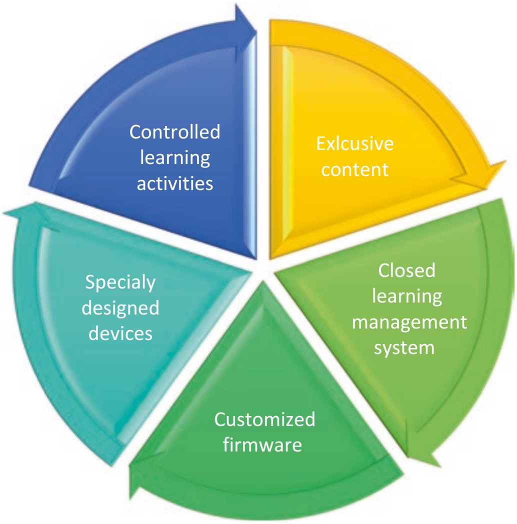

Fig. 4.2 The model of closed e-Schoolbag system

students' academic achievements. They hope to build exemplars and collect empirical evidence through large-scale and long-term pilots to convince educational institutions, teachers, and parents of the educational value of e-Schoolbag.

4.4 Closed Systems with Specially Designed Hardware

4.4.1 Features

Unlike mobile learning systems elsewhere, the Chinese e-Schoolbag projects usually employ a closed system with specially designed mobile hardware. This contrasts with general mobile learning trends that depend on educational apps and commonly available portable devices like iPads, eReaders, and smartphones. The trend of adopting specially designed devices started in the pre-mobile age when such devices could realise a number of mobile learning functions, particularly portability, without mobile Internet connections. Interestingly, this preference continues in the mobile Internet age. Currently, the leading e-Schoolbag projects like Huawei Smart Classroom solutions, China Mobile e-Schoolbag, and *Liren* e-Schoolbag all have their specially designed devices and a comparatively closed system. Figure 4.2 illustrates the typical model of such e-Schoolbag systems.

The Chinese e-Schoolbag systems mostly depend on exclusively licenced educational content like e-textbooks, references, and interactive materials rather than OERs, though they sometimes take advantages of 'free' OERs. The learning management system allows very limited end-user customisation, which restricts teachers' direct participation in co-developing the e-Schoolbag products. The specially designed portable devices are able to connect the exclusive eLearning ecosystems as portable terminals, and in doing so, they restrict many user functions through deeply customised Android or Linux software systems. The firmware is updatable in order to solve technological bugs, add new functions, and address user feedback. There are differences between teachers' and students' devices in terms of hardware and firmware. Students' overall uses are more restrictive, controlled, and monitored within the closed system in the digital classrooms of e-Schoolbag systems. Compared with open designs based on commonly available devices, such closed system saves teachers' time in preparing eLearning resources, building eLearning environments and managing students' learning activities. But it restricts the potential of pedagogical innovations by teachers and students' initiative in managing their own digital learning.

Some e-Schoolbag projects have begun to offer flexible options in terms of terminal devices while still keep the overall system closed. For example, Huawei e-Schoolbag provides both special pads and commonly available pads, while the former have better usability and utility due to optimised software system and exclusive resources. The special pad option not only includes a specially designed portable terminal but also value-added learning apps and software, especially the exclusive eClass app that will connect to its closed learning management system. Comparatively, the commonly available pad (tablet) option is supported by a special e-Schoolbag app with access to exclusive digital educational content only, which allows offline uses of learning resources. There is no major price difference between the specialised pads for e-Schoolbag and commonly available tablets with similar hardware specifications. The selection is up to the schools, teachers, and parents in practice.

4.4.2 Reasons and Motivations

There are historical, educational, and commercial reasons for the preferences of a closed system with specially designed devices in the Chinese e-Schoolbag projects. The overall e-Schoolbag industry has a strong historical link with hardware manufacturing. As China has the world's leading manufacturing industry of electronic devices, it is not difficult for the e-Schoolbag projects to produce highly customised devices at a reasonable cost through either OEM manufacturers such as Foxconn and Inventec Appliances (*ying hua da*) or using the corporations' own manufacturing bases (e.g. Huawei). Such hardware-oriented mobile learning can hardly be imagined in the countries without strong domestic or local manufacturing industries. In the early stages of e-Schoolbag when institutional markets were small, a number of enterprises and development teams depended on the consumer markets of the so-called learning machines. These toy-like learning machines provided rich media and interactive learning experiences based on portable electronic devices, and the content was closely related to school textbooks and curricula. Targeting Chinese parents who expect both high exam scores and learning with fun (*yu jiao yu le*), learning machines were commercially successful with a number of famous brands like Noya Boat, BBK, and Venus (*Qiming Xing)*. Prior to mobile Internet, learning machines already made learning portable and mobile and enabled learners to learn more flexibly in terms of time and place, which is more convenient access to electronic learning than those based on desktop computers. Further, the original idea of replacing physical schoolbags has always deeply shaped the design of e-Schoolbag, which also helps to explain the preferences of specially designed devices.

The dominance of specially designed devices with closed systems also results from special technological demands in the Chinese eLearning environments. For example, the technological support for handwriting is a crucial demand. The development of the stylus pen started in the late 1990s and has been used widely in the Chinese e-Schoolbag industry. Some devices could even recognise 1024 levels of pressure, which ensures that writing using special devices is almost the same experience as writing with a real pen and paper. Most commonly available tablets and smartphones cannot offer such technological functions even today. The use of e-ink screens in some e-Schoolbag projects aimed to meet another special demand, students' eye health. Moreover, e-ink devices might enable more concentrated reading and learning experiences compared with tablets (Daly 2012). However, the educational functions in commonly available eReaders like Kindle are extremely poor, and due to their closed software system, it is hard for educators or educational technologists to improve these systems through customisation. As such, specially designed e-ink devices become an important option for e-Schoolbag. For example, Havon, a leading e-Schoolbag provider, has designed and produced a series of e-ink screen devices with strong educational functions, handwriting support, and customised features for learning purposes. The third important demand is about the diverse Internet connections in Chinese schools. Many specially designed devices provide different options for the quality of audio-video resources, download or streaming methods, and online interactions so that users can use the e-Schoolbag functions with different Internet connections. As the closed system provides stronger copyright protection based on digital right management (DRM) technologies, publishers usually allow offline uses or pre-installing exclusive content and educational functions, which is especially useful in practice. It is also a reason that commonly available tablets and smartphones are not preferred.

Teachers and parents value the specially designed devices and closed system because of some educational concerns, in particular, their ability to restrict distracting functions like digital entertainment. Unlike commonly available tablets or smartphones, specially designed devices make it easier and more effective for teachers and parents to control the use of the devices, including Internet access and entertainment functions. As the Chinese educational context is dominated by exam-oriented cultures, to many teachers and parents, everything in school, should be preparing for exams. As such, electronic devices are normally banned in schools, and even home electronic entertainment is highly restricted for secondary and high school students (Zhang 2015). Therefore, the e-Schoolbag providers need to assure the parents and teachers that their devices would not turn out to be a portable game console, which has been a key concern and controversy of e-Schoolbag in China (Zhu and Yu 2011).

There are commercial reasons for the closed systems with specially designed devices as well. The business models of e-Schoolbag not only depend on selling devices and mobile learning solutions but also continuing technological supports, updates, and services based on and within an exclusive and closed system. Encouraging consumers to stay in the system is thus commercially necessary. China's rampant copyright infringement is another significant reason why a closed system with specially designed devices is believed to be helpful for copyright protection.

4.4.3 Disadvantages

Despite the advantages in customising software and hardware for educational demands, there are obvious disadvantages of such a closed design paradigm. The fragmented e-Schoolbag industry and highly diverse models offered by different providers make it difficult for teachers, schools, and administrators to adopt e-Schoolbag effectively and efficiently in educational practices. It creates significant barriers to collaboration, resource sharing, and consistent administration. Moreover, due to the lack of standards and consistent e-Schoolbag models, it is difficult for teachers' professional training to help with the implementation and promotion of e-Schoolbag through delivering suitable training sessions. It also confuses and upsets the teachers and makes them resist the overall e-Schoolbag initiatives. As discussed above, the closed design paradigm provides educators limited opportunities and space to co-develop e-Schoolbag products, neglecting teachers' specific educational needs. This forms a structural tension in the Chinese e-Schoolbag field between the increasingly open and participative mobile learning environments and the dominance of closed paradigms in most projects.

Economically, the closed and exclusive paradigm becomes costlier and less efficient for designing and implementing e-Schoolbag as different providers and enterprises have limited space for collaboration and resource sharing. Apart from sustainability issues, there is a lack of transparency in the cost-pricing aspects, and enterprises were criticised for making too much profit from the e-Schoolbag products. For example, the Chinese Central Radio Station reported a controversial e-Schoolbag project implemented in Luoyang, Henan Province, in 2015, in which the cost of e-Schoolbag device was only 1000 RMB Yuan ($175) whereas the price was over 5000 RMB Yuan ($840).[1] In some cases, the uses of specially designed devices are mainly driven by commercial motivations, while few unique educational functions are provided, which causes controversies on the necessity of using such devices. The parents in some e-Schoolbag pilot projects have even publicly questioned the cost and protested the policies that make specially designed devices mandatory (Yang 2014; Liu 2013).

[1] See the transcript of the report in Chinese at http://www.chinanews.com/edu/2015/02-08/7045157.shtml

4.5 Mobile Learning and Exam-Oriented Education

Two conflicting promises have been made regarding the educational role of e-Schoolbag. On the one hand, e-Schoolbag is designed as a supporting technology and supplementary to mainstream classroom teaching and learning (Ni et al. 2015), which as a sustaining innovation, aims to replace the physical schoolbags and reduce students' physical burdens. Furthermore, a secondary aim is to help students prepare for exams more efficiently than traditional curriculums and pedagogies, by harnessing digital technologies. On the other hand, in reducing students' learning burdens, the use of e-Schoolbag promises to further revolutionise textbooks and pedagogies and the educational system by acting as a digital catalyst, which demonstrates the potential of disruptive innovations and even leading to a paradigm shift (Yu and Li 2014a, b). This paradox between sustaining and disruptive innovations (Christensen 1997) is shaping the design, implementation, and adoption of e-Schoolbag in China.

4.5.1 e-Schoolbag as Sustaining Innovations

The Chinese educational system is characterised by its overemphasis on academic performance and particularly exam scores, the dominance of traditional pedagogies, and strong government control in educational administration. All these lead to a restrictive context for mobile learning innovations.

Chinese teachers and students are under heavy pressure from the exam-oriented education. The key performance indicators of teachers solely depends on students' exam scores, and students are valued for their rank in class. The e-Schoolbag initiatives are thus expected to provide effective and efficient ways to increase students' performance in exams, using digital technologies. The e-Schoolbag design is aimed at meeting such demands through a close alignment with school curricula and exam guidelines, a wide variety of interactive sessions for repetitive testing and practising, and gamification to facilitate memorising knowledge that would otherwise be boring. Empirical studies have found that e-Schoolbag encourages students to be more proactive and engaged in studying (Zhang et al. 2013) and helps to increase short-term academic performances (Guan et al. 2015), but there is no strong evidence that e-Schoolbag results in a dramatic increase in students' exam scores.

In addition to replicating traditional education with rich media and interactive interfaces, the learning design of e-Schoolbag also pays attention to the latest theoretical developments and innovative pedagogies of digital/mobile learning, especially inspired by good practices in the West. Many e-Schoolbag projects are trying to promote learner-centric, constructivist, and personalised learning experiences, which is challenging the dominant educational paradigms and educational cultures in Chinese schools. However, teachers' attitudes are still conservative, and they believe traditional teacher-centric pedagogies based on one-way knowledge transfer, memorising facts, and repetitive practices are more suitable and effective in the exam-oriented educational system, which ensure students' high exam scores and thus their academic futures including university entry. Instead of ambitious educational innovations, the practical functions and resources that save teachers' time and labour in preparing teaching materials, marking assignments, and classroom management are valued and expected.

The traditions and cultures of exam-oriented education are impacting students and parents in China as well. It is challenging for students to shift from highly controlled and regulated classrooms to the flexible and learner-centric learning systems enabled by e-Schoolbag. Chinese students have very limited free time as they have a heavy homework load and extra tutoring after school. This leads to the lack of students' independence and self-management in learning as well as parents' trust in them. Some e-Schoolbag projects enable interaction and collaboration between schools and families, which was found to be useful in practice for parents to monitor and supervise students' homework (Liu et al. 2013).

The strong intervention of the Chinese government is a double-edged sword in the e-Schoolbag developments. On the one hand, the government is promoting educational reform and digitisation of learning and teaching as a national priority. On the other hand, no resources to date have been committed to support change or fundamentally reform the exam-oriented system and highly controlled administration, which restricts the impact of digital innovations. Consequently, the growing scale of e-Schoolbag pilot projects results in conflict for individual schools and teachers between prioritising student exam scores as their KPIs and the digital potential of educational innovations. In other words, the role of government policies have not been constructive in addressing the tension between the innovative dynamics of e-Schoolbag and contextual constraints from China's exam-oriented educational system; rather, the regulatory and administrative contexts are still unfriendly to disruptive educational innovations of mobile learning (Liu 2013).

As such, the selection of mobile learning initiatives is predominately based on exam-oriented priorities in China. Though e-Schoolbag is designed as a systematic eLearning solution with significant disruptive potential, the innovations that aim to make the traditional learning and teaching more efficient and sustainable are much more valued.

4.5.2 Driving Co-evolution

The Chinese educational system is controversial but fast evolving. Educational reform has been put on the governmental agenda, especially moving from the emphasis on exam scores to the comprehensive development of students (known as quality education, *sushi jiaoyu*). Some practical policy changes are ongoing, such as cancelling key schools (distinguished in terms of academic performance) in K12 education, increasing the even distribution of educational resources, and reducing homework burdens. Discussions on the reform of university entry exams have also started, which will be a fundamental policy change in China's educational system. Moreover, Chinese parents and the general public increasingly realise the limitations and problems of exam-oriented education. This is leading to a strong call for deep educational restructuring and reforms in future.

The evolving educational landscape helps to remove some institutional barriers against e-Schoolbag. In the meantime, the design and implementation of e-Schoolbag need to be more proactive and innovative, driving educational changes by providing dynamic digital initiatives, rather than replicating old educational paradigms in a digital dress. This demonstrates the potential for e-Schoolbag to drive co-evolution between educational technologies, pedagogies, educational policies, and business innovations. However, practically there are two significant, yet neglected, issues regarding the role of educators in such co-evolution: the inclusion of educators in e-Schoolbag design and implementation and the usefulness and usability of e-Schoolbag innovations for educators.

The cross-institutional collaboration among schools, government, enterprises, and experts is essential in facilitating such co-evolution. However, as the development of e-Schoolbag is led by enterprises and encouraged or mandated by government policies, the role of educators is less influential in the design and implementation. The lack of participation by educators has led to a separation between e-Schoolbag functions and the demands of teachers. Controversies also exist in the application of Western theories and good practices without contextualising and localising them in the special Chinese contexts. Some emerging concepts like flipped classroom, personalised learning, and learning analytics are sometimes even misinterpreted and misused, with enterprises marketing exaggerated reports of their impact. It is thus important to include educational experts and teachers in future developments of e-Schoolbag in order to develop innovations that properly translate Western theories and practices and mobile learning dynamics into practical benefits for Chinese schools. The creative and insightful participation of educators is essential to ensure the right direction of e-Schoolbag innovations.

Instead of abstract slogans that focus on changing educational cultures and the mindset of teachers, e-Schoolbag needs to develop friendly and convenient user interfaces for teachers, in particular facilitating easy and direct processes that enable them to participate in educational innovations. Design improvements in every aspect are necessary. More importantly, systematic and practical training for teacher users is highly needed. Many leading e-Schoolbag providers have realised the importance of effective teacher professional training. However, comprehensive professional training on using digital technologies, the considered application of the latest educational theories to change classroom teaching, as well as improvement of the skills and capacity of teachers using specific e-Schoolbag products are essential to drive practical innovations and make transformations. Figure 4.3 is a model summarising the major teacher training activities for effective use of e-Schoolbag for the purpose of educational innovations. Apart from basic training on software and digital literacies, training and professional development sessions on using e-Schoolbag in classrooms and for educational innovations are especially needed. Practical examples and good practices are more useful than abstract theories.

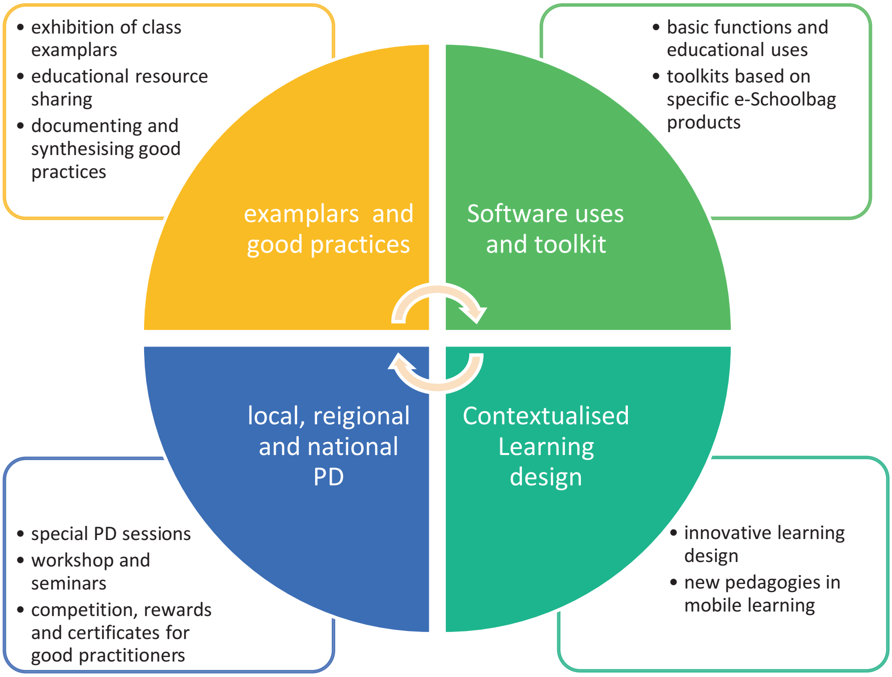

Fig. 4.3 A framework of comprehensive teaching training in e-Schoolbag innovations

4.6 Implications and Inspirations

The e-Schoolbag developments in China provide a unique perspective to understand the role of mobile learning in developing countries and in the Asian educational contexts. Though most Chinese e-Schoolbag projects focus on K12 education, there are also a number of influential ones designed for tertiary education, for example, the Chinese national medical e-Schoolbag project with 40 university members (Zhuang 2015). Overall, the Chinese practices hold some important lessons and inspirations for those considering mobile learning in higher education institutions globally. There are two aspects worth further discussion: one is the use of closed systems and specially designed devices in special education and as an alternative to BYOD; the other is the potential and constraints of technology-driven innovations in reforming established educational systems.

In both the pre-mobile and mobile ages, the e-Schoolbag projects have developed various strategies to adapt to diverse Internet connections in China, which are inspiring for mobile learning internationally. Through deeply customised firmware and a comparatively closed system without continuous mobile Internet connections, these portable learning machines enabled offline use of digital educational resources, interactive learning experiences, and occasional data exchange of learning results and analytics between portable terminals and the system. In the mobile Internet age, the specially designed closed system devices offer more flexibility for adapting to various Internet environments than commonly available tablets with open systems thanks to the integration between hardware and software and deep customisation. Internet connections remain an issue for implementing sustainable and effective mobile learning globally. Moreover, mobile learning sometimes needs to meet special educational demands in areas with limited availability of the Internet, for example, prison education and learners in rural and remote areas. The design paradigm and practices of Chinese e-Schoolbag might be inspiring in these aspects.

Though BYOD and open systems are becoming more mainstream in global mobile learning practices, the e-Schoolbag model based on specialised devices and closed systems is still an important alternative in designing and implementing mobile learning. Overall it provides a protected and controlled mobile learning environment. It ensures more concentrated learning experiences and removes unnecessary distractions; comparatively, students' use of commonly available mobile phones and tablets in university classes is less controlled and thus controversial. Students' security and privacy are increasingly big concerns of mobile learning, and closed systems have comparative advantages. Furthermore, unlike BYOD and open systems, the use of Chinese e-Schoolbag practices have resulted in evidence for the viability of closed systems in digital copyright protection for the offline use of digital content as the students use copyrighted educational resources in encrypted and controlled ways. Though OERs is a global trend, the use of copyrighted educational content remains as an essential concern for most universities considering the implementing of mobile learning. The restrictive licences imposed by publishers on educational content hinder the accessibility of educational content on commonly available mobile devices outside the campus. An alternative to BYOD and open systems might reduce some concerns of publishers and thus enable more flexible licences. On the other hand, the cost of specially designed devices and the potentially poor compatibility and interoperability of closed systems with other mobile learning initiatives are undeniable disadvantages.

The adoption of e-Schoolbag in China so far suggests a tension between mobile learning innovations and the constraints from China's exam-oriented educational contexts. It is not unique in China that the innovative dynamics of mobile learning is being restricted and reshaped by institutional policies. In higher education, mobile learning is mostly used to sustain innovations in practice, while the disruptive potential for established pedagogies and educational cultures has not been fully explored. The Chinese e-Schoolbag design and implementation processes have not provided really inspiring practices for driving paradigm shift or disruptive change. However, the concept sheds light on a co-evolution framework between mobile technologies, learning designs, pedagogies, and policies as well as the dynamics of third parties (enterprises) in driving the transformations, which might deserve more attention.

In addition to the two points discussed above, the Chinese e-Schoolbag developments reflect a number of significant educational issues and provide some inspiring good practices that might be useful for institutional leaders and educators all over the world to support the design and implementation of mobile learning. They are summarised as in Table 4.1:

Table 4.1 Issues and insights on design and implementation

Pedagogical level (learning)	The effects of mobile learning on increasing students' academic achievements are still uncertain though in the short term, students become more engaged with learning
	The influence of exam-oriented education and traditional pedagogies on students' independence and self-management capability in learning deserves more attention
Pedagogical level (teaching)	The conflicting demands on teachers in terms of students' academic achievements and educational innovations
	User-friendly interfaces for teacher users and comprehensive professional training that links pedagogical innovations with specific mobile learning tools/toolkits are important
Technological level	The comparison between closed paradigm (specially designed mobile devices plus exclusive software and resources) and open paradigm (BYOD and open OERs)
	Though 'open' is a trend in mobile learning, the alternative design principles and practices are of value, particularly in meeting special educational needs or adapting to complex technological contexts
Organisational level	In the cross-institutional collaboration between government, enterprises, and educational institutions, the leadership of educators is essential in driving practical, sustainable, and forward-thinking innovations
	Mobile learning must be co-evolving with educational technologies, pedagogies, policies, and cultures

4.7 Conclusion

e-Schoolbag conceptualises mobile learning through an original idea of replacing physical schoolbag and adopting innovative eLearning models that enable portable, learner-centric, and personalised learning. The Chinese models of e-Schoolbag are the product of China's own political, social, and educational contexts. Undeniably China's top-down approach of implementing e-Schoolbag and mobile learning with strong governmental intervention is not free of controversy; likewise, the enterprise-led collaboration in designing and implementing the e-Schoolbag projects also causes concerns about the public and private tensions, given education is a public good. However, it is such uniqueness of the Chinese e-Schoolbag practices that enriches our understanding of mobile learning and provides implications and inspirations for other countries. Despite various contexts, there are commonalities in terms of using digital technologies to reform teaching and learning and achieving sustainable mobile learning. As discussed throughout this chapter, the design options of closed systems and specialised devices and the adaptive/sustaining innovations of mobile learning in exam-oriented education are two major aspects that deserve attention from international mobile learning practitioners. This work only reviews the practices and raises some issues. Further comparative analysis is needed, not only between the Chinese/Asian educational contexts and the elsewhere in the world but also between K12 and tertiary education in mobile learning. A critical approach is essential in understanding technological affordances and contextual factors across different contexts.

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Chapter 5
Implementing Sustainable Mobile Learning Initiatives for Ubiquitous Learning Log System Called SCROLL

Noriko Uosaki, Hiroaki Ogata, Kousuke Mouri, and Mahdi Choyekh

Abstract The prevalence of high-performance mobile devices has enhanced the potential of mobile learning initiatives. There has been substantial technology-driven research on mobile learning. This ubiquitous learning project using lifelogging technology is among them. Since 2010, work has been undertaken to develop a system called SCROLL (System for Capturing and Reminding of Learning Log). It is still an ongoing project with new functions being added to the system. It has been used in various language learning settings in Japan. The aim of this chapter is to describe past and current research endeavours using SCROLL in various learning environments such as seamless learning and flipped learning. The past studies show that the system is effective for learners with their vocabulary learning; it contributes

N. Uosaki (✉)
Center for International Education and Exchange, Osaka University, Osaka, Japan
e-mail: n.uosaki@gmail.com

H. Ogata
Academic Center for Computing and Media Studies and Graduate School of Informatics (Social informatics), Kyoto University, Kyoto, Japan
e-mail: hiroaki.ogata@gmail.com

K. Mouri
Department of Computer and Information Sciences, Tokyo University of Agriculture and Technology, Tokyo, Japan
e-mail: mourikousuke@gmail.com

M. Choyekh
Graduate School of Engineering, Osaka University, Osaka, Japan
e-mail: mahdi.choyekh@gmail.com

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to linking in-class learning with outside-of-class learning, to boosting outside-of-class learning and to enhancing learners' learning opportunities.

5.1 Introduction

The pervasion of high-efficiency mobile phones has expanded the potential of mobile learning environments. Researchers in this area have been very active during the past decade (e.g. Cavus and Ibrahim 2008; Ismail et al. 2010; Kukulska-Hulme and Bull 2009). Mobile learning has been recognised as one of the natural directions towards which computer-assisted learning is heading (Chinnery 2006; Stockwell 2007). Thornton and Houser (2005), who indicated that the learners preferred mobile platforms rather than PCs, endorsed this trend. Mobile and ubiquitous technologies have been expected to foster shifting from classroom-based learning to the one that is free from time and space boundaries, which is what Wang and Jason (2012) call mobile cloud education. Moreover, the progress of mobile and ubiquitous technologies enables new learning environments such as flipped learning, context-aware personalised learning, mobile-navigated task-based learning, mobile-based collaborative learning and seamless learning.

Since 2009, using cutting-edge ubiquitous technology, an award-winning system, SCROLL (System for Capturing and Reminding of Learning Log) has been developed as one of the Sakigake projects. Sakigake or PRESTO (Precursory Research for Embryonic Science and Technology) is promoted by the JST (Japan Science and Technology Agency). Since then, extensive research has been undertaken into applying the system to various learning environments. It has been used in Miraikan (National Museum of Emerging Science and Innovation) in Tokyo for sharing knowledge (Ogata et al. 2014) and career support for international students who were seeking jobs in Japan (Uosaki et al. 2015). However, the focus of this chapter was the use of the system for language learning.

The rest of this chapter includes a research background on ubiquitous mobile learning in Sect. 5.2. The ongoing ubiquitous mobile learning system called SCROLL is described in Sect. 5.3. Section 5.4 presents a case of successful implementation of SCROLL in a seamless learning environment, and Sect. 5.5 describes a learning scenario and pilot evaluation using SCROLL with a SNS (social networking service) in a flipped learning environment. A visualisation of SCROLL log data has been introduced in Sect. 5.6. Finally, Sect. 5.7 presents conclusions with future plans for developing an ubiquitous mobile learning environment.

5.2 Research Background

5.2.1 Ubiquitous Mobile Learning

Ubiquitous mobile learning has generally been defined as learning with the use of mobile and wireless technologies. 'Mobile' as in mobile learning encompasses both learning supported by mobile devices and also learning in an era characterised by the mobility of people and knowledge (Sharples et al. 2007). The concept of mobile learning was foreseen as early as the 1970s with the Xerox Dynabook project, which proposed a 'self-contained knowledge manipulator in a portable package the size and shape of an ordinary notebook' (Sharples et al. 2009).

The new-generation smartphones, as represented by iPhone and Android, provide users with such functions as the multitouch interface, full browser and vast amounts of applications. One of the advanced features is that they are equipped with a range of sensors such as accelerometers, ambient light sensors, GPS (global positioning system), microphones, cameras and compasses. Aggregation of mobile devices with such multi-sensor systems would enable users to benefit from the information gathered via other surrounded devices and users (Hwang et al. 2010; Mouri et al. 2013).

Research on practical uses of ubiquitous technology for learning environments covers a wide range of approaches such as logging individual learning experiences, sharing and linking knowledge, providing learning content and linking people. There are various kinds of devices being explored, such as mobile phones, PDAs, MP3 players, iPods, wireless laptops and handheld electronic game devices.

5.2.2 Learning Log and Life Log

The term 'learning log' is basically a log or record of one's own learning. Also the term 'electronic portfolio (e-portfolio) or digital portfolio' is used for a collection of electronic evidence maintained by a learner. Learning log data or learning portfolios not only provide teachers with ways of evaluating student achievements but also provide assistance for students in understanding their learning situation (Jong et al. 2007). Research findings indicated that journals were likely to increase metacognition and reflective thinking skills as students become more aware of their own thought processes (Ma and Kelly 2006). The approach taken for the SCROLL project focuses on how to enrich learning log or e-portfolio and to promote retention and metacognition by using mobile, ubiquitous and context-aware technologies.

The idea of a 'life log', which dates back to the 1940s (Bush 1945), is to capture everything that ever happens to people, to record every event they have experienced and to save every bit of information they have ever touched (Sellen et al. 2007). Ubiquitous memory system (Kawamura et al. 2007) is a life log system using a video and RFID (radio frequency identifier) tags. SenseCam (Hodges et al. 2006) is a sensor-augmented wearable stills camera aiming to capture a log of the wearer's day by recording a series of images and capturing logs of sensor data. In the SCROLL project, a system called PACALL (Passive Capture for Learning Log), developed by Hou et al. (2013), was added to facilitate the learners to record their learning logs. MyLifeBits (Gemmell et al. 2006) stores scanned material as well as digital data. The common idea of these projects is to use life log data for aiding memory. On the other hand, the proposed system, SCROLL, aims to utilise life log data in the learning process.

5.3 SCROLL Project

Learning can happen practically at any place, for example, classrooms, home, libraries, museums, trains, buses and streets. When people come across new information, they may take notes. However, the notes will not remind them of what they have learned. SCROLL has been developed in order to support learners with recording their new information, to remind them of what they have learned and to share and reuse the information in future learning (Ogata et al. 2011). Since the system has been developed in Japan, most of its users have been Japanese students and international students who study at a Japanese university, and its domain is mainly language learning.

5.3.1 Design of the System

SCROLL is a client-server application. The server side runs on the Ubuntu operating system. It runs on different platforms such as smartphones, tablets and PCs (cf.http://scroll.let.media.kyoto-u.ac.jp/learninglog/signin) (see Fig. 5.1).

In this chapter, ubiquitous learning log (ULL) is defined as a record of what a learner has learned in his daily life using ubiquitous technologies. Each recorded object is called a ubiquitous learning log object (ULLO). SCROLL interfaces that support learners with recording, sharing and reusing ubiquitous learning log objects (ULLOs) with mobile devices are discussed in the following section.

5.3.2 ULLO Recorder (Capturing)

This component facilitates the way learners record their newly learned terms to the server. In order to add a ULLO, a learner can take a photo, ask questions about it and attach different kinds of metadata with it. Figure 5.2 shows the mobile interface of the login page, adding a ULLO and its result.

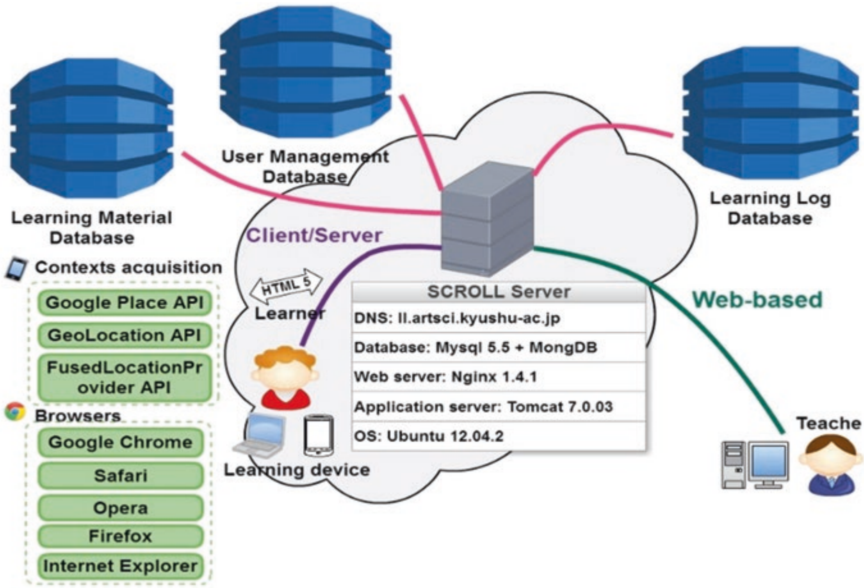

Fig. 5.1 System configuration of SCROLL

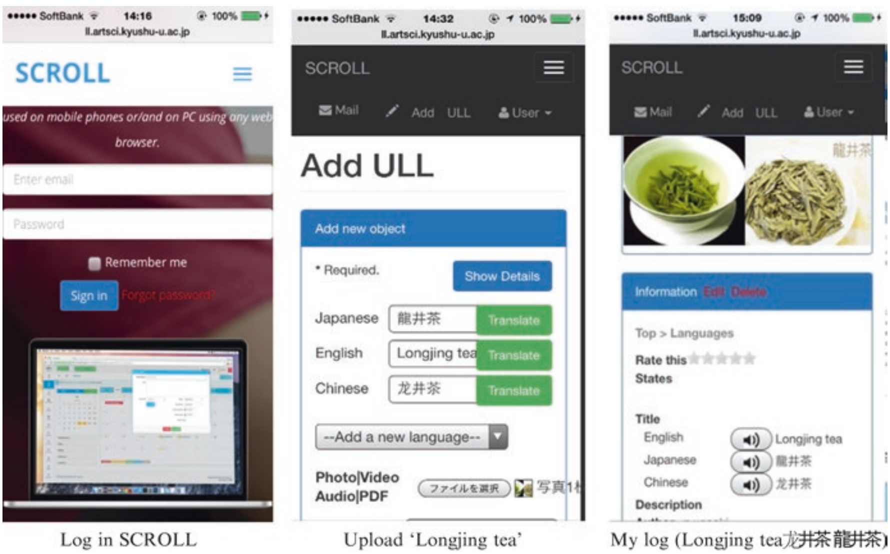

Fig. 5.2 SCROLL interface of smartphone

SCROLL also has a web version. Figure 5.3 shows 'My log' on the web. It includes more information than on the mobile version; if you click the speaker icon, you can listen to its pronunciation. So students can participate in listen and repeat

Fig. 5.3 ‘My log’ on the web version of SCROLL

Fig. 5.4 ‘Re-log’ function of SCROLL on mobile (*left*) and the web (*right*)

practice. There is a comment column, where questions about an object can be raised, and then the question goes to the native speakers of the target language for a response.

SCROLL has a function called ‘re-log’. If you like other learners’ logs, you can ‘re-log’ them to your own pages just like ‘retweet’ in Twitter so that logs uploaded by other learners can be your own logs. For instance, if you want to learn Japanese onomatopoeia ‘(*furafura*)’ (stagger, woozy in English), which was uploaded by someone else, just click ‘Click to re-log’ button as shown in Fig. 5.4. Then it appears in your ‘My log’ page. This means that you can make a copy of another learner’s learning object into your own log. Therefore, you can obtain a considerable amount of knowledge from others, even though you have not experienced that knowledge by yourselves. By sharing ULLOs with others and relogging other learners’ ULLOs, the acquisition of knowledge is enhanced.

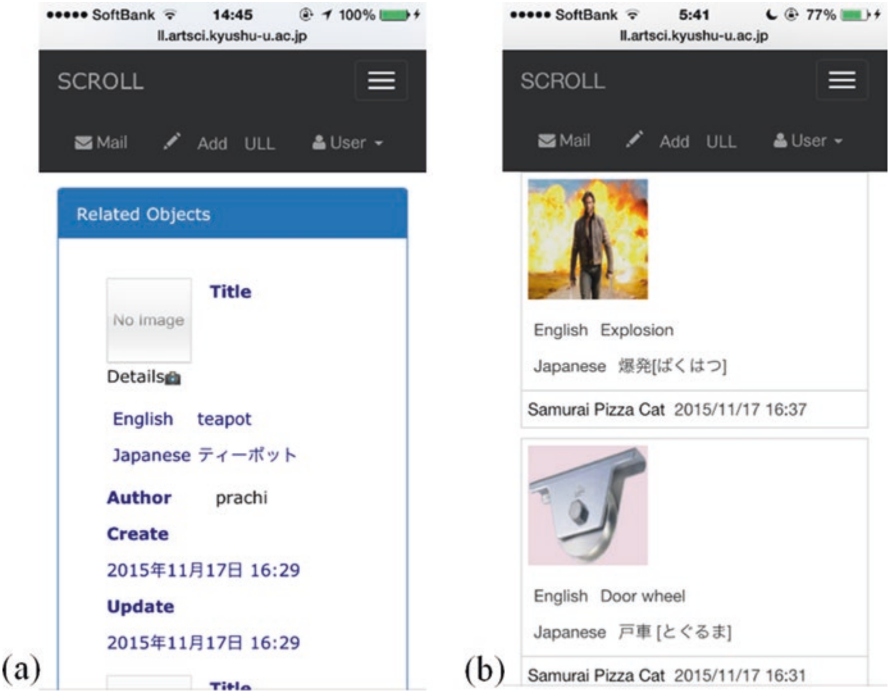

Fig. 5.5 (**a**) Related ULLO 'teapot' and (**b**) ULLO list

5.3.3 ULLO Finder

SCROLL supports learners with finding related information. If you register a new ULLO, the system checks whether the same object has been already stored or not. As in Fig. 5.5a, it shows you a related object 'teapot' right after you upload 'Longjing tea'. Also, you can search ULLOs by name, location, tags and time. Using this function, you can grasp what, where and when you and other users learned in the past. Figure 5.6 shows the list of ULLOs. In addition, the system shows some recommended objects by showing the knowledge map.

A SCROLL network graph also gives some related/recommended objects to the users. The system uses the recommendation algorithm based on collocational relationships. For instance, if someone learned 'stagger', and then learned 'slippery' next, the system analyses its temporal sequence and regards 'stagger-slippery' as a bigram. Then, it recommends 'slippery' as a related word to other learners who learned 'stagger'. Figure 5.6 shows the result of the search for 'stagger'. Words connected by yellow edges such as 'slippery', 'barely' and 'onomatopoeia learning video' are related/recommended words.

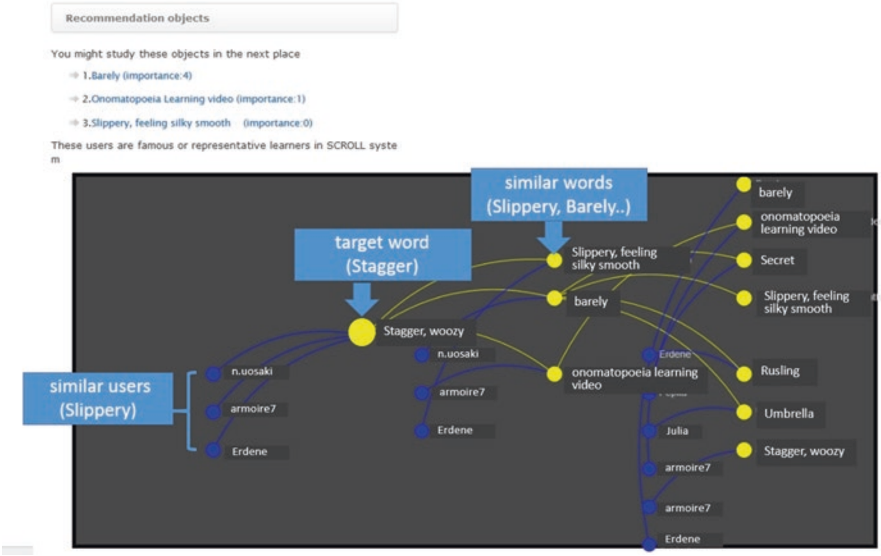

Fig. 5.6 SCROLL network graph

5.3.4 ULLO Reminder

SCROLL is designed to support students with retaining new information in their long-term memory by automatically generating quizzes. It is based on the idea proposed by Atkinson and Shiffrin (1968) where they assert memories can stay in the short-term 'buffer' only for a limited period of time while they are strengthening their associations to be stored in long-term memory. When you take a quiz, the system immediately checks whether the answer is correct or not. It generates four kinds of quizzes: multiple-choice image quiz, multiple-choice text quiz, Yes-No quiz, in addition to both image and text quiz. Figure 5.7 shows a multiple-choice image quiz and after-quiz interface. Quizzes are generated according to your profile, location, time and results of past quizzes.

5.3.5 ULLO Review and Evaluation

SCROLL provides various tools to support users to review their learning activities.

TimeMap has been implemented to show the users when and where they learned their logs for reviewing (Fig. 5.8). TimeMap, which was developed by Johnson and Wilson (2009), shows temporal data within a geographical framework. It consists of a timeline and Google Maps. It represents the shift of learning history in accordance with the lapse of time. Since location information plays an important role in retaining memory (Baddeley and Hitch 1974), it will provide users with good opportuni-

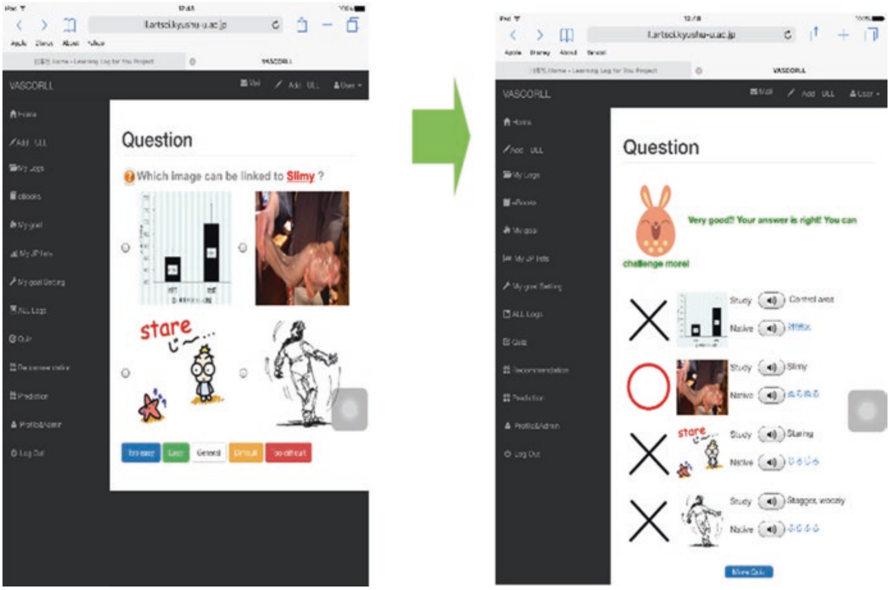

Fig. 5.7 SCROLL multiple-choice image quiz and after-quiz interface

Fig. 5.8 SCROLL TimeMap

ties to review their learning effectively. For instance, Fig. 5.8 shows the date and the place where a learner learned ‘ふらふら’ (stagger), ぎりぎり (barely), etc. When the learner clicks the knot on the map, it shows the word,‘ふらふら’(stagger), which he learned at the indicated place. There is a link to jump to the page which shows the description on ‘ふらふら’(stagger).

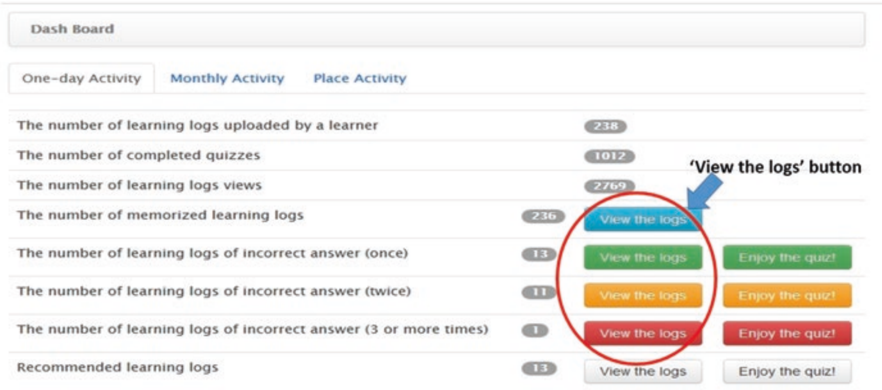

Fig. 5.9 SCROLL dashboard

The SCROLL dashboard which was developed by Lkhagvasuren et al. (2014) is shown in Fig. 5.9. It appears on the SCROLL top page, where students can see the statistics of their learning activities such as the number of uploaded learning logs, the times of taking quizzes and the number of the incorrect answers. Students can also review the logs for questions for which they gave the wrong answers by clicking 'View the logs' button. By viewing these figures, they can evaluate their learning activities for themselves.

5.4 Implementing Seamless Learning with SCROLL

Chan et al. (2006) defined seamless learning as a learning model where a student can learn whenever they are curious, in a variety of scenarios, and in which they can switch from one scenario or context (such as formal and informal learning, personal and social learning, etc.) to another easily and quickly using the personal device as a mediator. In this project, however, 'seamless learning' means learning which occurs with smooth and seamless transitions between in-class and out-of-class learning as the American College Personnel Association (1994) (as cited in Wong and Looi 2011, p. 4) 'stresses the importance of linking students' in-class and out-of-class experiences to create seamless learning and academic success'. 'Linking' is especially important in language learning initiatives because people learn words from the context (Krashen 1989; Nagy et al. 1985; Sun and Dong 2004). Five to 16 exposures are necessary to fully acquire a word (Nation 1990); therefore, it is necessary to encounter various contexts where the words are used in order to build up vocabulary. For instance, for many Japanese learners of English, it is difficult to grasp the meaning of 'subject to' unless they encounter this phrase repeatedly in different contexts as below:

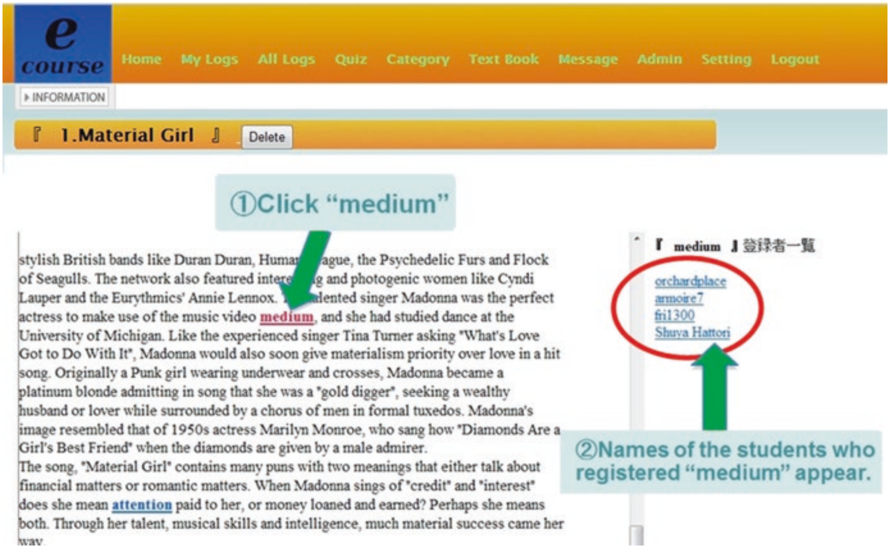

Fig. 5.10 Textbook interface

- All visitors and packages are subject to electronic scan.
- This agreement shall be subject to the laws of Japan.
- The terms of your account are subject to change.

Reappearance of a word reinforces the form-meaning connection in the learner's mental lexicon (Hulstijn et al. 1996).

An additional function to connect one context to another by hyperlinking the same vocabulary has been developed. This new function, which is called SMALL (Seamless Mobile-Assisted Language Learning) system, aims to entwine in-class learning with out-of-class learning. Learners upload what they have learned outside-of-class to the SMALL and then it supports linking outside-of-class vocabulary learning with their in-class one. It also links students' self-learning with that of others. SMALL is an addition to the original SCROLL so it has all the SCROLL original functions such as quiz function and 're-log' function as described in Sect. 5.3.

5.4.1 What Makes It Possible to Entwine In-Class Learning with Out-of-Class Learning?

Reading materials (e-textbook) were added to the SMALL system so that students can read anytime and anywhere for previewing and reviewing with mobile devices. They can use both an uploaded e-textbook in the system and a paper-based textbook.

In the electronic textbook, students' registered words are hyperlinked. For example, when students/teacher click 'medium' in Fig. 5.10, a sidebar pops up, and it

Fig. 5.11 Link between in-class learning and outside-of-class learning

shows the names of the students who registered it to the system so that the teacher will be able to grasp who has uploaded them to the system. When they click a user name, for example, 'fri1300', then it jumps to that student's log page.

Figure 5.11 shows how in-class and outside-of-class vocabulary learning are linked. When a student registers 'contemporary' during his outside-of-class learning, then the system shows him the textbook context where it appears as well as its page and line number. Then he can realise that he has already learned it in the textbook during his in-class learning. That way it reminds him of what he had learned before. It also shows the 'contemporary' objects registered by other classmates. When he clicks them, he can learn other contexts where 'contemporary' is used. This linking function is significant because, as mentioned earlier, students need to encounter as many different contexts as possible to grasp the true meaning of the word. For another reason, as a general concept, people are likely to forget what they have learned. In fact, forgetting learned vocabulary is a serious problem during learning English vocabulary (Chen and Chung 2008). Even though the student felt 'contemporary' was totally new to him, the system lets him know that he has learned it before in the textbook.

Table 5.1 The number of words uploaded/listed

	Number of words uploaded/listed
A (test group)	2162 (120/each)
B (control group)	3584 (179/each)

Table 5.2 Pre- and post-test (1) results (web-based vocabulary test, full mark (20,000))

	Pretest mean (SD)	Post-test mean (SD)	t	Effect size (d)
A (test group)	5082 (1647.16)	7220.82 (1876.665)	3.52*	1.21 (Large)
B (control group)	5458.75 (2053.35)	6756.53 (2454.30)	1.75	0.57 (Medium)

*p = 0.00063 V-check test (http://www.wordengine.jp/)

5.4.2 *Evaluation*

The study group consisted of 38 first-year students of a university in the west part of Japan. They were divided into two groups: Group A (experimental group, with SMALL) and Group B (control group, without SMALL) (Uosaki et al. 2012). At the beginning of the phase, there were two kinds of pretests given: a web-based vocabulary test called V-check test provided by Word Engine and one from the textbook vocabulary. During the evaluation, which lasted 4 weeks, Group A uploaded their new words to the system and Group B added their new words to their vocabulary spreadsheets both inside- and outside-of-class. At the conclusion of the phase, they underwent the post-tests, the same ones as the pretests as well as questionnaires.

Table 5.1 shows the number of words uploaded by Group A and listed by Group B. The number of listed words of Group B was larger than that of uploaded words of Group A. Registering words to the system takes more time than just listing words on spreadsheets. Test trial showed the average time taken to list words on spreadsheets was 25.7 s and 42.25 s on average to register a word to the system. This easy operation of spreadsheets apparently contributed to this result (see Table 5.1). However, Group A could view and 're-log' other users' uploaded objects, so they did not necessarily have to upload objects by themselves.

Table 5.2 shows the pre- and post-test (1) results of Group A and Group B. Group A shows a larger improvement than that of Group B. A statistically, significant difference was detected between Group A pre- and post-test (1) results (t = 3.52, p = 0.00063), while there was no statistically significant difference in Group B's results.

The pre- to post-test (2) results of Group A and Group B are shown in Table 5.3. Both groups show dramatic improvement. There was a statistically significant difference between pre- and post-test (2) results for both groups as illustrated in Table 5.3. As the content of test (2) was from the textbook, this result is predictable, as students could prepare for the test. On the contrary, test (1) content is totally unpredictable. This difference is directly reflected the test results.

Table 5.3 Pre- and post-test (2) results (textbook vocabulary test, full mark (80))

	Pretest (2) mean (SD)	Post-test (2) mean (SD)	t	Effect size (d)
A (test group)	25.62 (10.49)	60.54 (18.29)	6.67*	2.36 (Large)
B (control group)	31.98 (10.10)	64.39 (15.12)	7.70**	2.53(Large)

*$p = 5.03\text{E-}08$, $F = 2.13 < F\alpha$ **$p = 1.669\text{E-}09$

In conclusion, the experimental group showed a larger improvement in both tests than the control group. The experimental group uploaded fewer words but learned more words than the control group. Therefore, it can safely be said that the system was more effective and more supportive than spreadsheet vocabulary learning.

5.5 Implementing Flipped Classroom with SCROLL and SNS: A Case Study

An implementation of SCROLL into another new learning environment called ‘flipped classroom’ is described in this section. ‘Flipped classroom’ has gathered a lot of attention from researchers and educators of various fields in the recent years (Bergmann and Sams 2012; Kiat and Kwong 2014; Schmidt and Ralph 2014; Vaughan 2014). Flipped classrooms are a kind of blended learning, where learning content is moved outside the classroom. In flipped classrooms, how students can be encouraged to learn outside-of-class is a key issue. In a previous study, SCROLL contributed to the students’ increased involvement in outside-of-class learning (Uosaki et al. 2013). Therefore, it was expected that this system could play an important role in the effective implementation of flipped classroom. Bergmann et al. (2011) have listed one of the advantages of flipped classroom as ‘a means to INCREASE interaction and personalised contact time between students and teachers’. It is also expected that it can be a means to increase interaction not only between students and teachers but also among students. Thus, a student-centred collaborative learning environment can be realised, which is reported as one of the most effective ways of learning in second language learning class (Chen 2003). Since this is an emerging research area, a lot of issues are to be explored in order to prove its effectiveness and its efficacy.

5.5.1 Motivation

One of the motivations for introducing flipped classrooms was to make more use of class time for discussion and other collaborative activities. Since students in the subject class were international, collaborative work helps them to enhance mutual and cross-cultural understanding. Therefore, a lecture component such as learning new terms or briefings on how to use SCROLL, which is, in most traditional classes,

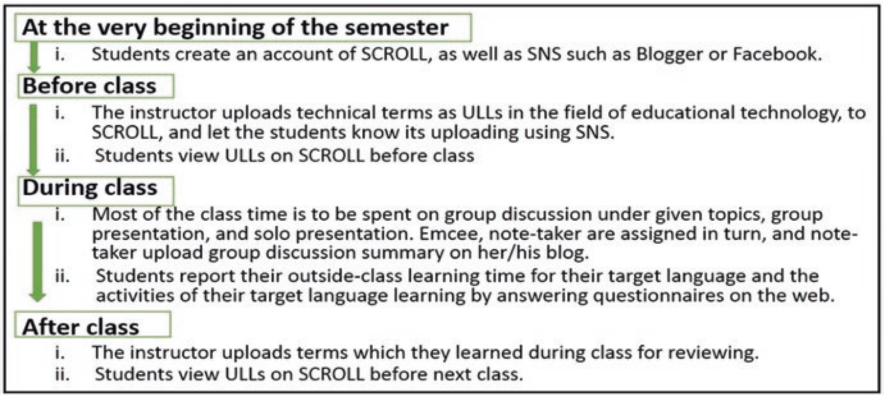

Fig. 5.12 Learning procedures of flipped classroom with SCROLL and SNS

completed during class, was assigned to be viewed on SCROLL outside-of-class. A secondary motivation was to boost up outside-of-class learning time because of the following reasons:

Learning a new language is a time-consuming process as noted by the Foreign Service Institute (FSI) of the US Department of State. According to their investigation, 2200 h is necessary for native English speakers to achieve a general professional proficiency level in Japanese. The time available in-class for language learning is therefore far from sufficient, and there is no other way but to learn outside the classroom (Uosaki et al. 2013).

5.5.2 *Flipped Classroom Design*

As mentioned, since it is a key issue what makes it possible to encourage students to get involved in learning outside-of-class in flipped learning, the participants were asked to report their outside-of-class learning time. In addition, in order to encourage students' outside learning, they created their own blog site using Blogger and were given a home assignment of composing essays using their target language. Furthermore, in order to promote their interaction outside-of-class, a Facebook group was created. The learning procedures are described in Fig. 5.12.

5.5.3 *Evaluation*

Eleven university students in a CALL (computer-assisted language learning) class held weekly at the university in the west part of Japan participated in the evaluation. There were five international students (two from the Netherlands, two from Brazil,

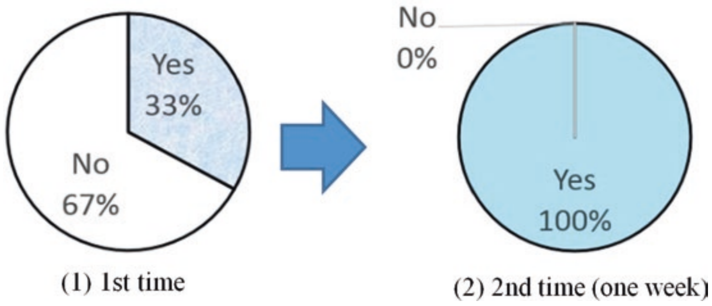

Fig. 5.13 Do you know what 'flipped classroom' means?

and one from Germany) and six Japanese students. In order to examine how effectively flipped classrooms contribute to boosting their outside-of-class learning time, the time students spent learning outside-of-class was compared for a period of time using 'flipped' sessions and without 'flipped' sessions. During the first half of the semester, which lasted 2 months, they learned without using a 'flipped' mode, and during the second half of the semester, they learned with a 'flipped' mode. The average outside-of-class learning time for the first phase was 51.2 min per day (SD 48.1), while that for the second phase was 75.7 min per day (SD 98.1). Outside-of-class learning time dramatically increased in the 'flipped' mode in this pilot study. However, there are various factors that contributed to boosting outside learning time. The interview session was conducted for the hardest worker whose average outside-learning time for her target language was 116.8 min per day. She said 'I studied hard because I intended to take IELTS (International English Language Testing System).' Apparently, it was preparation for IELT test that boosted her outside-of-class learning time. Therefore, it is too early to conclude that flipped learning was the major contributor.

5.5.4 *Appropriate Timing of Posting an Outside-of-Class Task*

5.5.4.1 One Week vs. Two Weeks

All the students were instructed by the teacher to view ULLs before class as a home assignment. Figure 5.13 shows the questionnaire results on whether they learned a new term, 'flipped classroom', as shown in Fig. 5.14. The first questionnaire result shows only 33 % answered 'yes' to the question of whether they understood the term and its meaning. This 33 % included students who had and had not viewed the content. Next class, the teacher instructed them as a reminder to view it and the second questionnaire conducted 1 week later shows 100 % of the students answered 'yes'. It seemed it was unlikely for them to do their outside-of-class task during the first week. Their performance was highly improved after the teacher pushed them to view it. Therefore, it is recommendable to give them at least 2 weeks for viewing as an outside-of-class task.

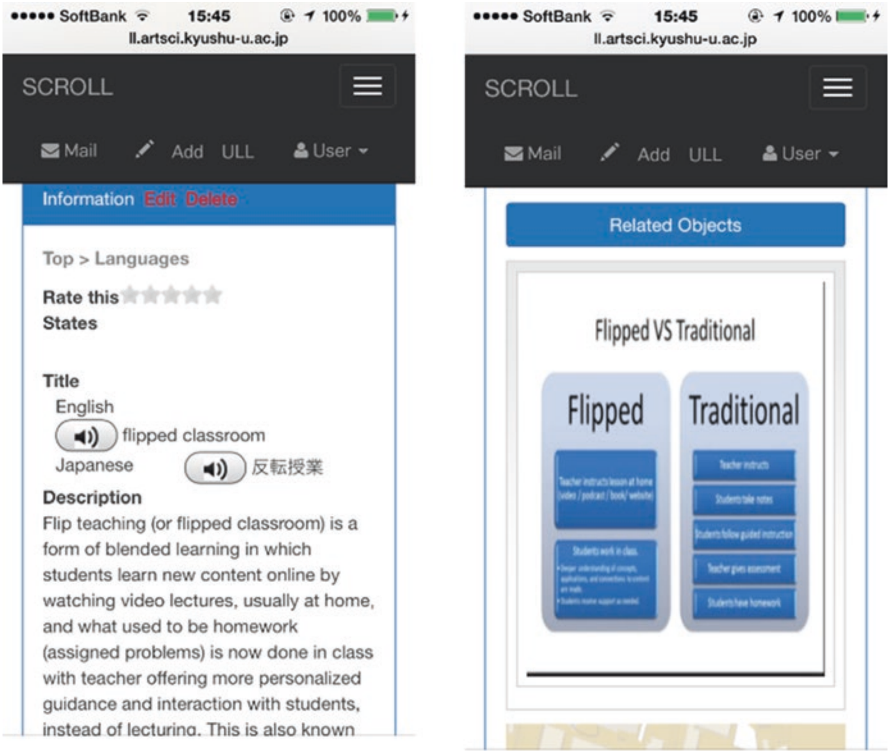

Fig. 5.14 'Flipped classroom' for previewing before class

5.5.5 *SNS Contribution to Outside-of-Class Learning*

SNS is an online platform that enables users to create a public profile, build social networks and interact with other users of the same website. Since the SNS function of SCROLL is yet to be fully developed, all the participants including the teacher created their own blog and became readers of each other's blogs. A Facebook group and a mailing list were also created in order to encourage outside-of-class interaction. All the participants got the instruction messages from all the three modes: via emails, Facebook timelines, and blog posts. According to the survey result, 75 % of the students used Facebook as a means of getting messages from the teacher (Fig. 5.15(1)). Fifty-five percent of the students viewed Facebook posts every day, while 64 % of the students viewed blog posts less than once a week (Fig. 5.15(2 and 3)). Therefore, blog sites did not work as a means of communication outside-of-class, while the Facebook group functioned as a group forum, and students interacted with each other using their target language outside-of-class, which is believed to be one of the contributors to boosting their outside-of-class learning time of their target language.

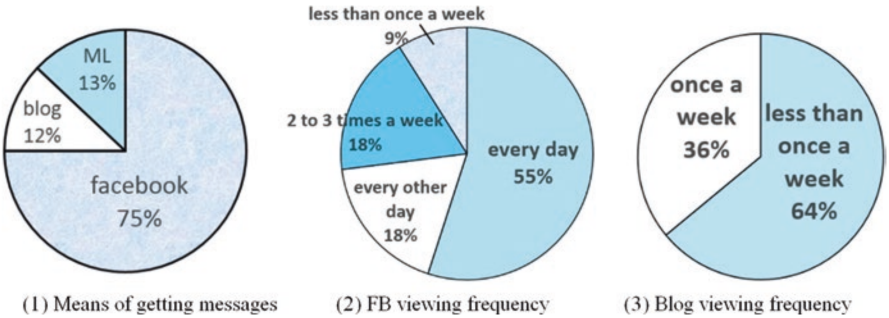

Fig. 5.15 SNS comparisons (Facebook vs. blog vs. mailing list)

Fig. 5.16 Facebook contribution to outside-of-class learning and interaction between students

When Japanese language learners (five international students) posted Japanese sentences on Facebook, Japanese students actively posted comments on their Japanese writings, making corrections and suggestions though it was not an obligation of class. Figure 5.16 shows one sample where the Facebook comments played an active role in the interaction among students outside-of-class. Each student created his/her own blog site using the tool, Blogger provided by Google. It also has a comment function, but it did not generate active interaction among the students. Therefore, as far as a comment function is concerned, Facebook is a lot easier for students to use compared to blogs.

5.6 Visualisation for Analysing Ubiquitous Learning Logs

SCROLL has been active for 6 years. Every opportunity has been used to promote this system for free use. As of April 25, 2016, SCROLL has 1871 users, including both informal and formal uses, and 29,096 learning logs. The analysis of

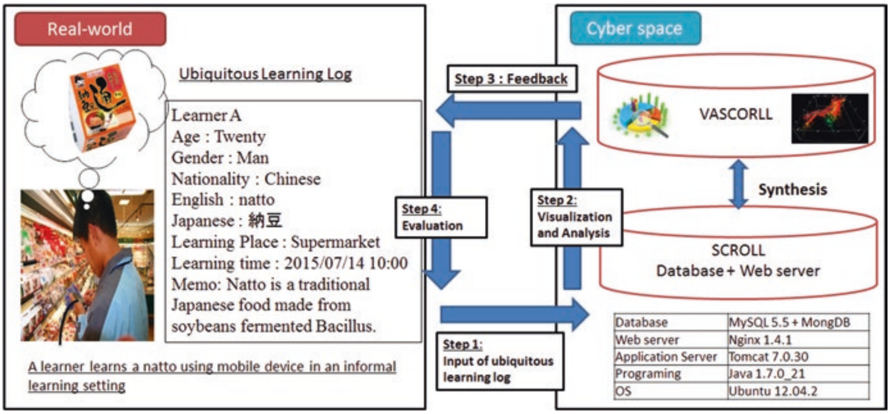

Fig. 5.17 How SCROLL and VASCORLL work

educational big data or learning analytics (LA) has been a recent trend among researchers of learning technologies (Aljohani and Davis 2012). Utilising log data collected by the ubiquitous learning system enables the enhancement and increase of learning opportunities, including the interactions among a learner, contexts, and context-based knowledge. In order to find effective and efficient learning patterns and learning trends, and learning style, VASCORLL (Visualization and Analysis System for Connecting Relationships of Learning Logs) has been developed (Mouri et al. 2015). VASCORLL is a visualisation and analysis system based on a collocational network (Williams 1998), TimeMap (Johnson and Wilson 2009) and association analysis (Behrouz et al. 2004). It is used for visualising and analysing the relationships between learners and context-based learning logs. With the help of VASCORLL, learners in the real world can grasp and understand deeply the relationships between their own knowledge and contexts, and other learners' knowledge and contexts, and apply the knowledge to other learning environments with proper learning logs recommended in accordance with the learners' level, skill and contexts.

5.6.1 *System Design and Scenario*

Figure 5.17 shows the workflow used to provide feedback to students after visualising and analysing learning logs using VASCORLL in a cyber-physical setting. The workflow shows the following four steps:

- Step 1. As shown in Fig. 5.17, if you learned about *natto* (a traditional Japanese food made from fermented soybeans) at the supermarket, you record it to SCROLL with your mobile device.
- Step 2. If you want to know whether this new knowledge can be applied to other learning contexts or not, you use VASCORLL, and you find knowledge that can be applied in different contexts.

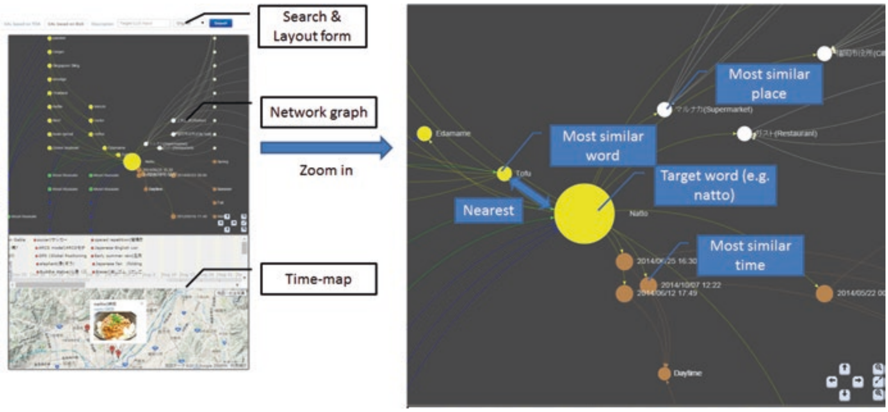

Fig. 5.18 Visualisation and analysis interface based on collocational network with TimeMap

- Step 3. Based on the results of step 2, the system shows important relationships, such as 'learner-to-context' and 'learner-to-context-based knowledge'.
- Step 4. There are two ways the results of visualisation and analysis can be shown: *learning* via *context-based knowledge* and *learning* via *context*.

Learning via Context-Based Knowledge If you learn about *natto* at the supermarket, the system will provide you with contexts such as 'restaurant' and 'convenience store' related to *natto*. After that, you will visit the place using the learning log navigator function (Mouri et al. 2013) and learn more information directly from these locations. In addition, if you want to learn indirectly about the experience, you can save other experiences using a re-log function on SCROLL.

Learning via Context When you are at the supermarket in the daytime, the system will provide you with knowledge about 'tofu' (a food made by curdling soymilk) and 'edamame' (a preparation of immature soybeans in the pod, found in the cuisines of China, Japan, Korea and Hawaii) related to 'supermarket' and 'daytime'. After that, you can learn the knowledge related to the supermarket in the daytime using SCROLL.

5.6.2 Visualisation and Analysis Interface

The interface combining network graphs based on these collocational networks with TimeMap for visualising and analysing the complex relationships between learners and ULLs is shown in Fig. 5.18 (left). It contains the following components:

Search and Layout Form Learners will input target word they want to search.

Network Graph The network graph shows the layout calculated by the system, and the layout in Fig. 5.18 (left) shows a sample layout. Figure 5.18 (right) shows the enlarged network graph. Using this figure, learners can grasp that the closest word to the target word (*natto*) is *tofu* (another traditional Japanese food made from soybeans). Similarly, they can grasp that the supermarket is the place where they learn *natto* most frequently and night is the time zone when they learn it most frequently.

TimeMap Learners might forget when and where they have learned before. Therefore, the system will remind them of their learning logs recorded during the specified period of time by showing them on the timeline (default, 2 months before and after the setting time). Also, the network graph and TimeMap functions are linked to each other. For example, if a learner clicks a certain node on the network graph, the TimeMap will show the location and time corresponding to it. Therefore, the learner can obtain its location and time information.

5.6.3 Recommendation Interface

To find other ULLs by location information, it is necessary to obtain the current location of the learner. Using the web interface shown in Fig. 5.19, learners can check in the location information. The green marker on the map shows a learner's current position and the red markers indicate the learning places of users in the vicinity.

Figure 5.20 shows the recommendation interface. It consists of the following components:

Association Rules If you are at the restaurant during the daytime, the system will recommend 'ramen' related to your location based on association analysis. The system makes a recommendation by detecting that a number of users learned and uploaded 'ramen' in the past when they were at a restaurant during the daytime.

Evaluation of Recommendation Uploaders will be asked questions: 'Is this recommendation an appropriate context for you?', 'Is this recommendation an appropriate level for you?' and 'Do you feel that this log is interesting to learn?' to evaluate whether association rules recommended by the system are appropriate.

5.6.4 Evaluation

The objective of the evaluation was to examine whether VASCORLL could increase students' learning opportunities and whether learners can apply their own experiences to different contexts (Mouri et al. 2016). Twelve international students participated in the evaluation experiments using their own mobile devices. They were

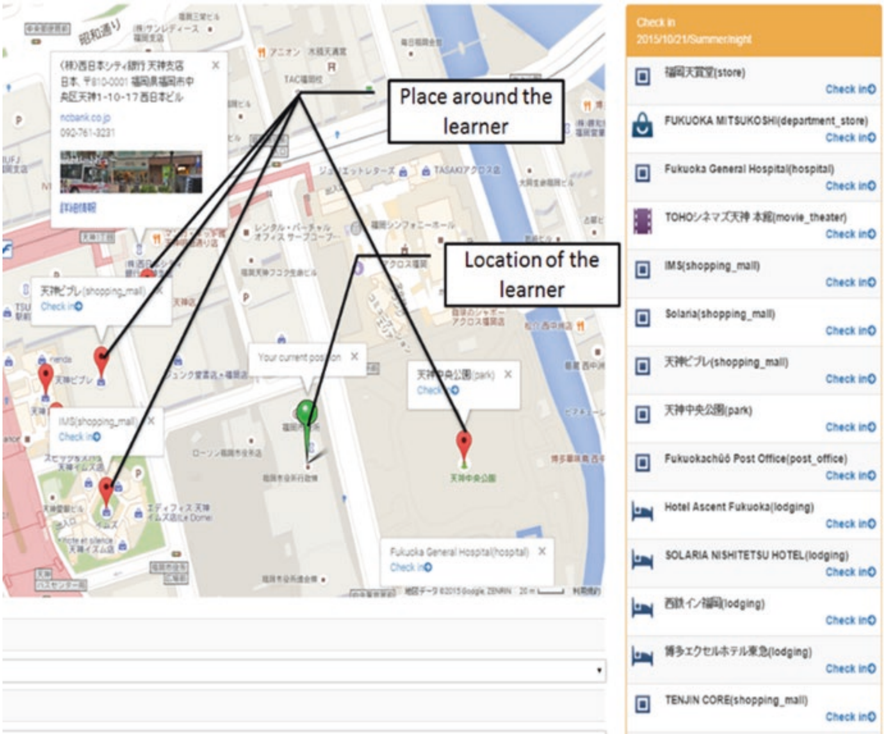

Fig. 5.19 Interface which records learners' current location

from China and Mongolia aged between 23 and 31. They were divided into two groups: Group A (experimental group, SCROLL + VASCORLL) and Group B (control group, SCROLL only). During the evaluation experiment, Group A learners evaluated the system each time they received recommendations by answering three five-point-scale questions as shown in Table 5.4. After the evaluation, the participants were asked to complete a questionnaire to evaluate the system's performance and its usability. The questionnaire was conducted with a five-point-scale style (5, yes; 4, lean yes; 3, so so; 2, lean no; 1, no).

Table 5.5 shows the number of ULLs that participants learned during the experiment. In total, students of Group A uploaded 176 ULLs and students of Group B saved 88 ULLs. The p-value was 0.004, which indicates that there was a significant difference between the results of two groups. VASCORLL was effective for finding other contexts which can be applied to their own learning experiences. As a result, VASCORLL succeeded in increasing learners' learning opportunities.

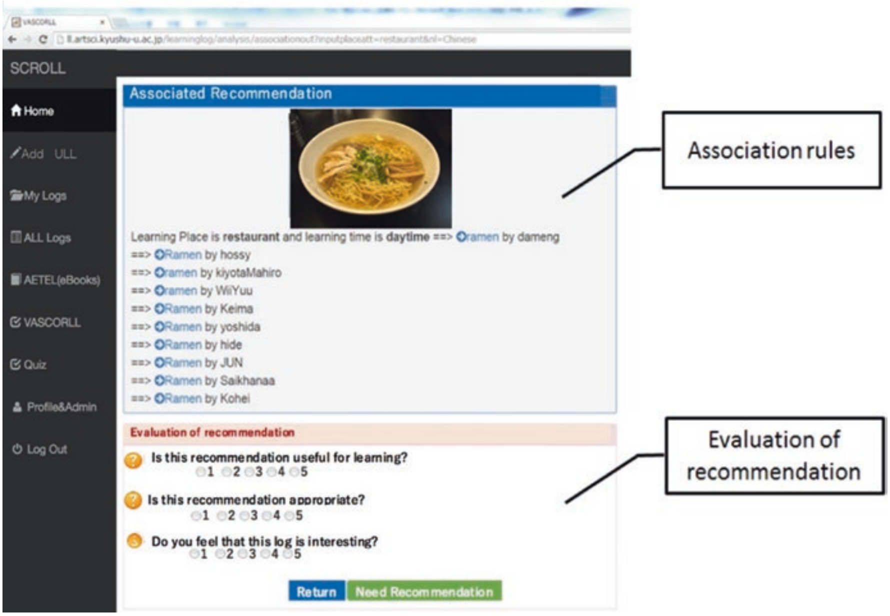

Fig. 5.20 Recommendation interface based on association analysis

Table 5.4 Five-point-scale questionnaire results

Question	Mean	SD
1. Was VASCORLL system useful for finding relationships among ULLS?	4.28	0.98
2. Were you able to find something to learn by using VASCORLL?	3.85	1.12
3. Did you think you were able to share other ULLs by using VASCORLL?	4.14	1.03

Table 5.5 The number of the uploaded ULLs

Group	Number of ULLs	Mean	SD	p
Group A with VASCORLL	176	29.3	5.15	0.0004*
Group B without VASCORLL	88	14.6	3.94	

*$p \leq 0.05$

5.7 Conclusions and Future Works

In this chapter, the cutting-edge online project called SCROLL featuring language learning has been discussed. Its application to new learning environments called seamless learning and flipped learning and the visualisation of SCROLL log data have been introduced.

Seamless Mobile-Assisted Language Learning Support System called SMALL was developed in order to entwine out-of-class vocabulary learning with in-class one. The experimental group showed a larger improvement between pre-and post-tests than the control group. The experimental group uploaded fewer words but learned more words than the control group.

Flipped classroom was explored using SCROLL with SNS. The result of the pilot evaluation showed that out-of-class learning time dramatically increased in our proposed scenario using SCROLL though one participant's keen involvement in out-of-class learning for the upcoming IELTS test need to be considered.

A visualisation and recommendation system called VASCORLL was implemented to SCROLL. The evaluation result showed that the system successfully increased learners' learning opportunities.

In each case, it was found that SCROLL contributed to the enhancement of learning effectiveness and learning opportunities.

With more sophisticated sensors, mobile devices are expected to capture the learning habits of students more accurately. Our future works, utilising sensor technologies will include the development of a more customised learning recommendation system so that the system can give learners more recommendation at more appropriate timing and more appropriate places, which is expected to enhance students' learning opportunities.

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Chapter 6
Mobile Instant Messaging (MIM) for Intercultural Communication: A Qualitative Study of International Students in the Republic of Korea

Aaron W. Pooley

Abstract For international students visiting the Republic of Korea (henceforth Korea), new social and cultural settings offer linguistic opportunities and challenges. This chapter explores the linguistic opportunities and challenges of a cohort of international students at a Korean university using qualitative analysis of surveys, discussion groups and semi-structured interviews. It then investigates how mobile instant messaging (MIM) supported their intercultural communication during a short stay. First, the chapter examines how direct interactions reveal linguistic, sociolinguistic, nonlinguistic and paralinguistic misunderstandings. Next, it examines how MIM provides international students with an informal digital space for improvising with the Korean language. It explains how improvised language development via MIM eased social and cultural challenges between international and Korean speakers. Moreover, it describes these international students' solutions for intercultural communication by blending direct interaction and MIM. Finally, it reveals how a blending of direct interaction with MIM offers new informal language development opportunities. These opportunities inform the pedagogical-learning aims of the Mobile Learning Evaluation Framework according to students' perspectives, their needs and desires (Murphy A Farley H, Development of a framework for evaluating the impact and sustainability of mobile learning initiatives in higher

A.W. Pooley (✉)
Department of English language and literature, Soonchunhyang University, Asan, Republic of Korea
e-mail: awpooley@outlook.kr

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6.1 Background and Chapter Overview

A key to Korea's hypermodernity and success of its export manufacturing industries are the globalisation policies that strengthen its trade relationships in the Asia-Pacific region and beyond (Chan and Mok 2015; Park and Lo 2012). The English language plays a critical role in these policies, so the Korean government has allocated financial and human resources towards English language instruction nationwide (Nicholson 2015). Initially, policies targeted primary and secondary school students by inviting English speakers as guest language instructors who could supplement existing English language classroom teaching. Recently, however, English language policies are shifting to higher education environments through international student recruitment programmes, which attract English-speaking undergraduates from around the world by offering generous scholarships (Kang 2015).

While the scholarships offer international students low-cost study abroad experiences, most of these international students arrive knowing little about the Korean language or culture. Moreover, the temporary nature of their stay, typically one to two semesters, limits their Korean language development as they balance formal classroom hours with free-time activities. Limited linguistic and cultural understanding coupled with time constraints present several direct interaction challenges between international and Korean speakers. First, the international students' limited Korean vocabulary and grammatical knowledge are complicated further by learning the Korean alphabetical script: *Hangeul*. Second, although most Korean speakers have attended an average 10 or more years of English language courses during primary and secondary schooling, these courses have focused on vocabulary retention and grammar studies rather than conversation (Carr and Wang 2015). Third, a mutual inexperience with using each other's languages leads to misunderstandings between them, which are sociolinguistic (topic appropriateness and use of humour), nonlinguistic (body language and facial expressions) and paralinguistic (voice pitch and tone).

Within the Asia-Pacific region, mobile technology and language research reveal expanding uses for mobile devices, platforms and applications (apps) as resources for second and foreign language learners in formal, classroom contexts and increasingly in informal contexts (Chun et al. 2016; Wang and Cui 2016). In higher education, integrating mobile technologies in second or foreign language curriculum allows learners access to study materials in their target language such as lectures, readings, audio and video files and the ability to create and share interactive media online (Sinha 2016; Taj et al. 2016). Outside the classroom, learners use mobile technologies to interact with others on study materials and to practice communicative tasks in the target language (Chan et al. 2015; Chun 2015; Le Hénaff et al. 2015).

Additional research, however, is needed on how these potentialities for mobile technologies and language learning assist individuals visiting the Asia-Pacific region for the first time. Furthermore, additional research is needed among these visitors as short-term or temporary users of a foreign language and the extent mobile technologies play in their understanding and use of a host country's language. The following sections explore these research challenges in Korea and how a rapidly increasing visiting population are using mobile technologies in novel ways to bridge communication challenges.

6.2 Research Context and Design

This chapter's research context and design draws on two recent Korean government strategies in support of globalisation through English language instruction. The first government strategy involved English speaking guest language instructors in primary and secondary public schools (Bendle and Pooley 2014; Song 2012). The second government strategy and the main focus of this chapter represents a shift in English instruction from the primary and secondary to the tertiary level through international student programmes that expose local students to international students communicating in English (Williams 2015).

6.2.1 Initial Government Strategy: Non–Korean Guest Language Instructors in Public Schools

During the period 2009–2012, the government recruited more than 9000 guest language instructors, one to nearly every public school nationwide (Bendle and Pooley 2014; Chung and Choi 2016). This guest language instructor recruitment allowed year 3–12 students to interact informally with a guest language instructor each week as a supplement to existing grammar-centred curriculum. Previously, most guest language instructors working in Korea did so through private academies, which charged high monthly rates for conversation and phonology-centred classes. For the first time, students from financially constrained families could interact with guest language instructors as a linguistic and cultural resource during the school day.

Guest language instructors, however, struggled with their lifestyle in Korea. With limited Korean language ability, guest language instructors found difficulties in simple tasks such as using public transportation, going to the bank or obtaining a mobile phone. Bendle and Pooley (2014) showed guest language instructors communicated in three distinct speech communities during their Korean sojourn. The first speech community involved guest language instructors where the English language was the means of communication. The second speech community involved Koreans and guest language instructors where the Korean language was the means of communication. These Korean-only language exchanges occurred at work. The guest language instructors struggled because their Korean language instruction was limited to a short course during their programme orientation. Compounding this, their co-workers had limited knowledge of English. Typically, intercultural communication relied on brief utterances and body language. It was the third speech community that proved useful for facilitating intercultural communication and short-term Korean language development. In this third speech community, guest language instructors participated in free-time activities with Korean speakers, either going out shopping, eating and drinking, or volunteering in the community and joining sports leagues. This 'leisure-centred' time offered intercultural communication opportunities for guest language instructors and Koreans as they engaged in activities of mutual interest. Moreover, guest language instructors could observe linguistic, sociolinguistic, nonlinguistic and paralinguistic communication and experiment using the Korean language in these casual circumstances.

Bendle and Pooley's (2014) study of guest language instructors occurred between 2010 and 2012, just on the cusp of ubiquitous mobile device use in Korea (Park and Lo 2012; Song 2012). Guest language instructors reported using touch-screen mp3 players, podcasts and electronic dictionaries to overcome language barriers, especially in the Korean-language only circumstances at home and work. Guest language instructors also reported using early varieties of communication-based applications such as mobile instant messaging (MIM), an instant messaging platform designed specifically for mobile devices, allowing users to send text and visual media such as emoticons, photos and videos. MIM differs from short message service (SMS) as it is free to use, untethered to a network data plan and integrates other features from the mobile device including language translation and free voice and video calling. They also used mobile versions of social networking services (SNS) such as Facebook and Twitter to plan free-time activities with Koreans. By the end of 2012, however, the government began large-scale cuts to guest language instructor programmes, nearly halving those working in public schools (Lee 2014).

6.2.2 *Changes in Government Strategy: International Students in Korean Higher Education*

From 2010, the Korean government began shifting its English language strategies to international student recruitment. Scholarships, offering low-cost degree programmes and study abroad experiences, boosted international student populations in Korea from 15,000 to 80,000 in just 5 years. Currently the Korean government plans on expanding the international student population to 200,000 by 2025 (Wei et al. 2015). The standard scholarships targeting English speaking students cover tuition and room and board, while others also provide a stipend for day-to-day expenses (NIIED 2015). A condition of accepting one of these generous scholarships is the requirement a recipient spend 8 h of scholarship-mandated 'English

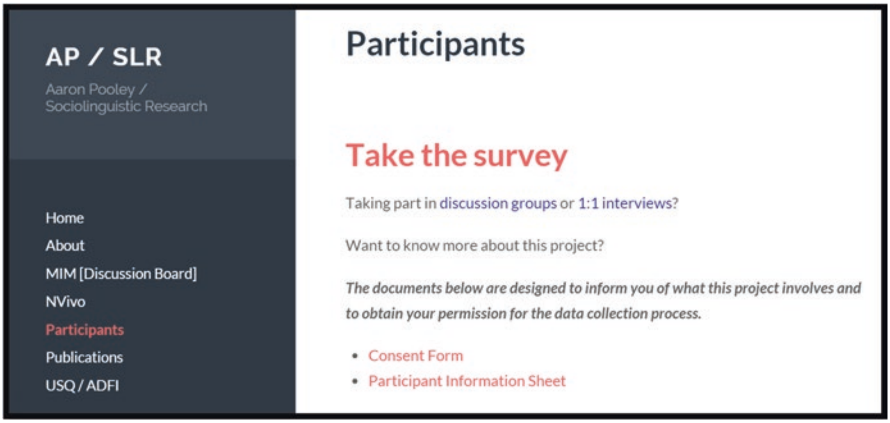


Fig. 6.1 The participants' subpage on the research website (http://www.apslr.com/)

language support hours' weekly with Korean speakers. These contact hours provide participating Korean speakers with English conversational opportunities and assistance with their English language projects from their semester courses.

The shift in government strategies from guest language instructors to international students directed the formation of a new project. This new project, discussed in the following sections, sought to understand the experiences of international students and how they adapted to their new surroundings. It investigated how international students communicated in the Korean language and if language skills and cultural competencies developed during their short stay. Furthermore, with the pace of change in mobile technologies, it examined if international students used mobile devices, platforms, apps and Internet services to ease their linguistic and social interactions. The research question that was asked was: *How do international students communicate with their Korean hosts during their study abroad and what are the properties of this communication?*

The research design for the international student project involved a form of grounded theory methods and thematic coding (Glaser 1978, 2005; Glaser and Strauss 1967; Thomas 2011). It also integrated computer and mobile-assisted organisational tools throughout data production and analysis such as NVivo, Microsoft OneNote and OneDrive, Google Tools for Business and a research website. The research website, captured in Fig. 6.1, provided an interactive space that linked participants to the online survey, project background and ethics documentation.

A grounded theory approach was chosen to encourage open-ended participant responses and allow these responses to guide data collection. First, the researcher selected a purposive sample of short-stay international students (one to two semesters) to understand better how international students developed Korean language skills when constrained by time and limited exposure to the Korean language. This purposive sample differs from long-stay international students staying more than two semesters who have access to formal language training and seek academic

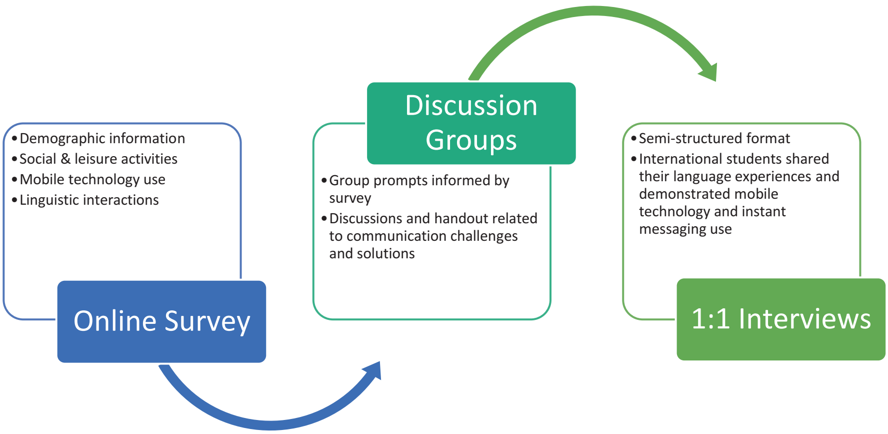


Fig. 6.2 Three-stage data collection exploring language and mobile technologies with preceding stages informing the next

accreditation from a Korean university. The total sample size consisted of 46 individuals, with 75 % in their first semester of study and 25 % in their second semester. Though the total number of international students (long and short term) studying at the hosting university is much higher, this purposive sample encompasses more than 90 % of the total English-speaking international students studying on campus at the time of data collection.

As shown in Fig. 6.2, subsequent data collection involved three stages: online surveys, discussion groups and semi-structured interviews. Each stage was designed to inform the next, allowing new findings from participant responses to contribute to discussion categories and interview questions.

International students needed to have enough time to experience their surroundings, struggle with direct interactions and adapt to Korea-specific mobile technologies. Thus, surveys, discussion groups and semi-structured interviews were conducted in weeks 9, 12 and 14, respectively, in a 16-week semester.

Though survey use is uncommon in qualitative research and grounded theory, writing later interview questions required an understanding of international student's language and mobile device use, which was not contained in the university's census data. The researcher contacted potential participants first by email with a link to the research website. The research website provided more information about the study and access to the online survey.

The online survey included questions that requested demographic information, inquired about the social activities of participants, use of mobile technologies and asked for examples of common linguistic interactions with Korean speakers. Results revealed three common communication scenarios: (1) forming relationships, (2) travelling and (3) socialising. Later, international students were divided into small groups to discuss challenges encountered in these scenarios and share solutions to them. Challenges discussed included *language barriers*, *explaining things face to* *face* and *being out in public*, *especially when alone*. Various solutions emerged such as *meeting halfway*, *rolling with communication breakdown* and *using technology*, though how participants defined these was as yet unclear. Thus, on an individual basis, semi-structured interviews explored participant's solutions in-depth. During these interviews participants demonstrated communicative challenges and solutions using their mobile devices, showing how mobile technologies had become part of their vernacular, an extension of their communication and a multitool for observing, supplementing and creating language. In other words, 'using technology' referred to integrating mobile devices, platforms, apps and online services into their communicative experiences to overcome linguistic and cultural complexities faced in their daily lives.

6.3 Findings and Discussion

Analysis of international students' experiences revealed how they acquired social and linguistic resources from blending direct interaction with virtual communication through MIM and how these resources supported intercultural communication and language development in the short term. First, direct interactions sensitise international students to linguistic and temporal limitations of intercultural communication and to language patterns useful for their interaction during a short stay. Next, virtual communication allows a creative space where international students can experiment and use languages learned, and observed, in direct contexts, and expand their linguistic and cultural inventories through interactions unrestricted by time, and physical places.

6.3.1 International Students and Direct Interaction

International student's cultural and linguistic diversity included English as a first language and second or third languages including Cantonese, Finnish, French, Japanese and Spanish. This linguistic diversity played a major role in relationship building, beginning at international students' programme orientation. Before the semester's start, the university held a 2-week orientation involving domestic travel to famous landmarks and cultural workshops. These familiarised international students with their surroundings before the Korean-speaking population of 12,000 arrived on campus. International students gravitated to others in their cohort who spoke their same second or third language and used shared multilingualism to understand their new environment. Once the semester commenced, international students also spent time with each other as they shared many of the same courses. Here too they used English and other languages to comprehend course content and to clarify newly acquired Korean vocabulary and expressions. While this direct interaction assisted international student's initial cultural adjustment and introduction to the Korean language, international students desired more contact with their Korean hosts. International students then used each other to make introductions to casual acquaintances, which occurred in pairs or small groups and pooled their limited linguistic resources to communicate in Korean. International students met success to some extent; however, challenges to this were frequent and unavoidable.

6.3.2 Experiencing Challenges to Direct Interaction with Koreans

Of all challenges conveyed, international students identified language barriers as the most significant hindrance to direct interaction with Koreans. As one participant stated,

> The language barrier limits face-to-face contact and relationship building more than any apprehensions we may have about cultural differences, which we are ready to overcome (male, 22).

Participants defined 'language barrier' as both linguistic (difficulties learning the language itself) and sociolinguistic (knowing how, when and where to use Korean appropriately). Each week, international students attended 2–4 h of formal Korean language classes comprised of mostly grammar instruction rather than conversation. These classes focused on basic sentence order, verb conjugation and vocabulary retention. For many, formal language instruction overwhelmed participants as course textbooks and lectures contained Korean language only and used the Korean alphabet script: *Hangeul*. Outside class, deciphering Hangeul in stores, restaurants and on public signs complicated simple matters such as where to go for lunch or what to eat. Visible English also needed deciphering as *Romanisation* rather than a translation appeared on street signs such as the Korean words 로 *(translation: street)* and 동 *(translation: district)* Romanised as *-ro and -dong*. Other visible English included a combination of Koreanised-English words and expressions on signs, menus and in stores, such as night (night club), service (free item) and D/C (discount).

Language barriers also involved nonlinguistic and paralinguistic elements as one student noted,

> It goes beyond learning what words to put together, it is also the intangible things that go along with the words you choose (female, 21).

International students often misinterpreted questions and compliments as aggressive, while Koreans misread facial expressions of anger where there was none. Gestures and other body language proved equally troublesome, described as a 'clash of mannerisms' on both sides. International students felt these barriers most when outside the university district, especially when shopping. Here, international students relied on nonlinguistic cues as they lacked 'situational' vocabulary.

Another significant challenge to direct interaction involved differences in obligated time. Obligated time involved course hours and required meetings within academic departments, student government and campus groups. International students experienced only a fraction of obligated time compared to Korean speakers, finishing responsibilities at three or four each afternoon, while Korean speakers finished after nine or later. Aligning schedules with any one person proved difficult and restricted possible free-time activities.

6.3.3 Finding Solutions to Direct Interactions with Koreans

International students improved upon their initial language barriers by immersing themselves in public spaces that forced them to practice the few expressions they knew and listen to spoken discourse between Korean speakers. Weekend travel proved most useful for immersion experiences. In small groups, international students travelled to main cities, attended music performances, booked lodging and tried new food and drink. Far from the university district, they had no linguistic safety net to explain where to go or what to eat. Students frequently became lost. They then worked together with their Korean interlocutors to piece together comprehensible language and solve encountered problems.

Living spaces offered another solution to language barriers and time constraints. One student commented,

> For conversational Korean, speaking with my roommates has been a lot more helpful than formal class time, simply because I'm practising the language more this way with those who can provide some corrective feedback in English (female, 21).

All international students lived in suites of six international students and six Korean speakers. Each suite then contained six bedrooms with one international student and one Korean speaker assigned per room. The remaining space, consisting of a study, living room and kitchenette, allowed the students to interact freely with one another. Direct interaction between Korean and International student roommates typically occurred on weekday evenings after completing coursework. Often too late to leave campus (a strict midnight curfew in effect 7 days a week), they ordered delivery meals or desserts to their suites and talked about their day, difficult classes, irritating lecturers, and never-ending assignments.

Another solution involved observation. While English dominated direct interaction during scholarship-mandated English language support hours, Koreans sometimes invited international students to join them for food and drink afterwards. Spending free time with these Korean speakers helped broaden international students' linguistic repertoire as well as sensitised them to relevant sociolinguistic, nonlinguistic and paralinguistic information. One student noted,

> Observing Koreans interacting with Koreans – even something basic like ordering coffee, you observe 'how' you would use the Korean language and begin to pick up on basic patterns in the language and then insert your own words (female, 20).

With exchanges, outings usually involved large groups of mostly Korean speakers. Here the Korean language dominated the conversation. Though international students understood little of what was said, they could note variation in tone of voice and accompanying body language. Also, international students found that listening to conversations, despite language barriers, helped correct errors in pronunciation. Activities involved teaching Korean drinking etiquette using hand and body gestures and games common on a night out. Singing rooms also provided a space for observation as international students could hear words and watch the matching Hangeul script on the screen.

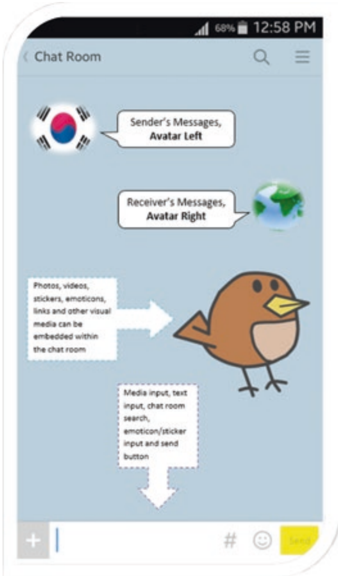
6.3.4 International Students and Virtual Communication

For international students, MIM enabled communication through mobile devices brought with them from their home country, and they established internet connections via Wi-Fi on campus or elsewhere in the university district. Free Wi-Fi acted as their mobile network as their visa status and limited time in-country restricted them from data contracts with Korean telecom companies.

MIM chat rooms mediated international student's social excursions as they negotiated the where and when to meet for meals, drinks and shopping. It was also their fastest method for contact as most checked email infrequently. The hosting university advised international students to use one MIM platform exclusively, KakaoTalk, to familiarise them with Korea's most popular mobile instant messenger. KakaoTalk serves 35 million (out of 50 million) Koreans and is installed on more than 90 % of all mobile devices in Korea (Ha et al. 2015). KakaoTalk as an MIM platform contains all the features of traditional SMS, including additional ways to incorporate textual and visual media, and does not require network data use. These features prove essential to international students who do not have the linguistic or financial resources to set up a phone contract or purchase pay-as-you-go data. MIM is designed specifically for mobile devices and allows sharing of text and visual media such as message texts, emoticons, stickers, symbols, written vocalisations, photos, videos and link previews. The common text and visual MIM elements used by an international student's MIM communications are outlined as follows:

- *Message texts* are type-written exchanges between those sharing an MIM chat room.
- *Emoticons* are small graphics which represent basic emotions that substitute facial expressions used in direct interactions either written (: or illustrated ☺.
- *Stickers* are small graphics which signify basic emotions and/or complete thoughts and are larger than emoticons, taking up a larger percentage of screen space.

Fig. 6.3 The basic layout and functionality of a KakaoTalk mobile instant message chat room



- *Symbol* keyboard characters such as (~ / < / > / *) add to standard punctuation to emphasise meaning or to clarify context in message texts. For example, adding (~) to (!) softens an exclamation point. Symbols can transform a response such as *I understand!* (i.e. you do not need to tell me twice) to *I understand~!* (i.e. no worries).
- *Written vocalisation* substitutes for vocalised sounds usually expressed in spoken, direct interactions. Often written these vocalisations express laughter, agreement or surprise.
- *Photographs* taken or shared via a mobile device may contain an image alone or an image with overlaying text or captions.
- *Video* taken or shared via a mobile device and can substitute for lengthy message texts, explain social and cultural situations or share multimedia such as music or film clips.
- *Link previews* are website links inserted into the MIM chat room that generate a title and static image to accompany the link.

Key features of MIM chat rooms are continuous, scrollable and searchable functionalities. MIM chat rooms are continuous as all previous text and visual media are saved within the chat room, with the most recent communication shown first. Users can review and recall specific text and visual MIM media by scrolling backwards through the chat room or by selecting the search button and typing in a search term. Users can create a personalised chat room to save information located in other chat rooms or in other apps and Internet media from a mobile device. Moreover, users can make free voice and video calls through the MIM chat room by tapping on a friend's avatar. Figure 6.3 shows a sample chat room where these 'avatars' display an image a user has chosen to represent themselves. In this example, the Korean flag

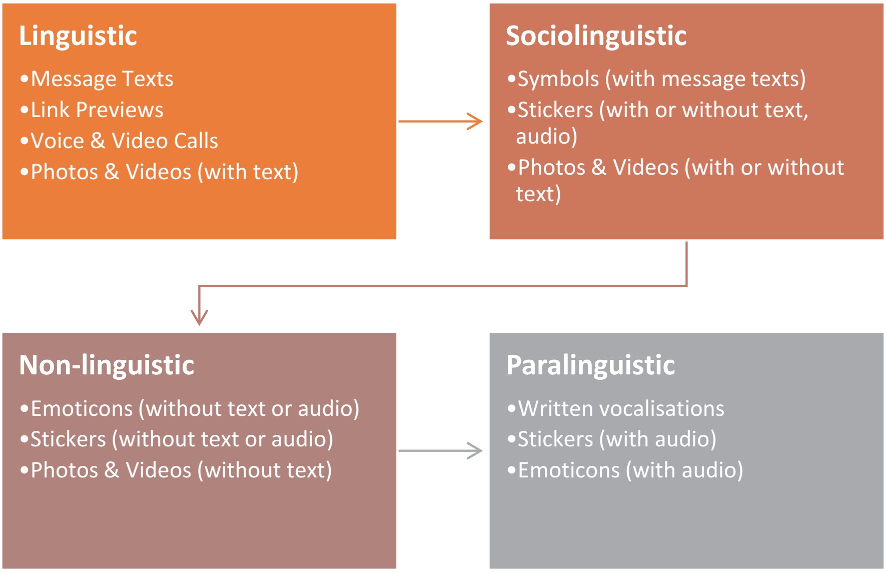


Fig. 6.4 A linguistic, sociolinguistic, nonlinguistic and paralinguistic classification of international student's most used MIM communication

avatar represents a Korean speaker, and the world globe avatar represents an international student. The bird image is an example of a sticker.

As outlined in Fig. 6.4, MIM enabled four aspects of international students' communication while in Korea: linguistic, sociolinguistic, nonlinguistic and paralinguistic:

- *Linguistic* elements involved written discourse through message texts and link previews, voice and video calls placed within the MIM chat room and photos and video containing text.
- *Sociolinguistic* elements involved visual elements such as symbols (~ / < / > / *), static and animated stickers, photographs with text and videos containing spoken dialogue. These elements helped provide cultural or situational context to MIM communication when unable to express themselves through linguistic means.
- *Nonlinguistic* elements included emoticons and stickers without text or audio, photos and videos without spoken or written dialogue. These substituted for expressing body language and gestures associated with direct interactions.
- *Paralinguistic* elements included written vocalisations as well as stickers or emoticons containing audio that accompanied written communication.

With MIM, students no longer had to check multiple services (email, Facebook, Facebook Groups and Messenger) and could send and receive messages instantly. Also, an acuity for KakaoTalk's familiar MIM interface and features (comparable to Facebook Messenger, LINE or WhatsApp used in most international students' home countries) helped familiarise international students with the interface and vernacular needed to communicate in MIM chat rooms with Koreans.

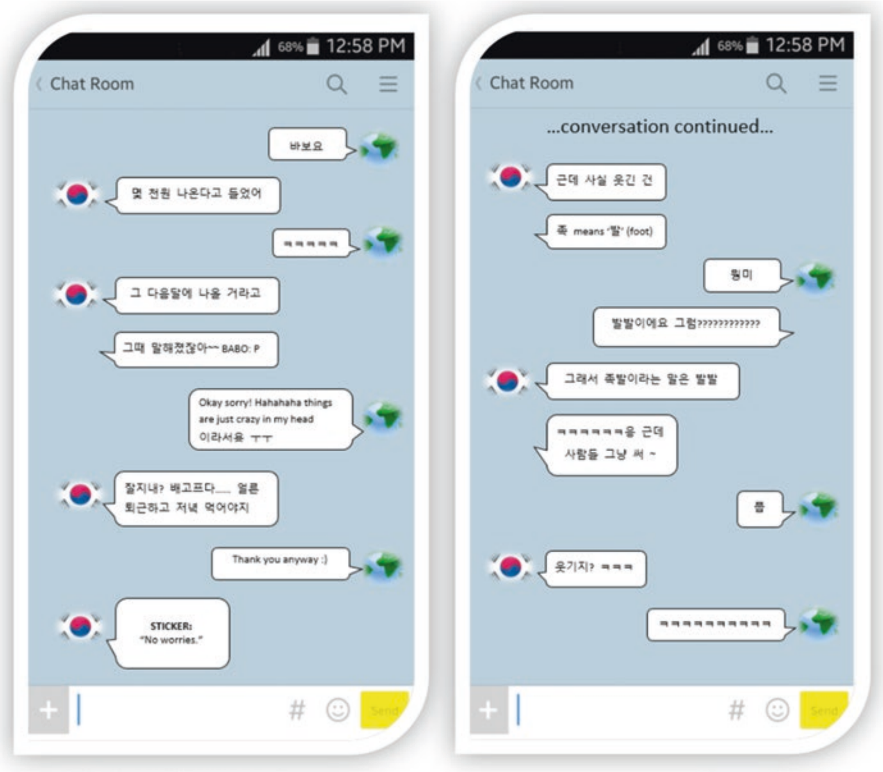


Fig. 6.5 A virtual conversation through MIM between an international student and Korean. Though simplified for the benefit of the international student, the Korean language is grammatically intact

6.3.5 Communicating in MIM Chat Rooms

For Koreans, MIM chat rooms mitigated challenges experienced in direct-only interactions and made intercultural communication possible. Korean is featured as the primary language used, and exchanges consisted of message texts, emoticons, and stickers, symbols, written vocalisations, photos, videos and link previews. English appeared only as a supplement to Korean text, clarifying or confirming unclear meanings. Figure 6.5 show screen captures with examples of international student and Korean MIM conversation. These figures recreate the screen captures provided by international students during data collection and remove personally identifying and copyrighted materials.

In these screen captures, the Korean language dominates with messages mixing text and emoticons. As the international student and Korean speaker exchange brief messages, both intersperse written emoticons throughout. They discuss what to eat, and the conversation goes on to explain the meaning of the dish, sliced pork knuckles

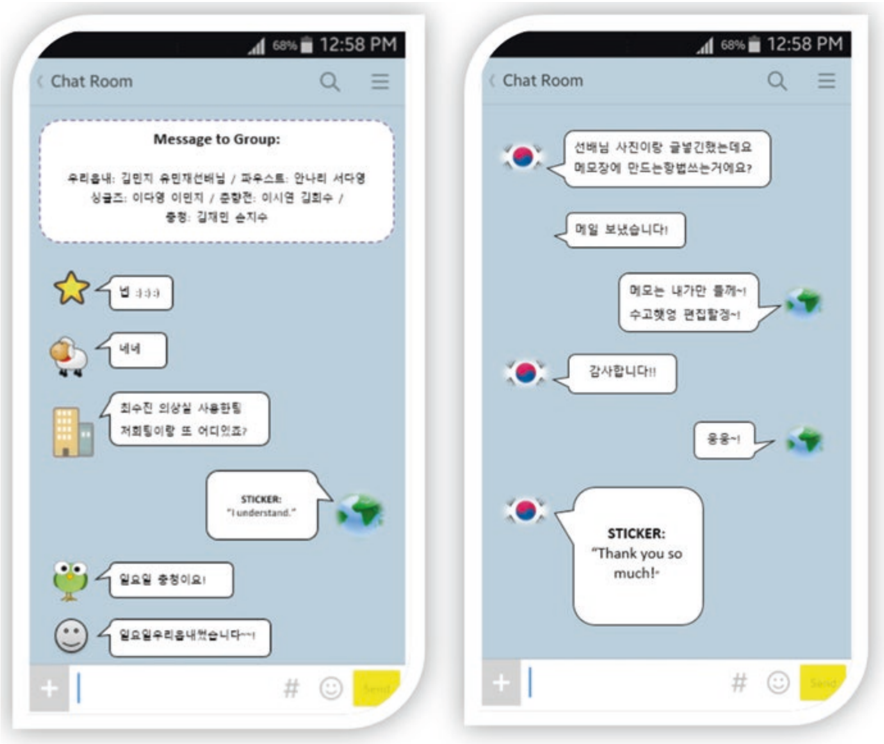


Fig. 6.6 An example of a group MIM chat room in KakaoTalk (**a**) and paralinguistic features in a Korean language only exchange (**b**)

(족 발). The international student understood the second syllable 'foot', written as '발' in Hangeul, and the Korean explained in both languages that the first syllable '족' has the same meaning. Here the international student learns a new word (족 as foot), how these syllables combine to create the dish's name (족 + 발) and the humour Korean's use to describe it, '(족) foot vs. (발) foot'. During these exchanges, the Korean modifies language to ease the international student's understanding, using complete grammar in each message while omitting extraneous words and unfamiliar expressions. Each message then contains short, simple but grammatically intact language.

Figure 6.6a shows an example of an MIM group chat room. This virtual space allows students to confer on a course project. The message at the top indicates project objectives visible overtop the continuous exchanges. International students then observe and interact with Koreans differing in age, academic major and level of familiarity inside and outside the classroom. They witness a variety of speech levels and corresponding grammars, and vocabulary, and both short and longer written messages. Moreover, they witness how Korean speakers link discourse together authentically using unmodified Korean language, with complete grammar, conversational expressions and vocabulary.

In Fig. 6.6b, a Korean speaker contacts an international student regarding a course-related project. This Korean speaker, however, cannot communicate in English. The Korean speaker makes some attempt including borrowed words such as memo (메모) and mail (메일), written in Hangeul. Otherwise, they use a complete Korean grammar throughout and elevated speech levels and honorifics. The international student responds using two simple expressions interspersed with the same borrowed English words. This provides enough linguistic information to complete the exchange. Also, the international student uses the symbol (~) before the exclamation mark (~!). This symbol 'softens' her response to ensure the Korean understands her words and tone (*I am happy to help you*). The Korean responds with a sticker indicating she understood and signalled the conversation's end. In this exchange borrowed words and sociolinguistic information embedded in symbols and stickers allow both participants to convey information and confirm understanding when struggling with language barriers.

These examples demonstrate some intercultural communication possibilities in virtual spaces. In these MIM chat rooms, international students exchanged and acquired resources to contextualise new linguistic information, observe authentic language use and manage gaps in communication. These communication possibilities experienced in MIM encouraged international students to communicate more often with Korean speakers of varying English language proficiencies. Though both sides struggled with direct-only interaction, MIM offered a new social space and with it ways to improvise and contextualise language. However, international students and Koreans did not limit this communication to a virtual-only space. Rather, they blended virtual communication with direct interaction and in so doing developed many language skills that facilitated intercultural communication.

6.3.6 Blending Virtual Communication with Direct Interaction

Illustrated in Fig. 6.7, blending virtual communication with direct interaction first involved contact through MIM followed by improvisational language use incorporating text, Internet content such as website links and visual media such as photos, emoticons and stickers. Unlike navigating appropriate speech levels and forms of address in direct-only interaction, improvised language took an informal tone with visual media filling in gaps that were linguistic (unknown vocabulary) and sociolinguistic (when and how to respond). Students could also delay their improvised responses to locate word definitions, or to translate phrases, improving the comprehensibility of the message. As MIM chat rooms are ongoing, students could refer to previous messages, look up word definitions or translate expressions in real time and study from older messages at their leisure.

This initial improvised language then generated direct interactions. Students made acquaintances and followed up with appointments through MIM and used the same text and visual tools used in improvised MIM language to clarify meeting points and share needed directions. Once in direct contact, students used their exist-

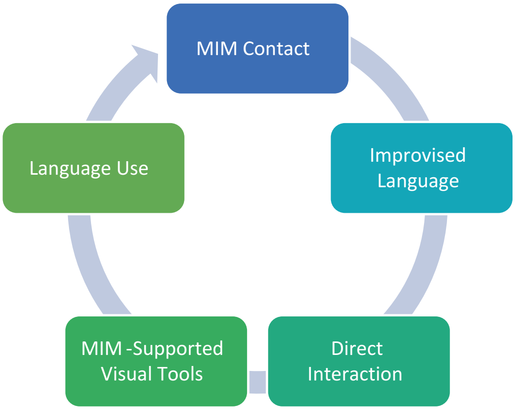


Fig. 6.7 Blending direct and virtual communication begins with MIM contact and through improvisation using linguistic, sociolinguistic, nonlinguistic and paralinguistic communication, international students and Koreans interact directly

ing language skills in person, with the mobile device as a reference tool, when communication breakdown emerged. This allowed international students the opportunity to practice language observed in other direct settings and in MIM exchange. Korean speakers helped correct pronunciation errors and suggested alternative vocabulary and expressions. Moreover, international students improved their understanding and use of the Korean alphabet as they asked Korean speakers to type words overheard in public or in the media in the MIM chat room. International students also helped Korean speakers contextualise their English language learning at this time. As questions materialised, particularly on cultural practices, international students searched for photos, short videos and websites providing examples in real time via MIM.

6.3.7 Developing Language

From the blended direct interaction with virtual communication emerged successful intercultural communication that supported informal language development for international students. The experiences described by students indicated that this language development process consists of two key properties. First, language development from blended direct and virtual interaction is *intermittent* and is comprised of brief exchanges in the host language among a range of hosts. Here the international student receives messages containing a few words or expressions at a time reflecting their varying social and linguistic experiences. This promotes a non-linear language development, shown in Fig. 6.8, as international students receive a mixture of speaking, writing, listening and reading accompanied by cues from message texts, emoticons, stickers, symbols, written vocalisations, photos, videos and link previews. Also, this form of language development is *task oriented*, as international students sought solutions to linguistic challenges emerging from their academic and free-time priorities.

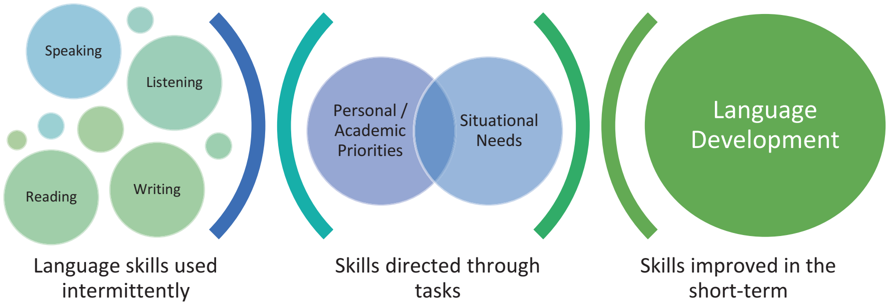


Fig. 6.8 Language development emerging from intermittent language skills used and improved through blended direct and virtual interactions supported by MIM

Task-oriented language development involved learning only what was necessary to accomplish important tasks. Examples included conducting banking transactions, using the post office, shopping for specific items and making reservations for free-time activities. Most often these tasks required international students to work alone as time or other commitments prevented Koreans from completing tasks with them. Through MIM international students requested vocabulary or expressions they needed to say during the task and responses they might expect in that scenario. If the Korean language for the task exceeded the international student's language abilities, Korean acquaintances provided messages or pictures that international students could show rather than speak from the MIM chat room during the task. When tasks reoccurred, international students reused MIM messages, taking advantage of MIM's continuous, scrollable and searchable functionalities to perform tasks independently.

6.4 Conclusion

This chapter informs the learning level of Murphy and Farley's (2012) Mobile Learning Framework by identifying learner approaches to bridge communication challenges between English and Korean speakers using mobile technologies. The form of qualitative, grounded theory methods used in project design, implementation and analysis explored English-speaking international students' perspectives on communication challenges and solutions and revealed their needs and desires for understanding Korean cultural and linguistic practices during a short, one to two semester stay in Korea.

This chapter shows how MIM enables intercultural communication among speakers of two dissimilar languages and discusses how direct interactions unsupported by mobile technologies can lead to linguistic, sociolinguistic, and nonlinguistic and paralinguistic misunderstandings. Time constraints also complicate these challenges as divergent schedules and free-time priorities limit potential direct interactions. This chapter shows how virtual-only interaction in MIM provides a communicative social space increasing language contact between international students and Koreans. As a social space, MIM facilitates language contact whether interlocutors are sitting side by side in a coffee shop or trekking across different ends of the country. In one-to-one and group MIM chat rooms, international students and Koreans utilise MIM's continuous, scrollable and searchable functionalities as they exchange message texts, emoticons, stickers, symbols, written vocalisations, photos, videos and link previews. In MIM chat rooms, the Korean language dominates; however, this is modified through simplified vocabulary and language mixing based on the respective linguistic competencies of the international student and Korean speaker.

This chapter supports the emergence of a novel blending of direct interaction with virtual communication through MIM, which could support language development in certain short-term settings. This blending involves initial contact through MIM, followed by experimentation and improvisation with language. It can lead to direct interactions that through the help of MIM-supported tools enable language use. MIM direct and virtual blending engages multiple language skills simultaneously and in different ways depending on social contexts. Tasks then help focus language skills in use, and international students learn their host country's language informally through authentic, learner-driven contexts with a diverse sample of Korean speakers. Limited exposure to the host country's language and a time-restricted sojourn constrains language learning opportunities. But in Korea, where mobile technology and MIM use prevails, international student populations can blend direct and virtual communication through MIM to attune to linguistic and temporal constraints. International student populations can also integrate MIM text and visual tools to communicate across cultures and develop language skills in a short stay.

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Part III
South-East Asia

Chapter 7
A Historical Review of Mobile Learning Research in Malaysia and Its Implications for Malaysia and the Asia-Pacific Region

Norazah Mohd Nordin, Mohamed Amin Embi, Helmi Norman, and Ebrahim Panah

Abstract Mobile technologies have rapidly grown over the past decade and have become ubiquitous in all sectors of education. This scenario has enabled mobile learning to grow – providing learners with more mobility to learn anywhere, anytime in a connected learning environment. Together with this growth, research in this field has expanded worldwide. This growth has also impacted Malaysia – with the upward trend of mobile learning research conducted by Malaysian researchers and educators. To illustrate the history of this research trend, the chapter reviews mobile learning research in Malaysia in four research waves: (1) the emergence of mobile learning research (year 2003–2006), (2) mobile learning early research (2007–2010), (3) growth of mobile learning research (2010–2013) and (4) mobile learning research extension (2014–2016). The chapter ends with implications and future directions for Malaysia and the Asia-Pacific for educators and researchers interested in the field of mobile learning in Malaysia and its potential application in the Asia-Pacific context.

N. Mohd Nordin (✉) • M.A. Embi • H. Norman • E. Panah
Faculty of Education, Universiti Kebangsaan Malaysia, Selangor, Malaysia
e-mail: drnmn@ukm.edu.my; m.amin@ukm.my; helmi.norman@ukm.edu.my; ebrahimpanah@siswa.ukm.edu.my

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7.1 Introduction

Advances in mobile technologies have led to the disruption of traditional teaching and learning practices, in which the technology offers ubiquity, connectedness, mobility and seamlessness in learning. The orthodoxies of traditional learning are challenged by mobile learning – offering new learning approaches, environments, forms of engagements and assessment with the support of mobile technologies (Land and Zimmerman 2015; Ally and Samaka 2016). A survey conducted by Internet Society (2016) with 1620 participants across the Asia-Pacific discovered that usage of mobile broadband networks in most countries has exceeded the usage of fixed broadband, with more than one-third of Asia-Pacific's population accessing mobile networks via their mobile devices. This illustrates the potential growth of mobile learning in this region. In the context of Malaysia, mobile learning research is still in its growth stage. Yet, despite the growth, there is a lack of studies that have been conducted on illustrating the growth of mobile learning in Malaysia. As such, the chapter describes the Malaysian mobile learning research scenario from a historical perspective and discusses the implications for Malaysia and the Asia-Pacific region.

The search for articles in the review was conducted using the Google Scholar online database. The main criteria used for selection of articles were articles that consisted of the following descriptors: (i) mobile learning, (ii) m-learning and (iii) Malaysia. Articles that were targeted were related to conceptual and applied studies in the field of mobile learning in Malaysia. Articles that were not related to mobile learning in Malaysia (e.g. adoption of mobile technologies for organisational teams) were not included in the review but were used as references where suitable. The earliest article that was related to mobile learning in Malaysia was by Traxler (2005), where the article touches on one of the earliest mobile learning conferences dedicated to mobile learning research in Malaysia.

7.2 Mobile Learning Research Waves in Malaysia

Over the past decade, in Malaysia, research in the field of mobile learning has seen significant progression. The growth is discussed in the period of 4-year intervals, which is termed as "research waves" in this chapter. The first research wave is from 2003 to 2006, when mobile learning research started to emerge, while the second wave is from 2007 to 2010 during which mobile learning started to receive more and more attention. The third and fourth waves are from 2011–2013 to 2014–2016, where evidence of a rapid growth of research in mobile learning have been and are currently being witnessed. Table 7.1 summarises research of mobile learning in Malaysia according to the four research waves.

Table 7.1 Mobile learning research in Malaysia according to the four research waves

Research waves	Authors	Domains of research
First wave (2003–2006)	Siraj (2003)	Mobile learning initiatives
	Ali (2004)	e-Learning via mobile devices
	Safie (2004)	SMS on mobile phones for learning
	Seong (2006)	Usability guidelines for mobile learning portals
Second wave (2007–2010)	Hashim et al. (2007)	Games in mobile learning
	Suki and Suki (2007)	Mobile content subscription
	Oliver and Goerke (2008)	Comparison between Malaysia, Australia and Ethiopia learners – usage of SMS vs. voice-over-IP for mobile learning
	Abas et al. (2009a)	Mobile learner readiness
	Abas et al. (2009b)	SMS usage for mobile learning module
	Shiratuddin and Zaibon (2009)	Integration of contextual culture in development of mobile learning content
	Ismail et al. (2010)	Mobile learning adoption among distance education learners
	Poon and Koo (2010)	Mobile learning from economics perspective
	Nordin et al. (2010a)	In-service school administrators
	Nordin et al. (2010b)	Mobile learning framework for lifelong learning
	Hashim et al. (2010)	Design principles for mobile learning apps
	DeWitt and Siraj (2010)	Learner perception and use of a collaborative mobile learning module
	Mohamad and Woollard (2010)	Impact of mobile learning tools
	Diah et al. (2010)	Mobile game-based learning framework
Third wave (2011–2013)	Suki and Suki (2011)	User acceptance of mobile phones in learning
	Alzaza and Yaakub (2011)	Usage preference of mobile learning
	Zukafly et al. (2011)	Adoption of mobile learning in teaching and learning
	Ariffin (2011)	Mobile learning awareness
	Chong et al. (2011)	Mobile learning adoption
	Lim et al. (2011)	Mobile learning using SMS
	Siraj et al. (2011)	Mobile learning concepts and practices in Malaysia
	Hussin et al. (2012), Hamat et al. (2012), Mahat et al. (2012), Tan et al. (2012), and Mohammad et al. (2012)	Mobile learning readiness and adoption
	Parhizkar et al. (2012)	Mobile augmented reality
	Hanafi and Samsudin (2012)	Perception of android-based learning systems
	Tayebinik and Puteh (2012)	Mobile learning for TESL
	Embi and Nordin (2014)	Compilation of mobile learning research initiatives and findings

(continued)

Table 7.1 (continued)

Research waves	Authors	Domains of research
Fourth wave (2014–2016)	Pendit et al. (2014)	Cultural heritage using mobile augmented reality
	Ibrahim and Walid (2014)	Security issues
	Lee et al. (2014)	Mobile games
	Bipinchandra et al. (2014)	Argumentative writing
	Hashim et al. (2015)	Adult learners' intention for mobile learning adoption
	Jamali et al. (2015)	Mobile augmented reality
	Alias et al. (2015)	Mobile games in Malay language learning for foreign students
	Chachil et al. (2015)	Mobile learning application for "Iban" language
	Ismail (2015)	Mobile learning in technical and vocational education (TVET)
	Aliff et al. (2015)	Mobile learning in religious studies
	Norman et al. (2015)	Learning patterns of mobile social media using social network analysis
	Kingsley et al. (2016)	A smart mobile English learning tool
	Yeap et al. (2016)	Mobile learning adoption in higher education
	Gan and Balakrishnan (2016)	Mobile technology adoption in interactive lectures
	Norman et al. (2016)	Situation awareness model in mobile learning
	Sabri et al. (2016)	Mobile augmented reality for heritage content
	Yussof et al. (2016)	Down syndrome learners using mobile learning technologies

7.2.1 The First Wave (2003–2006): Emergence of Mobile Learning Research

The first wave of mobile learning research in Malaysia was between 2003 and 2006. In this wave, research in this field began to emerge. In the international context, the year 2002 was among the earliest years the field was beginning to gain interest, where notable events in the field can be traced back to dedicated conferences, seminars and workshops for mobile learning. This include conferences such as MLEARN 2002 held in Birmingham, United Kingdom (UK); MLEARN 2003 held in London, (UK); and MLEARN 2004 at Rome, Italy, as well as IEEE's International Workshop on Wireless and Mobile Technologies in Education (WMTE 2002) held in Sweden and WMTE 2003 at Taiwan (Traxler 2005, 2007). Along with the growing trend of mobile learning research globally, Malaysia also embarked on research in the field.

One of the earliest notable conferences related to mobile learning in Malaysia was the "ICML International Conference on Mobile Learning: New Frontiers and Challenges", which was held at the University of Malaya, Kuala Lumpur, Malaysia, from 5 to 7 March 2003 (Traxler 2005). In this conference, mobile learning initiatives regarding infrastructure, curriculum, governance and future directions were discussed (Siraj 2003).

With regard to research in 2004, Ali (2004) discussed how mobile learning could be integrated into local higher educational institutions by leveraging e-Learning through the use of mobile devices. In another study in the same year, Safie (2004) reported his findings on the utilisation of short messaging systems (SMS) on mobile phones as a learning tool. The study investigated how SMS were used to send quizzes to distance learners. It was discovered that 76% out of 50 learners perceived that SMS can be used for drills (i.e. quizzes) and it was easy to read quiz questions from their mobile phones. Two years later, Seong (2006) suggested several usability guidelines to develop mobile learning portals. The guidelines covered three main aspects, which are user analysis, interaction and interface design, as well as ten guidelines in designing efficacious, user-friendly and usable mobile interfaces. Other studies in 2006 include works of Singh and Bakar (2006), Ramayah and Suki (2006) and Karim et al. (2006). The former studied mobile learning in wireless classrooms, while the latter conducted investigations on the use of mobile PCs with MBA students. Meanwhile, Karim et al. (2006) carried out a study on mobile phone applications in library services.

7.2.2 *The Second Wave (2007–2010): Mobile Learning Early Research*

The second wave of mobile learning research occurred between 2007 and 2011. In this wave, mobile learning research was still in its early stages. Between 2007 and 2008, the studies were conducted in areas such as mobile games, mobile tool usage and mobile learning practices. Hashim et al. (2007) discovered 60% of 129 students preferred using games in mobile learning. Suki and Suki (2007) found that heavy mobile phone users frequently access, subscribe and purchase mobile content for learning as compared to light mobile phone users. With regard to comparisons of mobile learning practices in Malaysia with other countries, Oliver and Goerke (2008) conducted a study comparing Malaysia with Australia and Ethiopia. They found that in 2008, Malaysian students' usage of instant messaging and blogs was higher than that of Australian and Ethiopian students, while Australia students tend to use SMS and voice-over-IP for mobile learning.

Subsequently, between years 2008 and 2009, Malaysian mobile learning research was in areas such as learner readiness, design principles and frameworks as well as learning modules, tools and game-based learning. Learning readiness research was conducted by Abas et al. (2009a), Ismail et al. (2010), Poon and Koo (2010) and

Nordin et al. (2010a). The studies were mostly conducted in higher education settings (i.e. public and private universities) with the exception of Nordin and colleagues' (2010a) study, which focused on in-service school administrators. Hashim et al. (2010) proposed design principles for mobile learning apps based on system analysis and design aspects. Nordin et al. (2010b) proposed a mobile learning framework for lifelong learning. The framework consisted of four main aspects to be considered in mobile learning design: theories of learning, generic mobile environment, mobile learning context and learning experience and objectives.

Also in the second wave (2007–2010), learning modules for mobile learning were developed. Studies in this area include one by Abas et al. (2009b) on the usage of SMS in a private university and the study by DeWitt and Siraj (2010) which investigated learners' perception and use of a collaborative mobile learning module for secondary education. Mohamad and Woollard (2010) also performed a study to discover the impact of mobile learning tools in secondary education. Additionally, in this research wave, there was a trend on mobile game-based learning. Shiratuddin and Zaibon (2009) studied the integration of contextual culture in the development of mobile learning content. An example of the integration is the usage of local characters in a storyline of a game, such as Indian father, Chinese mother and Malay baby boy. They discovered that integration of contextual culture increased the engagement of learners during mobile game-based learning. In another related study, Diah et al. (2010) proposed a mobile game-based learning framework that consists of four major aspects: mobile learning approach, learning theories, learning and education medium and games development approach. This study differs from Nordin and colleagues' (2010a) study as they developed mobile learning from a game-based perspective, while Nordin et al. (2010b) developed a framework for a more generic mobile learning design. It is also worth noting that in this research wave, the first non-governmental organisation (NGO) related to mobile learning was established on 12 November 2008 at the International Workshop on Developing and Implementing Successful Distance Education, e-Learning and Mobile Learning. The NGO is called Mobile Learning Association of Malaysia and serves as a platform for expertise exchange and collaborations among local and global counterparts (Mobile Learning Association of Malaysia 2016).

7.2.3 Third Wave (2011–2014): Growth of Mobile Learning Research

The third wave of mobile learning research occurred between 2011 and 2014. This wave demonstrated a wave of growth of research in this field. In 2011, research focused on awareness of mobile learning teaching and learning practices as well as the adoption of technologies. With regard to teaching and learning via mobile learning, Suki and Suki (2011) used the technology acceptance model (TAM) to gain an understanding of learners' acceptance of mobile technologies. They found that Malaysian mobile phone users positively accepted mobile learning due to perceived mobility value and perceived usefulness of mobile learning. In a related study, Alzaza and Yaakub (2011) discovered that university students preferred using mobile learning for course registration and accessing exam results, while the cost of data usage and slow data exchange were highlighted as limitations of mobile learning. Learners' perceptions of mobile learning were contrasted with educators' perceptions. Zukafly et al. (2011) conducted a study in this area and found that educators were early adopters of mobile learning in teaching and learning implementation. Other related studies in 2011 include mobile learning awareness (Ariffin 2011), mobile learning adoption (Chong et al. 2011) and mobile learning using SMS in universities (Lim et al. 2011). In that year, one of the earliest books related to research of mobile learning in Malaysia was published entitled "mLearning: A new dimension of curriculum advancement". The book summarised early adoption of mobile learning concepts and practices in Malaysia (Siraj et al. 2011).

In 2012, a similar trend of assessing mobile learning readiness and adoption was observed. These studies include works of Hussin et al. (2012), Hamat et al. (2012), Mahat et al. (2012), Tan et al. (2012) and Mohammad et al. (2012). An emerging trend of studies related to mobile learning applications was also observed. Parhizkar et al. (2012) studied the design aspects of mobile augmented reality application development for primary school learners. Aspects such as learning theory, interaction and evaluation were considered in the design. Hanafi and Samsudin (2012) carried out a study on android-based learning systems and discovered that positive perceptions were gained in terms of interactivity, accessibility and convenience. However, they also reported that learners were frustrated by occasional interruptions due to Internet connectivity disruptions. In terms of studies related to mobile-assisted language learning (MALL), Tayebinik and Puteh (2012) conducted a study on using mobile learning for supporting teaching English as a second language (TESL). They discovered that mobile learning made English learning easier and more attractive.

Subsequently, a book entitled "Mobile learning: Malaysia initiatives and research findings" was published which compiled several studies of mobile learning in Malaysia (Embi and Nordin 2014). This included studies related to mobile learning readiness in Malaysian universities (learner perception and mobile technology), mobile learning in secondary education (English learning), mobile learning for distance education (physics course) and mobile learning for teacher training (English learning).

7.2.4 Fourth Wave (2014–2016): Mobile Learning Research Extension

In 2014, works related to mobile learning were extended in the areas of mobile games (Lee et al. 2014), MALL (Soleimani et al. 2014), augmentative writing (Bipinchandra et al. 2014), security issues (Ibrahim and Walid 2014) and cultural heritage using mobile augmented reality (Pendit et al. 2014). Meanwhile, the year

2015 witnessed existing mobile learning research trends such as readiness and adoption of mobile learning as well as mobile augmented reality and MALL (Hashim et al. 2015; Jamali et al. 2015). A new trend of localised-based mobile learning also emerged. This was evident in studies such as Alias et al. (2015) and Chachil et al. (2015), where the former investigated the potential of mobile games in Malay language learning for foreign students, while the latter studied a mobile learning application for "Iban" language (i.e. one of the native languages in Malaysia). Other areas of mobile learning research include mobile learning in technical and vocational education (Ismail 2015) and religious studies (Aliff et al. 2015). The learning patterns of students using mobile social media were also analysed via social network analysis (Norman et al. 2015). In the current year (January to February 2016), research in the adoption of mobile learning and MALL was still observed (Kingsley et al. 2016; Yeap et al. 2016). Emerging trends in this period include mobile learning research in areas such as special education, heritage using mobile augmented reality, interactive lectures using mobile technology and situation awareness in mobile learning (Gan and Balakrishnan 2016; Norman et al. 2016; Sabri et al. 2016). For example, with regard to special education, Yussof et al. (2016) investigated whether mobile learning technologies were suitable for learners with Down syndrome. They discovered that these types of learners are able to use mobile technology such as tablets and smartphones for learning.

7.3 Mobile Learning in Malaysia and the Asia-Pacific Contexts: Way Forward

7.3.1 Implications and Future Directions for Malaysia

The research waves resulted in several implications for Malaysia. First, in terms of integration of mobile learning technologies, it is reported that Malaysia has over 43 million mobile phone subscriptions in 2014 (Malaysian Communications and Multimedia Commission 2015). This presents a huge potential for integration of mobile learning in higher educational settings as well as other education and non-educational sectors. Moreover, current and new technologies, such as mobile virtual reality and the Internet of things (IoT), could be tapped into to indicate whether such technologies could help facilitate teaching and learning in higher education. Furthermore, development of massive open online courses (MOOCs) has increased exponentially due to the Malaysia policy (i.e. the Malaysia Blueprint 2015–2025 for Higher Education) on focusing on MOOCs. It would be worthwhile to look at these learning environments and investigate mobile learning integration in such environments.

Second, studies conducted in the research waves (Table 7.1) showed that there is a lack of research on issues relating to security and privacy of mobile learning practice and integration in teaching and learning. The issues are essential to be studied – as they impact how information is handled during teaching and learning and to which extent the educators and learners are aware of security threats in mobile learning (Chen and He 2013). In addition, there is also a lack of research in specific communities as well as research in specific localities. An example of an area of specific communities is marginalised communities – in which mobile learning in special education can be further investigated to see whether these technologies and environments can assist learners with disabilities. With regard to specific localities, higher education mobile learners residing in remote or rural areas could be studied to ensure that sustainable yet affordable solutions are offered to these types of learners.

Third, with the development of the National e-Learning Policy in Malaysia, this allows for the integration of mobile learning in the policy to ensure that teaching and learning via mobile learning is catered for. Another viable solution is the development of a new policy specifically focused on mobile learning, in which the policy could cover topics such as governance, infrastructure, pedagogical and learning integration, professional development and enculturation. This would be beneficial in providing a general guide for the implementation of successful mobile learning solutions.

Finally, the literature indicates that there is still a lack of mobile learning research carried out in cross-cultural settings. Malaysia is populated by a multi-racial/ethnic/cultural society. Backgrounds for different cultures of learning could have an impact on the design of mobile learning environments as some cultural-related learning practices could be different from other cultures. It would be worth investigating the cultural diversity in identifying the appropriate cultural dynamics to instigate meaningful mobile learning practices and environments for diverse cultures.

7.3.2 *Implications and Future Directions for Asia-Pacific*

Mobile learning research in Malaysia has several implications for the Asia-Pacific region overall. First, mobile learning research conducted in the Malaysian research waves indicated that there are still limited studies conducted in a regional context (i.e. Asia-Pacific) – in comparing and contrasting different mobile learning infrastructure, technologies, pedagogical practices and learning cultures across the Asia-Pacific. In a massive survey conducted with 1620 respondents across the Asia-Pacific region in September 2015, it was discovered that only 42% of the region is penetrated by mobile broadband – and beneath the penetration rate lies large gaps. The gaps are caused by socio-economic levels, wherein advanced-based economies such as South Korea, Australia, Taiwan and Hong Kong have rates exceeding 100% yet contrast with extremely penetration rates (below 10%) for countries such as Nepal, Timor-Leste and Papua New Guinea (Internet Society 2016). This has a huge impact on the application of mobile learning in the regional higher education sector, where most mobile solutions require online connections. Despite the low bandwidth penetration rates, alternative mobile learning solutions could be utilised like the use of native mobile apps in order to leverage the absence of online connections. In addition, with regard to pedagogical practices and learning cultures, research on comparison across the Asia-Pacific region could help with identifying the similarities and contrasts of different learning cultures and suggest approaches to foster cross-regional support for mobile learning.

Second, a comparison of historical research trends among Asia-Pacific countries could be beneficial in the identification of pedagogical and technological advancements in mobile learning. This comparison would highlight the “success stories” of mobile learning integration in economically advanced countries like Japan and also outline the “failures” of mobile learning application, hence providing several Asia-Pacific case studies that could be applicable in the appropriate learning contexts in respective countries. This could potentially become a basis for the development of a future mobile learning policy for the Asia-Pacific region.

Finally, the establishment of a new mobile learning organisation for Asia-Pacific (such as the Mobile Learning Association of Malaysia and the International Association of Mobile Learning) could be beneficial in promoting the Asia-Pacific as a hub for mobile learning. The organisation would be a point of reference for governance of mobile learning across the region and could potentially foster the exchange of expertise and knowledge among its members. Moreover, regional conferences, seminars and research grants could be initiated with the establishment of such an organisation.

7.4 Conclusion

The chapter has illustrated research trends of mobile learning via a historical overview of mobile learning initiatives and practices that have been carried out in Malaysia. The research conducted was discussed for four research waves between years 2003 and 2016. These waves have illustrated the growth in this field via emerging and existing research trends that started with the early adoption of mobile learning technologies such as SMS technology in 2004 and progressed towards the latest technologies such as mobile augmented reality in the years 2015 and 2016. Areas of mobile learning research have also seen changes – where early research focused on readiness and adoption of mobile learning (in 2004) which later extended to mobile games, mobile-assisted language learning and mobile learning for special education (in 2015 and 2016). The chapter then describes several implications with regard to mobile learning implementation in the Malaysian context as well as the Asia-Pacific context and outlines future directions for mobile learning advancements in terms of potential research domains, pedagogical practices, organisation approaches and policies. Building on promising research in this field, longitudinal and rigorous studies are called for to further enhance and cultivate mobile learning in Malaysia as well the Asia-Pacific region. It is hoped that this chapter could be useful for future educators and researchers interested in the field of mobile learning research in Malaysia and its impact on the Asia-Pacific region.

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Chapter 8
Investigating Mobile Learning in Higher Education in Lao PDR and Cambodia

Ann Starasts, Maiyer Xiong, and Tyneth Ly

Abstract Mobile learning technologies have the potential to change higher education teaching, participation and learning now and in the future. This chapter investigates contributing factors and how these are positioned and considered within higher education in Lao PDR and Cambodian universities. It investigates the cases of two university-based agriculture courses. In particular, it explores the issues under consideration by educators as they develop degree programmes that enhance flexibility and learning outcomes through the incorporation of mobile technologies. Literacies, access, barriers and participation associated with adopting mobile learning technologies in higher education in these two countries are explored from the perspectives of the student and the lecturer. The chapter considers the functional aspects of mobile learning relevant to participation and learning including dissemination and access to information and communications, enabling person-to-person connections in education and connecting and intersecting learning content with the situated contexts of the learner. Access issues and barriers to the use of the technology within programmes are considered. Key insights associated with mobile learning adoption within these universities are highlighted at each of pedagogical, technical and organisational levels.

A. Starasts (✉)
National Centre for Engineering in Agriculture, University of Southern Queensland, Toowoomba, Australia
e-mail: ann.starasts@usq.edu.au

M. Xiong
National University of Laos, Vientiane, Laos
e-mail: xmaiyer@yahoo.com

T. Ly
Cambodian Agricultural Research and Development Institute, Phnom Penh, Kingdom of Cambodia
e-mail: tynethly.sssc@gmail.com

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8.1 Introduction

Lao PDR and Cambodia are situated in Southeast Asia. Access to higher education has been expanding over the past 20–30 years, with university enrolments increasing in many cases from very low to 20% or more (World Bank 2012a). A World Bank report suggests that these countries must develop the right type of skills and research capacity in order to become more competitive. It suggests that technologies enabling easier access to education and to resources that facilitate education will play a key supporting role. Yet this may occur only as education opportunities and levels increase across communities of both countries and only as technologies become more affordable and accessible.

Mobile learning (i.e. the use of mobile devices for educational purposes) within higher education appears to be emerging in both countries. Increased ownership of mobile phones across many communities means that mobile learning has some potential for application in a range of educational contexts and within varying community sectors. Mobile learning particularly has the potential to extend educational opportunities to lower socio-economic groups to whom education has traditionally been limited. However, in order to successfully develop and apply mobile learning applications in a formal educational context, there are many factors that need to align (Al-Zahrani and Laxman 2014; Alrasheedi and Capretz 2013).

This chapter discusses these factors in relation to a tertiary-level agricultural course at the National University of Laos and one at the Royal University of Agriculture in Cambodia. These programmes are explored in order to describe current contexts and the factors that might contribute to the potential future development of mobile learning initiatives. Consideration includes the contexts of students and educators, technical capacity, and organisational perspectives, with regard to access, literacies, barriers and equitable participation. Key areas are identified that may facilitate future wider applicability of mobile devices in higher education contexts in these countries.

8.2 Mobile Learning and Higher Education in Asia

Mobile devices such as mobile phones and tablet devices have functionalities that may have the potential to contribute to facilitating learning including phone calls and messaging, web and email access, e-books, photography, music and video recording and playing, games, diaries, calendars and locational devices (Trinder 2005). Their portability and the ability for use anywhere and anytime warrant consideration of their potential for enhancing higher education learning opportunities.

The functionalities associated with mobile devices can serve as tools in learning for users in relation to their own educational goals (Brown 2003), including creating and sharing their own digital content (Grant and Hsu 2014). The technologies allow for a variety of use approaches (Kennedy et al. 2010), allowing users to take a more personalised and active learning approach (Traxler 2007).

Mobile learning can be defined as "learning across multiple contexts, through social and content interactions, using personal electronic devices" (Crompton 2013, p. 83). Mobile learning can allow learning activities to be more learner-centred (Crompton 2013) and related to students own personal needs and circumstances (Kukulska-Hulme et al. 2007; Traxler 2007). It enhances opportunities not only for increased and timely access to information but for increased engagement and communication between students, peers and with teachers (Butoi et al. 2013).

In this sense, mobile learning adds value to education by allowing learners to change or enhance their learning in relation to their own contexts and experiences (Land and Zimmerman 2015; Pimmer and Pachler 2014; Crompton 2013) and to potentially facilitate the application of learnings from one setting to another (Sharples et al. 2005). It appropriates a range of approaches to learning that includes independence, interactivity, collaboration and communication (Gikas and Grant 2013; Liaw et al. 2010). In higher education, mobile learning can be evaluated from the four perspectives of learning, teaching, technical and organisational (Farley et al. 2015); this informs the work presented in this chapter.

8.2.1 Mobile Technologies in Asian Higher Education

An online review of higher education among Asian student and graduates by the World Bank in 2011 identified limitations in learning and teaching through misalignment of programmes with the job and skill requirements of local industries (World Bank 2011). Participants suggested learning programmes should be more creatively focussed on this misalignment. They identified the high cost associated with obtaining higher education and the resultant inequities existing among the population in terms of access. Affordability of education, textbooks and Internet access were key issues. In addition, curricula, lack of laboratories and outdated equipment were seen as limiting the potential for student success in higher education (World Bank 2011).

Mobile learning in Asia is considered to have strong potential to enhance learning not just at tertiary level but in more self-directed, informal and lifelong circumstances (So 2012) and across a range of community sectors. Farley and Song (2015) suggest that these mobile learning initiatives should incorporate regional-specific issues that include economic, political and cultural aspects.

Current initiatives aimed at making learning more accessible and promoting self-directed learning are largely considered to be small scale and ad hoc (So 2012). These are seen as advancing basic education and knowledge acquisition (most important for developing countries), through use as a tool to deliver learning materials and resources to students. A United Nations Educational, Scientific and Cultural Organization (UNESCO) study in 2011 suggests that although mobile learning is considered to be operating at a high level in tertiary education, few projects explore the potential of mobile phones for "knowledge deepening or knowledge creation" (So 2012, p. 28). Five of eight Asian countries surveyed by UNESCO in 2011 showed a high use of mobile technologies in tertiary education compared with significantly lower use in primary or secondary education, likely due to greater affordability of mobile phones among tertiary students and possible commercial linkages (So 2012).

Farley and Song (2015) reviewed mobile learning in Southeast Asia and suggest importantly that the social aspects of relationships developed through mobile learning activities are a key facet contributing to learning and that these aspects should have explicit rules and roles associated with the learning process. These authors suggest vigorous research is necessary around large-scale mobile learning initiatives in order to access quantitative data about the learning process to inform future initiatives.

Technology access increasingly is parallel to the availability of educational opportunities. This is particularly evident where cost-effective education is limited, and a high percentage of people living in the developing world have no access to printed knowledge, ICT skills or technologies (Valk et al. 2010). Technology is considered to have the greatest potential to provide access to learning opportunities for disadvantaged rural community members. Improving literacy levels, especially in these areas, and improving educational opportunities for the high percentage of the population who live in rural areas without access to traditional post-school education opportunities (So 2012) are key applications. However, limited device ownership and Internet access are challenges in these areas.

8.3 Lao PDR and Cambodia

Lao PDR and Cambodia are countries with low-income economies and low rates of application of technologies. However, development is occurring in these countries at relatively fast rates (World Bank 2012b).

8.3.1 Overview: Lao PDR and Cambodia

Lao PDR has a population of 6.7 m of which over 60% are rural; over 25% of adults are illiterate and over 20% struggle with poverty. It has a high rate of early school enrolments and over 17% of the community enrol in tertiary studies (World Bank 2012a, Table 8.1). By comparison, almost 80% of Cambodia's population of 15.3 m is based in rural communities. It exhibits a similar population growth, a similar level of literacy, and similar early and tertiary education enrolments but a slightly lower rate of poverty (World Bank 2012a, Table 8.1).

Increased application of technologies is considered to have the potential to assist both countries in enhancing productivity (World Bank 2012b). Improving skills is

Table 8.1 Population and education statistics, Lao PDR and Cambodia

	Lao PDR	Cambodia
Population	6.7 m (2014)	15.33 m (2014)
Population growth	1.65% (2014)	1.64% (2014)
Rural population	62.4% (2014)	80% (2014)
Poverty	23.2% (2012)	17.7% (2012)
School enrolment primary	97.2% (2013)	98.4% (2014)
School enrolment secondary	44.7% (2013)	38.2% (2008)
Tertiary enrolment	17.7% (2013)	15.8% (2011)
Literacy adult	80% (2013)	74% (2009)
Internet users	14% (2014)	32% (2014)

Sources: World Bank 2012a, UNESCO Institute for Statistics (2014), Internet World Statistics (2015) and World Bank (2016)

Table 8.2 Mobile phone ownership – Lao PDR and Cambodia

	No. of mobile phone subscriptions per 100 inhabitants (year)			
	2000	2005	2010	2014
Lao PDR	0.2	11.4	64.6	67
Cambodia	1.0	8.0	57.7	133

Sources: Adapted from United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP 2011; World Bank 2016)

seen as a way to "enhance capacity to apply, adapt, and create new technology," and research, which "enhances capacity to develop new technology" are considered two key drivers for the economies of both countries, setting an important agenda for their higher education sectors (World Bank 2012b, p. 12).

8.3.2 *Device Ownership and Internet Use*

There has been significant growth in the use of the Internet in both countries over the past 10 years with approximately 14% of the Lao population and 32% of the Cambodian population using the Internet in 2014 (Table 8.1), and increasing this has been a priority area for governments. Mostly this has occurred through increased availability of mobile broadband Internet services in rural areas, through private sector development, and increased access to inexpensive devices and technologies (BuddeComm 2015).

During this period, Asian countries with the lowest number of mobile phone subscriptions have shown significant growth rates (UNESCAP 2011), largely in city-based areas, but extending well into the lower socio-economic rural sectors. In Lao PDR, mobile phone connections grew from 0.2 for every 100 people in 2000 to 67% in 2014 (Table 8.2), while in Cambodia, the number of mobile phone connections has grown from 1 to 133 for every 100 people during the same period (Table 8.2).

Mobile phones are the most commonly owned mobile devices in both countries with usage having risen significantly since 2005 (Table 8.2). However, poor development of the telecommunications industry has hindered growth in mobile phone subscriptions in Lao (BuddeComm 2015), with poor investment in network maintenance and deficiencies in appropriate regulations for establishment and management of networks. The authors of the Budde report suggest that the use of tablet devices is very limited in both countries with limited affordability being the key issue cited.

8.4 Mobile Learning Implementation Issues Relevant to the Asian Context

Mobile technologies are seen to offer significant potential to enhance learning within developing countries. In these countries, there is often poor geographical and physical infrastructure, and mobile networks are seen to offer quicker and more cost-effective Internet access (Dholakia and Dholakia 2004). Motlik (2008) believes that there are advantages of mobile phone technology for learning in developing nations in that it is more widespread, easy-to-use, and familiar to many learners than computer-based online learning.

However, the introduction of mobile learning into developing countries must incorporate a holistic approach as the dangers of initiatives that focus simply on technology ownership, access and infrastructure alone (rather than on the social, cultural and learning contexts) have been identified (Kirkwood 1998).

8.4.1 Enablers and Barriers to Instigating Mobile Learning

Costs of smartphones and wireless data transfer are a barrier to mobile phone ownership and particularly to the development of broader applications of mobile learning (Zhang 2015a) in poorer countries. Educators cannot assume that all learners have access to mobile technologies, have connectivity or "ubiquitous" access to the Internet, or have the ICT skills to apply mobile devices to their learning needs (Petrakieva 2015).

Difficulties with the availability of infrastructure and resources, inappropriate learning content and lack of time and experience to develop or use programmes, along with non-user-friendly interfaces, are also seen as barriers to the development of successful mobile learning solutions (Skillsoft 2015). Other problems of relevance that have been previously identified include poor course monitoring, lack of feedback to students, poor design, poor training for instructors, lack of required technology, lack of Internet accessibility, lack of online resources, high costs and lack of credibility (Baggaley and Belawati 2007).

The UNESCO study identified that enablers to mobile learning rested at government and institutional level along with research, accessibility, connectivity and affordability. Barriers were costs, mindsets, poor training and support and content. The government, hardware makers, students and education specialists were considered most likely to promote the use of mobile technologies in learning. Teachers and parents were seen as most likely to prevent use (So 2012, p. 22). Success factors appear to be based on ownership and infrastructure rather than social, cultural and learning contexts (Kirkwood 1998).

8.4.2 Design Considerations

In addition to considering barriers and enablers in developing mobile learning programmes, the expectations and value gains from any incorporation of mobile learning into higher education programmes must be considered carefully. Initiatives can only be successful if the added value is seen by both educators, learners (Petrakieva 2015) and institutions. This added value to learning differs across contexts and between countries and individual communities (Zhang 2015).

In designing mobile learning applications in higher education, these factors to be considered include learner contexts and learner objectives (Haag and Berking 2015; Parsons et al. 2007). In addition to these context issues, aspects of the various devices, technologies and their usability must be considered (Koole 2009). These then must be translated into the development of authentic tasks and opportunities for collaboration, engagement and meaningful assessments within learner-centred environments (Turbill 2015). Teaching and assessment programmes can be designed to support reflection, sharing of experiences and responding to others, collaborative learning and working and application of new practices, using a variety of media (Turbill 2001). The development of such programmes requires educators to have a good understanding of pedagogies and technologies so as not to simply publish content online (Petrakieva 2015).

8.4.3 Implementing Mobile Learning in Teaching and Learning

From a teaching perspective, mobile technologies have the potential to contribute to the provision of resources and educational material and to promote interactive discourse (Kukulska-Hulme and Traxler 2005). These authors suggest that teachers need to understand their own conceptions of teaching and what they expect of their students' learning in order to assess how technologies can support them. They suggest that mobile learning is not only about enhancing the usability and accessibility of mobile devices in learning but about the perceptions of whether mobile technologies can support different approaches to teaching (Kukulska-Hulme and Traxler 2005).

The mobility of the learner and of learning itself is a key advantage (Pandey and Singh 2015). There is potentially improved "connectivity for spontaneous communication and collaboration, beaming of stored information from device to device, location-awareness, giving instant information about objects within sight, portable sound-recording and voice-recording, and cameras for taking photos and making video clips" (Kukulska-Hulme and Traxler 2005, p. 31).

In developing educational programmes using these technologies, developers must consider the needs of the learners and educators and the pedagogical reasons for developing learning programmes (Petrakieva 2015). The use of mobile technologies in learning, therefore, requires a change in pedagogies towards self-directed learning for students (So 2012), which is a significant shift for both teachers and learners.

8.5 Mobile Learning Cases: Lao PDR and Cambodia

There is a suite of factors that contribute to creating environments conducive to the development and application of mobile learning in higher education. In order to consider these more specifically in Lao PDR and Cambodia, an investigation of two educational programmes was undertaken. This research was based on qualitative investigation and analysis of two cases. Through a focus on each individual course as a case study, the investigation was allowed to pursue an understanding of its current contextual conditions. In-depth interviews were undertaken with one lecturer from each programme. Interviews were conducted in English. Lecturers were asked through open-ended questioning to describe how mobile devices were being used in their courses, factors affecting the use of these devices and successes. Data was collected from interviews as transcript notes by the interviewer and along with field notes provided the basis for qualitative analysis of the interview transcripts. This analysis identified themes associated with current and potential mobile learning in each institutional context which are summarised below.

8.5.1 National University of Laos (NUOL), Lao PDR

The National University of Laos (NUOL) is the only national university and is based in the capital of Vientiane. It has eight campuses. Its various faculties include agriculture, architecture, environment and development studies; engineering, natural sciences, forestry, education, environment and development studies; social sciences, natural sciences, literature, economics and business administration; and laws and political sciences. The university includes a Continuing and Distance Education Centre and an Information Technology Centre.

The faculty of agriculture which is the focus of this investigation delivers high diploma and bachelor level training programmes in plant science, livestock and fisheries, rural economics and food technology with 68 teaching staff in 2014, of which 42 have postgraduate qualifications. One lecturer from the rural economics course was interviewed about mobile learning within their teaching programme.

8.5.1.1 Students

Student enrolments in the Faculty of Agriculture vary from over 500 in 2009/2010 to 750 in 2012/2013, and graduations have ranged from approximately 250 to 400 over the past 7 years. The age range of students in the bachelor programme is approximately 18–20 years, and for students undertaking the bachelor programme who already have a High Diploma, the age range is 23–35.

Although almost all of the students in the bachelor and bachelor continuing programme have mobile phones, many lack the skills to use them efficiently to support their educational activities. Access to laptop computers generally is limited to one-third to one-half of all students studying at the University. Along with this limitation in the availability of computers, students' use of mobile technology is restricted by the cost and availability of Internet access. There is one publicly available Wi-Fi connection within the faculty of agriculture, and students have no access to Wi-Fi in their dormitories.

8.5.1.2 Access to Learning Content

The agricultural economics course offered in the bachelor and high diploma programme is delivered annually to up to 30 students. Currently, students studying this course must attend lectures that include topics of production systems, agricultural policy, rural economics, agricultural extension and rural sociology. Students, as for all students at the university, must attend these lectures in person to access their learning content. Although the university has developed an online learning management system, it is not used to formally provide access to lecture content because most students do not have their own computers. Students mostly hand in assignments in hard copy, but most have an email account usually accessed through a smartphone. Email is sometimes used for urgent communications. Students often send their final reports to the lecturer for checking using email or Facebook. Much of their research for these assignments is undertaken in the library or through books they borrow from the library.

Ownership of mobile phones by some students, however, is playing a role in contributing to their learning. Students are able to call the lecturer anytime, at a time and place convenient to their study with their questions. Some have received lecture notes and additional learning material from the lecturer using email on their mobile phones.

Mobile phones are allowing these students easier and more ongoing access to communication and sharing of notes at any time, as well as the ability to organise learning material. This supplements their learning in addition to the formal presentation of lectures in class. Students are increasingly expected to use the Internet for information searching to access additional learning materials and for undertaking assignments. Mobile phones are contributing to these activities but only for some students. Due to limited skills of students and limited connectivity, mobile phones are mostly used by students and lecturers for communication rather than information delivery and searching.

8.5.1.3 Teaching

In delivering this programme, the lecturer is increasingly sharing information and resources online. She uses the Internet more for information searching and sees her students doing the same:

> There is some change in our lectures since last few years, now we use … more and more social media for communication and share notes and we use also … more and more internet for information searching.

Although mobile phones have made a difference to the ability of some students to seek advice from lecturers in a timely manner, and for students to communicate with other students, some students within the faculty of agriculture are from poor rural families with little or no access to computers or mobile phones. Many lack the skills to use these devices as part of the learning activities. Lecturers, therefore, are challenged in making changes to their course delivery, even in sharing additional notes online or contributing to discussions equitably:

> It is still [remains] a challenge to change the delivery program even though part of the students have their mobile phones or devices. But part of the students are from the rural, poor families of countryside which they have no smartphone and computers and they still [are] weak on technology use. In addition, the IT system and internet network in our school [is] still weak and [of] limit[ed] availability. [For] example: the computer room in our faculty ha[s] a total of 16 computers which is a barrier to computer learning for the students.…the mobile phone is mostly use[d] to communicate…limit[ed] use for information delivery and searching…. we need more facilities such [as] computer and internet access.

8.5.1.4 Communication

In the rural economics course, mobile phones are used significantly for communication between lecturers and students, largely through phone calls but also through email as described below:

> My students and I communicate using email, yes sometime we used to share the lecture text to the students or the students can send us their assignments via email or social media such

> Facebook. But this is still [a] small portion [of students]. My students and I communicate using mobile phones, we use…sometime for call and chat if the students have questions or in case we have urgent message to the students.

The lecturer shares her mobile phone details with her students, responds to telephone calls and short text messages from them, and emails using her mobile phone. She can share lecture notes and additional material or homework questions with her students in a timely manner using her mobile phone. Mobile phones are also the main means through which students communicate with each other:

> My students communicate with each other using a mobile phone, the students have their group page in social media, [for] example Facebook… that they can communicate, passing message and for their organization...They rarely use email to communicate with each other.

Access to social media using mobile phones is enhancing communication to support learning. Students have set up group pages on Facebook where they communicate with each other and as a storage site for additional learning material sent by the lecturer. In this way, the students are taking some responsibility for organising communications between themselves and as a way for the lecturer to communicate with the group as a whole.

8.5.1.5 Skill Levels

Limitations in terms of computing equipment and the skill levels of both lecturers and students would need to be overcome in order to deliver programmes that more fully incorporate digital and technology-based resources and processes.

Educators — Up to half of the lecturers within the faculty who do not speak English or who studied within Lao PDR have limited digital skills. It was suggested that they would require significant amounts of training in order to be able to develop and deliver online educational programmes and resources

> At this point, [I] think it is not easy to make change (in the delivery of our programmes) because we still need many thing[s] before able to change such we still need material and skill

Students — Skill levels of students are limited and this is another barrier to developing more online and mobile-based learning programmes

> [Students'] skill to use online platform(s) and social media for study and research remain limit(ed)

8.5.1.6 Technical

NUOL has implemented a number of phases to enhance the use of information and communications technologies. These plans include the development of a network and Internet services, application of ICT in teaching and learning and research activities and application to planning and managing the university.

The university is establishing systems to manage learning processes online, but their implementation across the organisation appears limited due to low student numbers who have access to computers or mobile phones. It is progressing towards using Moodle software to deliver lectures and learning content and has organised staff training in the system. However, there are insufficient computers available for all students to access the online content:

> My University has an online Learning Management System…we are planning a distance learning system by using Moodle Software, but our foundation is not yet ready to use, mean that we still lack of IT room for students and most of the students don't have their own computers for this program…we already organised a training course for Moodle use to all staff.

Limitations in technical infrastructure within the university are a drawback to the use of mobile devices in learning programmes, with limited connectivity and functionality within the university IT system. Ongoing support for lecturers in developing their programmes to incorporate and maximise value from online resourcing is currently limited.

> We rarely get assist[ance] from the computer expert, as we have only 1 person responsible for that…mostly we find our solution by ourselves.

The lecturer suggests that students and staff have very little available assistance in setting up their mobile phones or laptops with Internet access or email or gaining help with technical problems. With only one technical (IT) expert available to staff and students, most students are forced to find their own solutions to computing problems and setting up computers and phones with Internet access. There are no available online self-help files or support services.

8.5.1.7 Organisation

The university has undertaken significant planning to expand the availability of computing facilities for students and increase the level of support for students and staff to adopt more use of technology in their educational activities, but lack of skilled human-based resources is a key limitation as the lecturer outlines:

> We plan to develop more computer room and give more support for technology use, but it still remains an issue, because we don't have skill human resource.

8.5.2 Royal University of Agriculture (RUA), Cambodia

The Royal University of Agriculture in Cambodia has been providing training in agriculture since it commenced in 1964. Among its eight faculties is the agronomy faculty which includes departments of soil science, plant production and plant protection. Within the degree programme in soil science, one of the courses offered is the pedology and soil analysis course which is delivered annually to around 50 students. One lecturer from this course was interviewed about their use of mobile learning within their teaching programme.

8.5.2.1 Students

The lecturer indicated that most students in this programme are in the age range 20–22 years old, and most of these students (around 95%) own their own mobile phones. They suggest approximately 40% of student phones are smartphones, while 70% of students use a laptop computer. Most students access the Internet at home, many using their smartphones.

8.5.2.2 Access to Learning Content

The pedology and soil analysis programme is delivered as lectures which students must personally attend. Lecture notes are emailed to each student prior to lectures so students have a chance to review and download the content. Assignments are issued to students in hard copy format and students submit these in hard copy in person to the lecturer.

Research papers and other information related to the course are published on the university website, and students download this material as part of their study programme. While most students download the material using their laptop devices, the material can also be accessed using smartphones.

The course lecturer indicates he is increasingly looking to include additional aspects to the assessments such as incorporating activities into assignments that rely on students accessing the Internet. Although he would like to use more digital approaches in teaching, he must use material and resources in formats available to all students. He outlines the changes that have occurred in his university:

> The availability of lecture notes and materials has increased significantly over the past few years due to teachers providing lecture notes and resources online to students, and they're being able to access these at any time freely using their own devices. Past students indicate that the enhanced availability of lecture notes and materials online is significantly different to the past model where students had to pay for their hard copy lecture notes available only in class.

The soils lecturer indicates that students are accessing lecture notes anywhere and anytime, before, during or after lectures mostly through computers but many can also use their mobile devices. Those students with mobile phones are seeking additional information to support their learning at a convenient time. Mobile devices are also enabling students to more easily participate in group learning activities and to increase the amount of reading they undertake (at a time and place suitable) as well as allowing students to store learning material and resources in a portable format. The teacher identifies the value of ongoing use of mobile devices in learning for students:

> … Increasing use of mobile phone and device[s] are necessary for [students'] present study and also for their future career. Because the students can access and get lecture notes and updated new technology information, especially they can keep documents for future use and share to others. Moreover, they can store many documents with saving more money ... and not use a lot of papers (saving environment).

8.5.2.3 Student Research

Students are using mobile devices and connectivity to undertake their research and access a range of additional information associated with their learning topics:

> Most of students do research using their mobile smartphone and laptop where they can access internet. Even [if] they are going to [the] library … they still use internet from their mobile smartphone. Because internet can provide more information and takes short time to find the information that they are searching.

8.5.2.4 Communication

Students now also have more opportunities for ongoing and enhanced social learning and interaction as part of their learning in the programme. It is in this area of communication associated with learning and teaching that mobile devices have had the most impact on this programme. Learning is enhanced through the use of mobile devices and connectivity as students communicate with their teacher on a range of media about learning content and activities. The lecturer is increasingly sharing information and resources on social media so students can access more and timely material faster and more easily (using their mobile devices):

> Personally, the students can communicate with me via any available media (email, Facebook, SMS and phone call, etc.). I also share information or document sources using …social media... because the students can get it faster and easily which they can get update and new technology information and also [it] can improve their reading skill.

This use of mobile devices among students and lecturers has enhanced the ability of students to communicate with teachers at a convenient time. In addition, most students are using available media to communicate with each other about course material and activities. Mobile devices have enhanced the timeliness of these communications and provided a range of different channels, depending on the availability of connections.

8.5.2.5 Teaching

The lecturer in this programme is using mobility and the associated increased connectivity with his students to adapt and build on his formal lecture programmes. He believes it is easy to increasingly incorporate more aspects of mobile learning into his teaching programmes as students are expecting to use their mobile devices:

> Students…prefer to open and read lecture notes from electronic file which easy to access and keep the information for a long [time]… many students want to study using technology as foreigner students do.

The lecturer sends lecture notes via email and sometimes posts information on his own Facebook account. He now has expectations around current and future student learning that are based on this enhanced mobility and connectivity. These expectations are that students pursue further reading and interaction with others (using their online connections) – taking a more self-directed focus, to add to the basic teachings:

> In my opinion, the students need to pay more attention on finding information on the available websites and increase their reading, especially group working which they can find something new or new ideas from each other.

8.5.2.6 Skill Levels

Beyond expectations is the important aspect of skills and literacies (of educators and students) in terms of developing and applying the functionalities afforded through the use of mobile devices.

Educators Although lecturers at RUA are increasingly developing their teaching programmes to incorporate more use of mobile devices, they are left on their own to accomplish this. Many appear to have sufficient skills to develop digital material and deliver programmes that incorporate mobility and connectivity, but they believe there are additional skill needs among staff in developing and using systems that can be more tailored to individual users

> I think many lecturers at RUA have enough capacity and skill in using digital technology to develop and deliver courses [and] materials, but they also need some training course on how to develop a security network system. It means that each student must have his or her personal username and password for access [to] the lecture… notes and information relate[d] to their study and research

Students Students in the programme mostly have higher levels of digital skills than lecturers, but these do vary significantly, a point educators must constantly consider in developing their programmes

> Presently, the students have higher digital literacy levels than lecturers…because there are more available digital devices on the market and they take a computer science course in part time (1–2 h per day). The students' skills in searching the Internet or using online platforms or social media for their study and research are completely different depending on their level of digital literacy and experiences

8.5.2.7 Technical and Organisational

The Royal University of Agriculture is supporting the increasing use of mobile devices in teaching and learning through its technical support and availability of Wi-Fi. Technical support is available at RUA for both lecturers and students for setting up mobile phones or laptops with Internet access or email, and free Wi-Fi is available. However, this support is limited, with very little support for technical problems, and no assistance for lecturers in terms of adapting their content so it could be delivered online.

> .. the university does not help for adapting the content to be delivered online. But university can help to share your information or posted your research on the website of university. Anyway... this support is not sufficient.

The RUA is developing plans to change to more online delivery of courses and introduce more support services; however, the lecturer suggested that:

> Financial and technical support is needed to successfully make those changes.

8.6 Discussion

The two cases outlined indicate that the increasing ownership of mobile devices is indeed impacting on the teaching and learning occurring in both universities. In these two teaching programmes, both lecturers and students have a vision to maximise value from the use of mobile devices in university teaching and in student learning.

Mobile phones in both programmes have enabled students to receive and access additional information related to the programme more easily and in a timelier fashion. It has facilitated more regular and easier communication with their lecturers and with other students during their course. The use of social media, mostly from mobile phones, has also allowed students to store and manage their learning content more easily and to do this within a social learning context.

8.6.1 NUOL, Lao PDR

Mobile phones are contributing to learning activities among a small number of students, in particular through access to information, searching for information, communication with lecturers and other students and in submitting assignments. However, there is significant variation in ownership of devices and in connectivity. Rural students from poor communities do not have access to mobile phones or computers, and they do not have the skills to use these devices. This limitation, along with the lack of resourcing and skills within the education institution, is hindering any potential development and broad application of mobile learning.

8.6.2 RUA, Cambodia

This case highlights increasing connectivity and mobility within the higher education sector in Cambodia and, therefore, the possibilities for students and teachers to use educational approaches that are based on access to mobile devices. In this example, increased communications and flexibility in the provision of and access to learning content have occurred in line with increasing access to mobile devices and connectivity among students. Additional approaches to expand educational opportunities for connected students were being developed by individual lecturing staff, and this was occurring with an expectation that students would enhance their mobile-based learning associated with the course content.

It may be that the sharing of expectations between lecturers and students about the possibilities of mobile learning may help map a pathway for future mobile learning development in this programme. The ability for lecturers to share their approaches with each other along with the identification and documentation of training and infrastructure needs may also help educational institutions map their pathways to broader mobile learning applications and functionalities.

There appears to be scope for educational institutions, in acknowledging the widespread and increasing use of mobile devices by students to formulate policies and strategies for institutions that will enable both groups to increase and develop their learning applications within mobile arenas. This case review suggests that these must include additional technical and systems-based approaches and incorporate standards and training to ensure security and protection of educational content and for system users.

8.6.3 Evaluating the Impact of Mobile Learning Approaches

In each case, the potential for students to engage in mobile learning practices was enabled through enhanced timeliness of learning, enhanced access to additional learning material and opportunities, increased capacity to search for additional information, connect with others and manage learning content and more social and ongoing interactions to stimulate the learning process. The use of mobile phones among students has meant that students are approaching their learning by including additional activities – social-based communications and some timely information searching around particular problems or questions they have. This more ongoing use is helping students to develop their own understandings of the relevance of the learning content. The new functionalities are contributing to redefining traditional concepts of learning.

Teachers in these two cases were providing more learning content and communicating more with students throughout the course. This occurred beyond formal lectures, using mobile phones which provided a platform for access to email, social media and short messaging service (SMS). They answered students' specific questions in a timely manner. The provision of this additional material and communications through social media requires a level of commitment from lecturers beyond formal lecture and assignment material and resources.

Although both organisations were committed to developing technology-based teaching and learning systems, the instigation and roll out of these were hindered by a lack of resources including equipment, staffing and training. Teachers were implementing approaches that incorporated use of mobile devices to add value to learning. However, in both cases, these approaches were undertaken by individual teachers alone, with little guidance from their organisations. Teachers' expectations were for students to take more social, self-directed approaches to their learning. They were expecting students to show evidence of additional self-directed learning and for more group interaction in their learning – through their use of social media on their mobile devices.

Students' ownership of smartphones means that there is less requirement for institutions to provide computing resources in order for learning content to be accessed. However, in both cases, more widespread student access, ownership and skill are required for this to occur. Students who cannot easily access Wi-Fi for affordable connectivity are not able to take maximum advantage of their mobile devices. Enhanced availability of Wi-Fi for students and mobile devices for those students who do not currently own them will ensure more equitable access to mobile-enhanced learning, activities and content.

Murphy and Farley (2012) developed a mobile learning evaluation framework which identifies the different levels and facets to consider in evaluating mobile learning within higher education contexts. Table 8.3 lists findings from the evaluation of mobile learning in both Lao PDR and Cambodian case studies in relation to the various levels of this mobile learning evaluation framework.

Both universities provide support to ensure staff and students have access to the Internet on their mobile devices and that lecture and course material is published online. Technical support, training and resourcing for lecturers to move their programmes and educational activities online are necessary factors in supporting lecturers to develop more online content, resources and digitally-based educational processes.

Mobile learning offers opportunities that may require less investment in equipment and more on people and learning programme design (Bandalaria 2005). It is in the design of programmes specifically suited to the particular needs of the course, the students, their regional particularities and the economic, cultural and political environments and operating systems that the most progress can be made. These aspects should guide future applications in mobile learning.

Table 8.3 Key insights from evaluation of mobile learning within higher education in Lao PDR (one case) and Cambodia (one case) at levels of the mobile learning evaluation framework

Framework levels*	Lao PDR	Cambodia
Pedagogical (learning)		
Student perspective	Communication and organisation of content	Communication and information access
	Access to additional content	Information sharing
		Portable storage of learning content
Learning needs and desires	Enhanced communication	Students want to use technology
		Easier access to content
Current and intended use	Additional learning content	Self-directed, social, communicative
		Group learning
Demographic and social context	Limited access to devices, connectivity and skills among poorer and rural students	High mobile phone ownership
Pedagogical (teaching)		
Educator perspective	Individual approaches	Educators develop their own individualistic approaches
	Increased availability to students	
Beliefs and pedagogies	More timely and communicative approaches to learning	More self-directed and empowering
Critical success factors/barriers	Limited digital skills and equipment	Device ownership and range of skills
	Need for equity among students to develop new approaches	Student motivation
Context and learning objectives	Provision of additional content and communications	Increased expectations of students for additional reading and social learning
Technical		
Processes and policies	Need for policies to cover resourcing and upskilling	Wi-Fi and some technical support
		Organisational commitment
Organisational barriers	Focus on technology without support	Range of literacies
Resourcing	Lack of computing, connectivity and technical support	No support for developing mobile learning approaches
Technological context	Require focus on people to apply new processes	Educators want systems for personalising
Organisational		
Institutional strategy/vision	Need holistic planning of online initiatives	Commitment to future online development
Focus and commitment	Technology and system focus	Focus on infrastructure and online publishing
Leadership support	Focus on staffing and supporting individuals	Limited holistic approach in planning
	Training and support required	Support for individual staff
Sector context	Incorporate communities, local, commercial and cultural aspects in planning	Incorporate communities, local, commercial and cultural aspects in planning

*Murphy and Farley (2012)

8.7 Conclusion

Higher education is an important factor in the growth and development of Lao PDR and Cambodia as it can potentially provide skills and research that can support growth in productivity and innovation. Enhancing the quality of teaching and learning using mobile technologies has the potential to add value to programmes by providing more continuous, portable and social aspects to learning.

Although there are various levels of ownership of mobile devices and access to Internet connectivity among students in both countries, mobile learning is occurring for those students who have mobile devices and are attempting to engage in mobile learning activities and more particularly in Cambodia. Lecturers in both countries are instigating approaches that incorporate the use of mobile devices to add value to learning. These approaches are undertaken by individual teachers or students alone, with little guidance from their organisations.

It appears that although both organisations are committed to developing technology-based teaching and learning systems, the instigation and roll out of these, in particular, mobile learning is hindered by a lack of resources including equipment, staffing and training. Higher education organisations in these two countries are encouraged to develop step-by-step planning approaches to implementing technology-based learning and to consider future research through pilot and case studies in order to fully identify requirements for successful operation and adoption.

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Chapter 9
The State of Practice of Mobile Learning in Universitas Terbuka Indonesia

Dewi Padmo, Tian Belawati, Olivia Idrus, and Lidwina Sri Ardiasih

Abstract As a distance learning university, Universitas Terbuka (UT) uses mobile technology as an integral part of its online learning system. In addition to its mobile interface website, online tutorials are also made accessible through mobile as well as handheld devices. In other words, UT students can literally study through their mobile devices from the very first activity of registering for courses, paying the tuition fee, obtaining digital learning materials, accessing the digital library, reading online journals, as well as participating in online tutorials. With the continuous development of increasingly sophisticated smartphone technologies, it is important for UT to continuously improve its online learning system. The development of UT's mobile learning, which was started in 2013, has gone through several phases. The first phase was the preparation of infrastructure, which includes the development of applications and frameworks. The second phase was the content development, which was done by the faculty using various media including text, audio, video, multimedia, and the utilisation of open education resources (OER). The last and third phase was the program delivery, which involves tutors, technical/IT assistants, and other support systems to allow students with seamless access to mobile learning using various mobile devices. This seems to be effective as shown by the data that demonstrates UT mobile learning is being accessed by students using different mobile devices with various operating systems. This chapter will give a glance on the state of practice of mobile learning in Indonesia as well as elaborate on the process and practice of mobile learning at Universitas Terbuka (The Indonesia Open University) as a dedicated distance learning university.

D. Padmo (✉) • T. Belawati • O. Idrus • L.S. Ardiasih
Universitas Terbuka (Indonesia Open University), Jakarta, Indonesia
e-mail: dewi@ecampus.ut.ac.id; tbelawati@ecampus.ut.ac.id; olivia@ecampus.ut.ac.id; lidwina@ecampus.ut.ac.id

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9.1 Background

The presence of mobile technology has opened up opportunities for every individual to communicate more quickly and obtain information more easily. It has been claimed that the capabilities of mobile technology in providing convenience, flexibility, engagement, and interactivity have made mobile learning more attractive to students (Chen and Denoyelles 2013). Furthermore, mobile technology has given birth to the creation of various mobile devices ranging from simple mobile phones to sophisticated smartphones with many features and affordances. Research by eMarketer (2013) shows that mobile phone users (all types) in Asia-Pacific in 2013 reached 2.43 billion or about 56.3% of total mobile phone users in the world. It is estimated that in 2017, mobile phone users in Asia-Pacific will reach 3 billion out of the total 5.10 billion of the world's users. This data shows the rapid advance of mobile equipment in the Asia-Pacific Region, as predicted by Baggaley (2007) that Asia would lead the world in the use of mobile learning.

Many studies related to the rapid growth of Information and Communication Technology (ICT) in education through mobile devices have been conducted. Data show that the popularity of mobile technologies among university students has been increasing significantly (Chen and Denoyelles 2013; Chen et al. 2015; McGraw Hill 2014). A study by Traxler and Wishart (2011) shows that mobile learning in the UK has been used both at higher education and secondary schools settings, especially to personalise and contextualise the learning environments and to enrich field trip activities. This study specifically reported that the function of texting (Short Messaging Service or SMS) has been viewed as 'an innovative pedagogic format uniquely suited to the technology' (Traxler and Wishart 2011, p. 11).

Another study conducted by McGraw-Hill Education (2014) revealed that while many students still prefer laptops as the first choice for studying, the demand for portable e-books and mobile learning tools is increasing at a significant rate. The McGraw-Hill Education study also found that 86% of surveyed students think that technology helps them perform their academic tasks more effectively and efficiently, and more than 60% of them now use their mobile phones to study (McGraw-Hill Education 2014). Similarly, based on a multi-year study, Chen et al. (2015) found that ownership of mobile devices among students of the University of Central Florida was very high. Their study found that although students and instructors still need some technical, logistical, and pedagogical support for optimising the potentials of mobile learning, 73% out of 1,181 surveyed students were reported as using smartphones, which is higher than those who used tablets (45%) and e-book readers (17%). According to the students, they use the smartphones mostly for looking up lecture topics during face-to-face class time and for accessing course textbooks both during and outside of class. Based on their experience, students felt that using mobile devices:

1. Makes it easier to access coursework (72%)
2. Increases communication with their classmates (65%)
3. Increases communication with instructors (60%)

Table 9.1 The use of mobile devices in Asian countries

	Project name	Country	Educational purpose	Technology used
1.	Viability of SMS Technologies for Non-formal Distance Education	Philippines	English language and math training	SMS
2.	Viability of SMS Technologies for Non-formal Distance Education	Mongolia	English language, emergency care, and endocrinology training	SMS
3.	Mobile Telephone Technology as a Distance Learning Tool	Bangladesh	Distance education course via national television	SMS
4.	An Experiment in the Use of Mobile Phones for Testing at King Mongkut's Institute of Technology	Thailand	Test taking	SMS
5.	Improving Literacy in Rural India: Cell phones games in an After School Program	India	English language training	Cell phone games
6.	Learning Communities enabled by Mobile Technology: A Case Study of School-Based, In-service Secondary Teacher Training	Bangladesh	Secondary teacher training	SMS, MMS, teleconferencing

Source: Valk et al. (2010)

4. Increases their knowledge in their field of study (48%)
5. Improves the quality of their work (43%)
6. Increases their motivation to complete coursework (42%).

The findings show that using mobile devices in learning was perceived to give students advantages and flexibility in accessing coursework and in communicating with both their classmates and instructors. It is perhaps for the same reasons that the use of mobile devices for learning in many Asian countries is also increasing significantly. Table 9.1 depicts the use of mobile phones to improve educational outcomes in the Philippines, Mongolia, Thailand, India, and Bangladesh as reported by a research conducted by Valk et al. (2010).

The findings show that mobiles can significantly reduce barriers to education while attaining educational outcomes comparable to those of traditional educational methods. This result was specifically shown by the Philippines, Bangladesh SMS, and Thailand projects. However, there remain substantial issues regarding future phone interventions to be considered in order to improve access to education. Valk et al. (2010, p. 134) explain that specifically in Thailand, 'technological issues such as screen size can remain a barrier to effective mLearning'. Moreover, some technical difficulties were experienced in the Philippines and Mongolia projects emphasising that 'the quality of the software and hardware is instrumental to the success of mLearning modalities' (Valk et al. 2010, p. 134). Another focus of the projects was how to use mobile learning to promote new learning. The feedback of

Table 9.2 Gross enrolment rates in tertiary education in Asia

Country	% of school-age population (within 5 years of secondary school age) enrolled in tertiary education in 2008
The Republic of Korea	98.1
New Zealand	78.5
Australia	77.0
Japan	58.0
Macao, China	56.5
Hong Kong, China	55.6
Mongolia	49.8
Thailand	44.7
Malaysia	36.5
Iran (The Islamic Republic of Iran)	36.1
Philippines	28.7
China	22.7
Indonesia	21.3
Brunei Darussalam	16.0
Lao People's Democratic Republic	13.4
Cambodia	7.0
Bhutan	6.6
Pakistan	5.2

Source: So (2012)

the participants shows that 'mLearning enables learner-centred education, particularly in comparison to traditional distance education models' (p. 135) in which mobile learning provides interaction. However, only the Bangladesh teacher training project reporting on the state of mobile infrastructure directly affects the success of mobile learning interventions.

Another project was conducted in some Asian countries by the United Nations Educational, Scientific, and Culture Organization (So 2012) in 2012 focusing on illustrative initiatives and policy implications of mobile learning in Asia. This project seemed to be the embryo of UNESCO's policy guidelines for mobile learning content which were published in 2013 (UNESCO 2013). Moreover, the results show that there was a significant increase in using mobile devices for learning compared to the project conducted in 2010. Globally, the project shows a valuable increase in the use of mobile devices for learning. The result supported an opinion that 'it seems likely that mobile phones will soon be ubiquitous in developed as well as developing countries in Asia' (So 2012, p. 9). Regarding the implication of mobile learning in Asia, during the project, UNESCO captured the gross enrolment in tertiary education in Asia as seen in Table 9.2.

In relation to the policy implications, a survey was conducted to gain some information regarding government support towards the implementation of mobile learning. Table 9.3 shows the results of a survey asking about whether the government actively supports the use of mobile phones in education?

Table 9.3 Government support on the use of mobile phones in education

Government support	Country
Yes, through initiatives by institutions and engaged individuals	China
	Malaysia
Yes, through specific projects or programmes with dedicated public funding	Japan
	Malaysia
	Singapore
	Taiwan
Yes, through specific projects or programmes with dedicated private funding	Japan
	Malaysia
	Singapore
	South Korea
Yes, through government initiatives including specific measures and incentives	Malaysia
No, not really	Thailand
Do not know	
Other	Indonesia

Source: So (2012)

As explained in the previous paragraph, following the project on mobile learning conducted in 2012, UNESCO (So 2012) launched a Policy Guidelines for Mobile Learning Content (referred to as PG ML Products) based on a belief that ‘mobile technology can expand and enrich educational opportunities in diverse settings’ (UNESCO 2013, p. 5). The guideline is very important since it aims at helping policy-makers to better understand what mobile learning is and how its unique benefits can be leveraged to advance progress towards Education for All (EVA). Moreover, based on the results of studies on mobile learning, UNESCO underlines the benefits of mobile learning as follows:

1. It expands the reach and equity of education. A number of studies on mobile learning have shown that it provides an excellent medium for extending opportunities to learners who may not have access to high-quality schooling.
2. It facilitates personalised learning. The mobile devices enable the learners to undertake independent learning.
3. It provides immediate feedback and assessment. Using mobile devices for learning, both learners and educators are equipped with faster and easier assessment facilities.
4. It enables anytime, anywhere learning. As people can easily carry their mobile devices, it becomes easier and more flexible for learners to access the learning materials or information anytime and anywhere.
5. It builds new communities of learners. They can invite other learners into a group of learners in order for them to communicate and share the knowledge with each other.
6. It enhances seamless learning. Using mobile devices also enables learners to access similar educational resources and information from a wide variety of devices such as desktop computers or laptops since they are stored on remote servers.

7. It bridges formal and informal learning. It means that by using mobile devices for learning, the boundaries between formal and informal education have blurred because it has enabled learners to learn independently by accessing supplementary materials in order to clarify ideas introduced by a classroom instructor.
8. It improves communication and administration of school management. Mobile devices have enabled school administrators to send the same messages to many recipients at the same time faster, making this more reliable, more efficient, and less expensive.
9. It maximises cost-efficiency. Mobile devices enable learners to access similar information through digital papers or books (UNESCO 2013, pp. 10–26).

This chapter will provide insight into the state of practice of mobile learning in Indonesia. In particular, this chapter will elaborate on the practice of mobile learning at Universitas Terbuka (The Indonesia Open University) as a dedicated distance learning university.

9.2 Mobile Learning in Indonesia

In Indonesia, the development of mobile learning has to be viewed in line with the development of the national infrastructure on Information and Communication Technology (ICT). It is very important to note that the ICT infrastructure in Indonesia is still unevenly distributed resulting also in uneven Internet accessibility. In general, although Internet users in Indonesia (around 78 million) are in the top five in Asia, the penetration rate is still around 30% (Internet WorldStats 2015). The rapid increase of Internet users has been contributed significantly to by the rapid increase in the mobile penetration rate. It is reported that the penetration of mobile phones in early 2015 had already reached 130% (BuddeComm 2015), which means that many Indonesians own more than one mobile device/number.

Online learning, in general, is still at an initial stage, and although the government has been encouraging universities to capitalise on online technology for learning, universities are still hesitant to fully move into the online learning space. One of the initiatives launched by the government to enhance the use of ICT for research and learning was the establishment of the Indonesian Higher Education Network (INHERENT) in 2006, which is a network that connected 32 universities located in every province in Indonesia (http://www.inherent-dikti.net/) combined with an allocation of competitive grants for universities to collaborate on developing educational software and content. This project has produced many educational applications including learning management systems (LMS), educational content and their repositories, as well as some experimentations of eLearning provisions. Unfortunately, support from the government for the network was discontinued before it could actually support universities to integrate online learning into their mainstream classroom learning system. Nevertheless, several big public universities continued developing their eLearning strategies to supplement and complement their classroom lectures. Recent data in 2012 show that 50 out of 3,070 private and public higher education institutions reported to the Ministry of Education's Directorate General of Higher Education that they have developed eLearning systems (Alamsyah and Ramantoko 2012).

The development of eLearning practice combined with the high penetration of mobile phones has triggered the birth of mobile learning in Indonesia. Mobile learning is practised in many higher educational institutions because of its capabilities in enhancing time and place flexibilities, in reaching wider audiences, and in enhancing the ease of updating as well archiving content. Especially for open education, Tsinakos (2013) mentioned that mobile learning is an alternative method of eLearning which enables the principles of open education that are flexibility, modularity, and time and place independence. As for classroom teaching and learning, mobile learning is used either to supplement or complement classroom activities or to substitute classroom activities altogether thus reducing the frequency of face-to-face classroom meetings (Panjaitan 2012). A survey in 62 higher education institutions conducted by Padmo et al. (2013) reveals that all institutions claimed to have used mobile learning in their instruction. Forty-nine percent of them claimed to have had used it for more than 5 years, and 23% of them claimed that they have used mobile learning for more than 10 years. The survey also found that the usage of what they claimed to be 'mobile learning' can hardly be considered as a 'real' learning process. Data show that 61.3% of institutions use mobile technology only for giving reminders or notifications of important dates/events, and 54.7% of institutions use it only for information purposes. It is encouraging, however, to see that 51.6% of the surveyed institutions also claimed to have used mobile technology for providing students with access to their digital library.

From the students' point of view, it is estimated that only about 25.8% of learners in the respondent's institution are actually using their mobile devices for any learning purposes. Regarding the reasons for low adoption of mobile devices for learning, many respondents stated that it was mostly caused by the following reasons: the small screen size of the device (38%), the cost of developing mobile learning (13%), limited connectivity (6%), and limited bandwidth (6%); in addition, their reasons also related to monthly costs, security issues, as well as lack of skill and expertise in operating the application (Padmo et al. 2013). Another reason mentioned by the students related to the fact that they still consider face-to-face meetings as an important part of their learning process (Padmo et al. 2013). These factors are in line with the three basic elements required for mobile learning activities mentioned by Miftah (2012), i.e. (1) the accessibility of the Internet, (2) the availability of facilities for learning, both print materials and technology devices, and (3) the availability of tutors to assist learners.

The results of the study conducted by Padmo et al. (2013) show that the use of mobile learning in Indonesia is still in its early stage and has not yet touched the real learning experience of the learners. However, one of the surveyed institutions which claimed to have used mobile technology for learning, Universitas Terbuka (UT), has practised mobile learning in a comprehensive way. That is understandable since UT is an open university and a dedicated distance learning university in Indonesia.

9.3 Mobile Learning at Universitas Terbuka (The Indonesia Open University)

Universitas Terbuka (UT) was established in 1984 with a special mission to open up access to higher education. UT currently has more than 400,000 active students spread throughout the archipelago of Indonesia and abroad. With such a large number of students, UT very much relies on information and communication technologies (ICTs) for all its academic and administrative affairs. Although printed materials are the main medium for delivering content, UT employs various media and channels for providing the supplementary learning materials and learning supports.

As the Internet became available, UT started to develop online learning support, commencing in 1997 and started to use a web-based application for online tutorials in 2000. Online tutorials are offered to UT's students as one innovative way of enhancing interactivity among students and between students and tutors. The UT's online tutorials aimed to build communities of learners, and this is in line with one of the benefits of using mobile learning as listing by UNESCO (2013). Via online tutorial a group of UT students is encouraged to communicate and share knowledge with each other. Figure 9.1 shows the screen capture of UT's online tutorial web page.

As the online tutorial system became settled and mobile technologies become more available, UT began to develop its mobile learning system by creating the mobile version of its website in 2002, followed by creating the mobile interface of the online tutorial services in 2007. The full use of a mobile application for tutorials

Fig. 9.1 The screen capture of UT's online tutorial webpage

Fig. 9.2 The appearance of UT's online tutorials in mobile devices

was started in 2013 using the Moodle mobile application (app) and was designed to be used on mobile devices such as smartphone, tablet, notebook, and laptop. After several years of development, the current mobile learning interface has become an integral part of the UT online learning system. In other words, UT students can now study using their mobile devices from the very first activity of registering for courses, paying tuition fees, obtaining digital learning materials, accessing the digital library, reading online journals, as well as accessing online tutorials. The only activity that cannot be done through students' mobile devices is examinations. Students have to take their examinations face-to-face in the various locations or online in one of UT's regional offices. The online examinations are not yet designed to be accessed from outside UT's intranet system for security purposes. Figure 9.2 shows the appearance of UT's online tutorials on mobile devices.

UT's mobile learning system was designed comprehensively involving various working units including the Computer Center, the Faculties, and the Multimedia Production Center. The Computer Center is responsible for developing the system and the apps (LMS) as well as the necessary infrastructure, while the Faculty and the Multimedia Production Center are responsible for developing the multimedia learning content (Padmo et al. 2014). The process of content development itself involves many activities starting from selecting the media format (text, audio, video, etc.) to the actual production of the media. This also includes the selection and integration of open educational resources (OER) as encouraged by the university. With the integration of OER in learning materials, students will have more access to knowledge. In the online tutorial itself, the OER materials uploaded by tutors include articles (accessed via http://jurnal.ut.ac.id/), videos or web-based materials (accessed via https://www.youtube.com/channel/UCoUPOCg0m4hGeHW_VP-q6QA/ and http://web-suplemen.ut.ac.id/html/suplemen/index.html), and self-assessments (accessed via http://elearning.ut.ac.id/lm/). Some of these OER materials are provided by UT and could easily be accessed through the SUAKA Portal (Sumber Pembelajaran Terbuka or OER) on the UT website. Besides getting OER materials from SUAKA, there are many institutions providing OER that can be utilised by tutors to enhance online tutorials, such as MERLOT (https://www.merlot.org/merlot/index.htm), OER Commons (https://www.oercommons.org/), and many others.

de los Arcos et al. (2015) found that the use of OER leads to improvement in student performance and satisfaction. There is stronger evidence that the use of OER improves related factors for students such as enthusiasm for study, confidence, and overall interest. Therefore, it is part of the policy in UT to include OER in learning material for students since it 'provide(s) a strategic opportunity to improve the quality of education as well as facilitate policy dialogue, knowledge sharing, and capacity building' (UNESCO n.d., para. 1). Once the tutorial content is ready, the faculty will start offering the service to students by assigning a tutor or a team of tutors who most likely are those who develop the content as facilitators. From the university's and tutors' perspectives, the activities undertaken for the provision of mobile tutorials are the same as those for the regular online tutorials. It is the students who would see the difference as they would access them through their mobile devices using the mobile interface.

The current interface for the mobile tutorials is based on Moodle Mobile, which converts the web-based online tutorials for the mobile user application/interface. This application is quite comprehensive, which enables students to read the learning materials uploaded by tutors as well as participating in the discussion forum by posting/making comments or asking/answering questions. Therefore, this Moodle Mobile application is really useful for students when they are 'on the road' and have no access to their PCs or laptops/tablets. In 2015, Padmo, Ardiasih, and Idrus conducted a study on students' perceptions about the use of mobile learning for their learning activities. Seven hundred and sixty-seven (767) out of 5,000 students from different study programs at UT, chosen by stratified sampling, responded to the survey. They were asked, among other questions, to identify their use of the various mobile learning services available from UT's system. The results show that 94% of the respondents claimed to use the mobile learning facilities to access online tutorials. This is very reassuring to UT showing that students have been able to utilise their mobile technologies for their learning process, although only 55.5% expressed satisfaction with the service. The other major use is for reading news and announcements, which was claimed by 56% of the respondents. As stated by UNESCO (2013) one of the benefits of using mobile learning is to improve communication and administration management. Mobile devices have enabled UT's administrators to deliver news and announcements to students at the same time, faster, more efficient, and less expensive. Figure 9.3 shows the various use of UT's mobile learning by students.

The results of the survey by Padmo et al. (2015) also show that students use different types of devices for accessing the mobile learning services. The types of mobile communication devices available and used by UT students for accessing online learning include cell phones, smartphones, tablets, netbooks, notebooks, laptops, portable media players, and PCs as seen in Fig. 9.4. Among the mobile devices, smartphones and laptops are to be the top two devices used most often by students (59.5% and 57.8%).

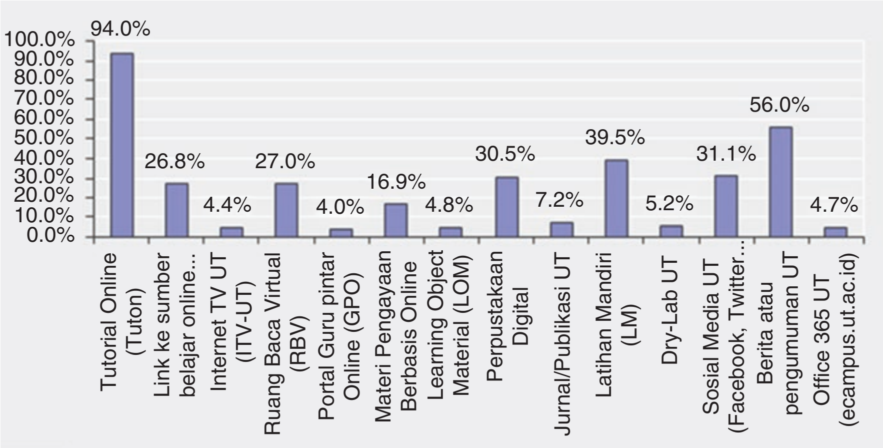

Fig. 9.3 Various uses of mobile services by students (From *left* to *right*: Online tutorials, links to other educational resources, Internet TV, virtual reading room, teacher portal, supplementary learning materials, LOM, digital library, UT publications, self-test, dry-lab, social media, news and announcements, and e-mails)

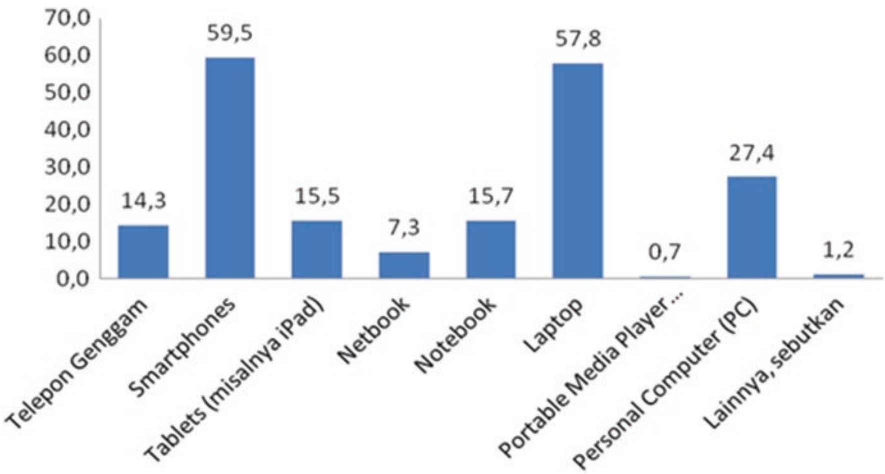

Fig. 9.4 The use of a variety of mobile devices (From *left* to *right*: hand phones, smartphones, tablets, netbook, notebook, laptop, portable media player, PC, and others)

The results of the survey also reveal that students use different operating systems, which include Blackberry, iPhone, Android, Windows Mobile, and WebOS. However, data show that 85.6% of student respondents use Android-based mobile devices as seen in Fig. 9.5 (Padmo et al. 2015). This seems to be in line with the result of a survey conducted by Alia and Ngazis (2014) that shows that almost all mobile Internet users (87.3%) in Indonesia use the Android smartphone.

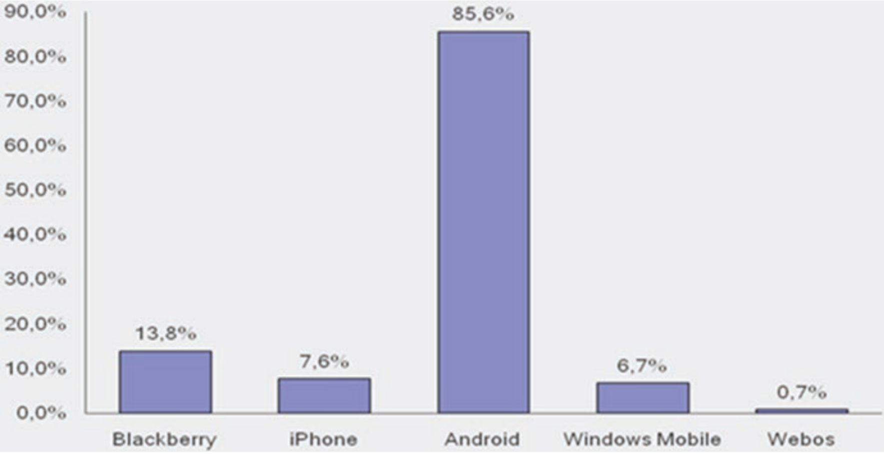

Fig. 9.5 The mobile operation system

9.4 The Future of Mobile Learning in Indonesia

The high penetration of mobile devices in Indonesia is expected to increase (Gusti 2014), thereby enhancing Internet penetration. This enhanced Internet access combined with the continuous development of learning content uploaded into the Internet is expected to increase the potential utilisation of mobile technologies for mobile learning.

In addition to the many educational resources available from all over the world, it is important that Indonesian educational institutions also develop content in the national language, which is Bahasa Indonesia. The big Indonesian universities that were part of the INHERENT project mentioned previously, continue to share some of their learning materials publicly. In addition, all of UT's learning materials have now been digitised and are accessible/downloadable through its online bookstore (the apps for the bookstore are freely downloaded from Google Play). Furthermore, as part of its Community Service Programs, the Universitas Terbuka has established a dedicated OER portal called SUAKA (Sumber Pembelajaran Terbuka or OER), which now contains thousands of multiplatform open materials (http://www.ut.ac.id/OER/index.html). The screenshot of UT's SUAKA, Free Apps in the Google Play, and the Online Digital Bookstore are shown in Fig. 9.6.

Several digital materials for master-level programs have even been formatted as digital files allowing students to be interactive with the materials and complete activities such as highlighting and taking notes. These materials were prepared with Kotobee Publishers, a well-known company that design books rich with interactivity and multimedia for all platforms. These materials are designed to be downloaded on computer tablets. The reason for using Kotobee Publishers was due to the company's capacity to provide authoring tools to create an interactive e-book technology that suited Universitas Terbuka's needs. The advantages of the Kotobee

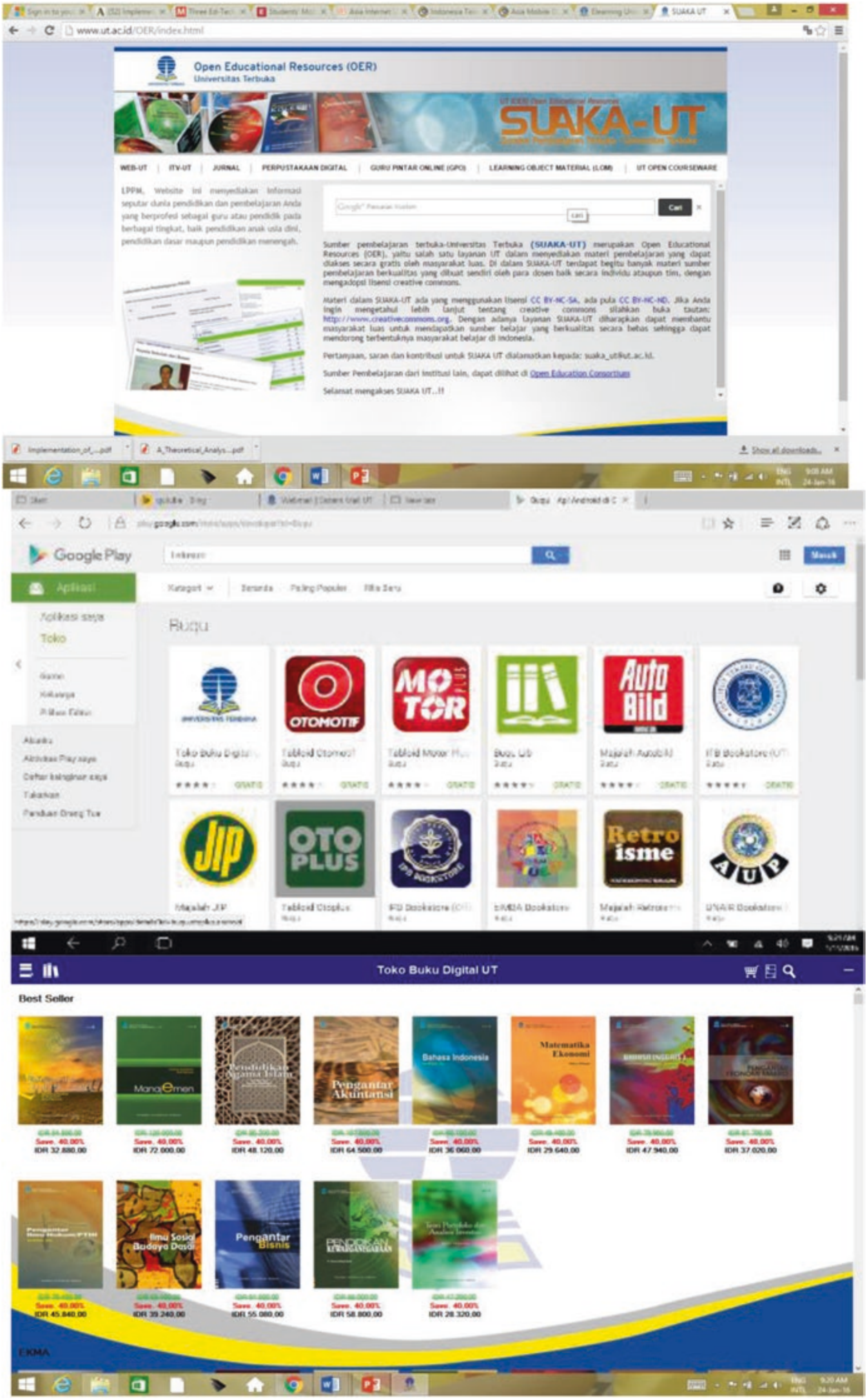

Fig. 9.6 Portal of SUAKA-UT and UT's free apps in the Google Play

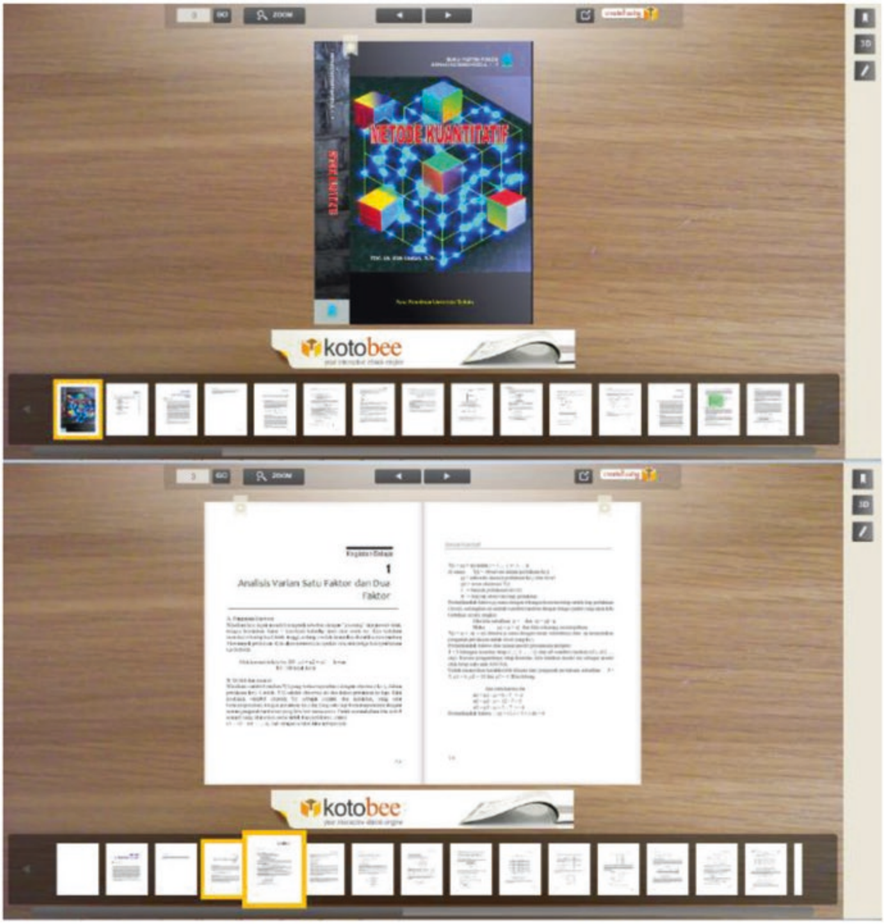

Fig. 9.7 The Kotobee-based digital learning materials (Source: Kotobee n.d.)

Publisher tool are mainly its interactivity and the ability to be freely customised. Kotobee Publishers allow users to create a well-designed layout and include their own logo and brand name. In terms of the learning process, Kotobee Publishers allow instructional designers to enhance learning experiences with interactive textbooks and enrich content by adding interactive elements such as video, audio, questions, interactive images, galleries, 3D, and more (Kotobee n.d.).

The UT's Kotobee materials were created and designed to be 'interactive' and enriched with video for visualisations of concepts. It is hoped that with these kinds of materials, the quality of students' learning processes and students' learning experiences can be enhanced. Although it is currently limited to graduate level courses, UT will gradually convert its undergraduate level course materials too, using Kotobee or a similar platform. Figure 9.7 shows the design of UT's Kotobee Materials.

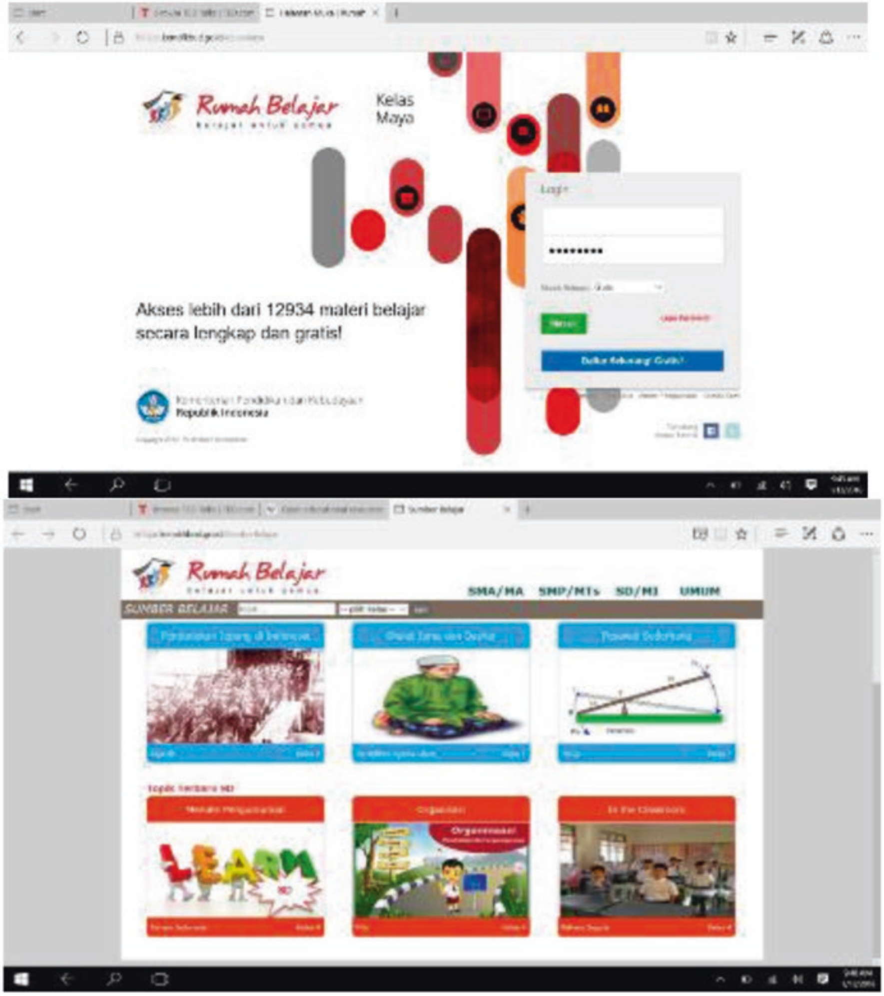

Fig. 9.8 The portal of Rumah Belajar (Source: Kemdikbud n.d.)

At the lower level of education, the Ministry of Education and Culture's Center for ICT has also been developing thousands of learning materials for both teachers and students of primary and secondary schools which is housed in the portal of 'Rumah Belajar' (Home of Learning), which can be accessed through https://belajar.kemdikbud.go.id/SumberBelajar/, using interfaces for both PCs and mobile devices. One of the goals of the development of the portal 'Rumah Belajar' was to introduce the concept of lifelong education for students at the primary and secondary school level. Through the use of the portal 'Rumah Belajar' as shown in Fig. 9.8, they will understand that lifelong education can be undertaken anywhere and anytime using ICT.

This development in online educational materials is seen to be complemented by the development of online and blended learning in Indonesia. A number of universities in Indonesia have implemented a blended learning approach in the learning process. The Institute Technology Bandung (ITB), the University of Indonesia, Universitas Pendidikan Indonesia (UPI), and the University of Bina Nusantara are among a few that have offered blended learning for some of their courses.

Furthermore, the existence of social media has also contributed to the popularity of online learning in Indonesia. Tu and McIsaac (2002) stated that an important factor to consider when enhancing distance learning is social presence which consists of three dimensions: social context, online communication, and interactivity. In line with this, Schroeder (2013) mentioned that social presence and online interaction can be accommodated by mobile technologies. There are a number of chatting apps provided in mobile technologies which enable students to communicate with each other, such as Facebook and Whatsapp. Social media users in Indonesia have created informal learning modes that are complementary to the blended learning approach. The survey conducted by Padmo et al. (2013), for example, reveals that 55% of respondents have utilised media or social networks as part of the provision of information or mobile learning content. Thus, it appears that a distribution of information through social networks can be an effective strategy for mobile learning. These all can eventually increase the enhancement of mobile learning practices in Indonesia.

Nevertheless, several issues need to be addressed for better implementation of real mobile learning in Indonesia (Padmo et al. 2013). Those issues include the need for better and seamless Internet access, better and more user-friendly LMS, and most importantly higher ICT-related competencies of human resources. The last aspect is very important as the success of mobile learning depends very much on the willingness of lecturers and students to change and to try something new, on the readiness of lecturers and students to navigate the LMS, and on the ability of the lecturers to develop attractive learning materials of a high quality, that are easy to operate (Padmo et al. 2013). This seems to be in line with Topolewski et al. (2013) who mentioned that the implementation of mobile learning should be supported by a well-trained teacher who is ready to change their role as the lack of teacher training and engagement can impact negatively on the success of technology initiatives in education.

Another important aspect to be considered for future development of mobile learning in Indonesia is conducting research on mobile learning. In terms of research activities in this area, based on the study conducted by Padmo et al. (2013), the number of respondents who were involved in research on mobile learning was very low (30.4%). Research that has been conducted was focused on several issues, such as the development of teaching materials that can be accessed on mobile devices; optimising the role of libraries and websites as a medium for supporting mobile learning; development of tablet-based learning materials; and development of Mobile LMS for certain subjects. The research on mobile learning in Indonesia will provide a significant contribution to the future of mobile learning in Indonesia.

9.5 Concluding Remarks

The advancement of mobile technology has opened up and nurtured the emergence of mobile learning. Many educational institutions incorporate mobile learning into their learning systems. The ability of mobile technology in increasing learning flexibility combined with the availability of various mobile devices has been appreciated by both educational institutions and students. Nevertheless, the utilisation of mobile learning in Indonesia is still in the initial stage and is mostly used only to provide access to the digital library, to supplement or complement classroom learning, to broadcast announcements and other one-way information and administrative services. One exception is the mobile learning at Universitas Terbuka, which allows students to literally pursue their entire learning process using mobile devices since the use of mobile learning at Universitas Terbuka is fully supported by the institution's policy, in terms of funds and resources. The Universitas Terbuka allocates sufficient funds for procurement and maintenance of ICT hardware and various applications, training, and procurement of outsourced developments. With the significantly high rate of mobile penetration, which still continues to rise, supported by government policy in terms of ICT infrastructure, it is believed that the practice of mobile learning in Indonesia will continue to increase.

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Chapter 10
Analysing Mobile Learning Acceptance in the World Heritage Town of Luang Prabang, Lao PDR

Yew Siang Poong, Shinobu Yume Yamaguchi, and Jun-ichi Takada

Abstract This chapter presents an empirical investigation of mobile learning acceptance in the world heritage town of Luang Prabang, Lao PDR. Education is recognized as playing an important role in promoting awareness in many areas requiring preservation and protection. Since the inscription of Luang Prabang as a world heritage site, the rapid increase of tourist visits and development has created pressure on preservation. This study stems from the need to understand potential user behaviour prior to the implementation of mobile learning to promote World Heritage Site preservation awareness in Luang Prabang. The technology acceptance model was adopted as the theoretical framework to investigate the research objective. Further, this study evaluated the moderating role of personal innovativeness and social influence on mobile learning perceptions. Samples were drawn from students in two local higher education institutions. Quantitative data based on 334 respondents showed that perceived usefulness, perceived ease of use and perceived enjoyment directly affect behavioural intention to use mobile learning. Further, personal innovativeness and social influence moderated the relationship between perceived usefulness and behavioural intention. This study suggests that while there is high intention to adopt mobile learning among higher education students in Lao PDR, different degrees of innovativeness among the students should be taken into consideration. Also, practitioners are suggested to consider taking advantage of the strong social influence culture in Lao PDR when promoting the use of mobile learning.

Y.S. Poong (✉) • S.Y. Yamaguchi • J.-i. Takada
Tokyo Institute of Technology, Tokyo, Japan
e-mail: yspoong@ap.ide.titech.ac.jp; yamaguchi@gsic.titech.ac.jp; takada@ide.titech.ac.jp

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10.1 Introduction

The high adoption rate of mobile phones in developing countries has given rise to the potential for using mobile phones for learning purposes. Mobile phones provide opportunities for learning by overcoming physical constraints through enabling access to learning resources, regardless of place and time (Kukulska-Hulme 2010). Given these characteristics, a mobile phone is considered a potential tool for lifelong, non-formal learning activities by enabling the relation between a sense of place, identity and belonging in the context of a World Heritage Site (Paskaleva and Megliola 2010). This study stems from the need to study potential users' behaviour with regard to mobile learning prior to the implementation of mobile learning to promote World Heritage Site preservation awareness in the world heritage town of Luang Prabang, Lao Peoples' Democratic Republic (PDR).

A rapid increase in tourist visits to Luang Prabang after its inscription as a World Heritage Site has created pressure to achieve a balance between development and preservation. The Department of World Heritage (DPL), whose role is partly to promote preservation awareness, was keen to implement mobile learning for that purpose. The idea of implementing mobile learning was backed by empirical findings showing that mobile phone ownership was high in the town of Luang Prabang (Poong et al. 2013). Thus far, little research has been conducted to understand the factors affecting users' intentions to adopt mobile learning in Lao PDR. Further, Lao PDR has been recognized to be a country with a high level of uncertainty avoidance and collectivism (Dorner and Gorman 2011). Studies show that uncertainty avoidance and collectivism are related to personal innovativeness and social influence, respectively (Lee et al. 2015). Exploring individual characteristics and social influence in terms of acceptance of mobile learning will provide deeper insights into how mobile learning acceptance is affected. Consequently, the objective of this study is to investigate the determinants, as well as the moderating role of personal innovativeness and social influence, in the acceptance of mobile learning based on the technology acceptance model (TAM) proposed by Davis (1989). The remainder of this chapter is organised as follows. In the next section, the motivation which led to the need to conduct this study is described. This is followed by descriptions of the theoretical framework and methods. The results of the data analysis and hypothesis testing are then presented. Finally, the implications and limitations of this study are discussed.

10.2 Study Background

10.2.1 The World Heritage Town of Luang Prabang

Lao PDR is a landlocked country in Southeast Asia with a population of about six million people and is one of the 48 countries in the world designated as a "least developed country" by the United Nations (UNCTAD 2015). It is ranked at 134 of

166 countries in the overall information and communication technology (ICT) development index (ITU 2014). The ICT development index measures a country's ICT readiness, in terms of infrastructure and access; ICT use, in terms of intensity; ICT capability in terms of skill; and ICT impact (ITU). The latest data, for 2013, showed that despite only 9.6 % of the households have a computer, there are 66.2 mobile cellular subscriptions per 100 inhabitants (ITU 2013). One of the major economic activities of Lao PDR is tourism. Due to its unique landscape and culture, Lao PDR has two world heritage sites, one of which is the world heritage town of Luang Prabang.

The town of Luang Prabang is located at the Northern part of Lao PDR, about 400 km away from the capital, Vientiane. It is surrounded by mountainous ranges and is rich with legends related to the establishment of the town. Luang Prabang is situated at a unique site formed by the confluence of the Mekong River and Nam Khan River. The two rivers form a 300-m wide and 1-km long peninsula surrounded by gorgeous greenery. In the centre of the historic town stands the sacred Mount Phousi, which has attracted many climbers to admire the magnificent view of the city from its summit. Luang Prabang is exceptional both for its rich architectural and artistic heritage that reflects the fusion of traditional Lao urban architecture with that of the colonial era. Its remarkably well-preserved urban landscape reflects the combination of these two distinct cultural traditions. On December 9, 1995, the town of Luang Prabang was inscribed on the world heritage list, under the recognition that "the city reflects the exceptional merger of traditional architecture and European colonial urban structures from the 19th and 20th centuries. Its unique urban setting is remarkably preserved, illustrating a major step in the fusion of two different cultural traditions" (UNESCO 1995, p. 47).

Following the inscription, the number of tourist visits to Luang Prabang has been increasing rapidly. This has led to the pressure to achieve a balance between preservation and development. DPL was established to manage the world heritage town of Luang Prabang. Among the responsibilities of DPL is to ensure heritage buildings adhere to the safeguarding plan in the event of building repair and modification requested by building owners. DPL has been keen in experimenting and deploying a number of ICTs to assist in the management of the World Heritage Site, such as using geographical information systems to visualize landscape changes, implementing databases for heritage data management and building modification authorization documents (Okumura et al. 2011; Takada et al. 2008). In addition to building authorization management, another important responsibility of DPL is to promote preservation awareness among the local community. The need to promote preservation awareness was further stressed in a monitoring report in light of fear of increasing the number of buildings not adhering to the architectures depicted in the safeguarding plan (Boccardi and Logan 2008).

Empirical findings show that mobile phone ownership is the highest in relation to other computing devices, such as laptop computer and desktop computer (Poong et al. 2013). This shows that the trend of mobile phone ownership in Luang Prabang resembles the trend of mobile phone penetration at the national level. Therefore, using a mobile phone as a tool for acquiring knowledge of World Heritage Site preservation may be deemed feasible. Although college and young adults at university may not be the direct owner of heritage buildings, at this stage of study, targeting college and young adults at university is considered suitable based on the following reasons: (1) this population represents active users of mobile phones; (2) other studies have shown that children who acquired knowledge and awareness from external sources influence attitude and behaviour of their parents and family members (Ballantyne et al. 1998; Grodzinska-Jurczak et al. 2003). A similar trend has been observed in the Asian context, where there is knowledge "spillover effect" from student to household members. For instance, in Thailand, Tengtrakul and Peha's (2013) study found that adults in the household are highly likely to adopt ICT if a student member who has access to ICT technologies in school is present in the family. Although further investigation is needed, given close proximity between Thailand and Lao PDR, similar tendency is expected in Luang Prabang, in which family members and building owners will be influenced by young adults with regard to World Heritage Site preservation awareness. Nevertheless, there is a knowledge gap in understanding what the local young adults perceive about the use of mobile phone as a learning tool.

10.2.2 Contextualizing Mobile Learning

This study employs the mobile learning definition by Park et al. (2012), where mobile learning is "any educational provision where the sole or dominant technologies are handheld and palmtop devices" (p. 592). Educational context can be categorized as formal and non-formal. While formal education is a structured educational system, non-formal education refers to "any organized, systematic, educational activity carried on outside the framework of the formal system to provide selected types of learning to particular subgroups in the population, adults as well as children" (La Belle 1982, p. 162). Delors (1996) argued that non-formal education is important in developing human capabilities, improving social cohesion and creating responsible future citizens. Although non-formal education does not lead to qualifications as recognized by formal education institutions, non-formal education is recognized to contribute to areas such as social or cultural development (UNESCO 2012). Consistent with the definition, this study considers the promotion of World Heritage Site preservation awareness targeting young adults as non-formal education and therefore fits into the mobile learning definition proposed by Park et al. (2012). Mobile learning in this study refers to the use of a mobile phone to learn heritage site preservation knowledge. Specifically, the mobile phone is used as a medium to gain access to learning content developed with the aim of promoting World Heritage Site preservation awareness. The next section describes the theoretical framework evaluating users' mobile learning perceptions and the relationship between users' mobile learning perceptions, individual traits and social influence.

10.3 Theoretical Framework

10.3.1 Perceived Usefulness and Perceived Ease of Use

Figure 10.1 illustrates the theoretical framework of this study. Beliefs about a new technology tend to determine a person's attitude toward using that technology, which in turn influences his or her intention to use it. Therefore, a person's perceptions of mobile learning establish the importance and relevance of mobile learning in his or her life and fundamentally affect the adoption process. The TAM is an influential sociotechnical model which aims to explain user acceptance of an information system. Sharing the basic premises of the theory of reasoned action, TAM posits that user's behavioural intention to use information systems is determined by perceived usefulness and perceived ease of use of the system (Davis 1989). Perceived usefulness is defined as "the degree to which an individual believes that using a particular system would enhance his or her job performance" (Davis 1989, p. 320) and is posited as the direct determinant of behavioural intention. Perceived ease of use is defined as "the degree to which an individual believes that using a particular system would be free of physical and mental effort" (Davis 1989, p. 320). Perceived ease of use is theorized to predict both perceived usefulness and behavioural intention (Venkatesh and Davis 1996). Literature shows that TAM is robust in technology adoption explanation, especially in voluntary settings (Lee and Lehto 2013). Some researchers argue the need to study the actual use of technology. However, Venkatesh et al. (2003), as well as Simon and Paper (2007), note that behavioural intention is a valid predictor of actual technology use, especially when the use of technology is voluntary. Studies have shown that both perceived usefulness and perceived ease of use affect mobile learning adoption (Chung et al. 2015; Tan et al. 2012). Therefore, the following hypotheses were proposed for this study:

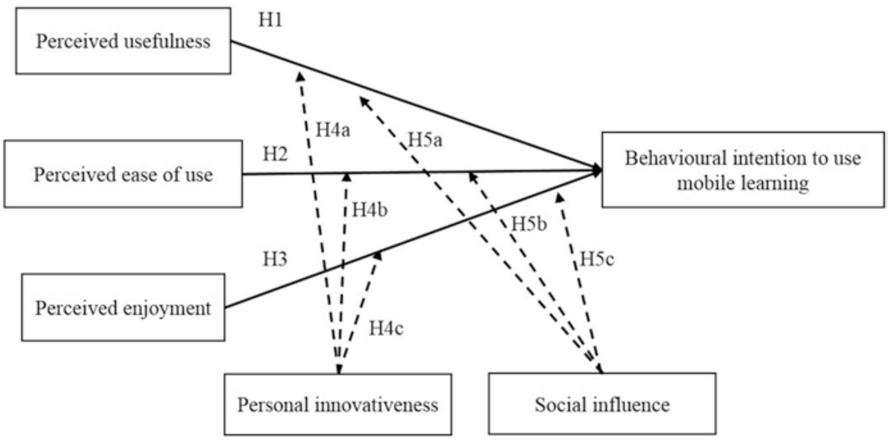

Fig. 10.1 Theoretical framework of this study

H1: Perceived usefulness affects behavioural intention to use mobile learning among young adults in Luang Prabang

H2: Perceived ease of use affects behavioural intention to use mobile learning among young adults in Luang Prabang

10.3.2 Perceived Enjoyment

Intrinsic motivation refers to the motivation that comes from inside an individual rather than external or outside reward. For instance, an individual is said to gain intrinsic motivation when the individual feels pleasure in the process of performing some action. Perceived enjoyment, defined as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use", is conceptualized as system specific intrinsic motivation (Venkatesh 2000, p. 351). Heijden (2004) found that perceived enjoyment is an important determinant for systems designed with fun in mind or hedonic systems. Studies have shown that perceived enjoyment affects behavioural intention to use mobile learning (Cheng 2014; Yang 2013). We expect perceived enjoyment will influence young adults' intention to use a mobile phone for learning. Hence, a related hypothesis was proposed:

H3: Perceived enjoyment affects behavioural intention to use mobile learning among young adults in Luang Prabang.

10.3.3 Personal Innovativeness

Dorner and Gorman (2011) findings suggest that Lao is a high uncertainty avoidance society. Uncertainty avoidance refers to the level of risk accepted by an individual (Lee et al. 2015). The level of uncertainty avoidance can be inferred from an individual's emphasis of their own rule of obedience and ritual behaviour (Hofstede 2000). As a traditional town, people in the world heritage town of Luang Prabang have strong beliefs in Buddhism. Traditional rituals, such as *basi*, which is a traditional prayer conducted by monks in households, and the belief that a person must be a monk at least once in a lifetime, are still well practised. Thus, the community in the town of Luang Prabang may exhibit a high level of uncertainty avoidance. According to Agarwal and Prasad (1998), people who are more prone to take risk have higher intentions to use new information technology. This notion is known as personal innovativeness and is defined as "the willingness of an individual to try out any new information technology" (Agarwal and Prasad 1998, p. 206). Studies show that uncertainty avoidance and personal innovativeness are negatively related (Thatcher et al. 2003). Given that personal innovativeness is one of the variables that potentially affect how people respond to innovations (Jeong et al. 2008), this study intends to investigate the moderating effect of personal innovativeness with regard to mobile learning acceptance. Existing studies indicate that personal innovativeness moderates mobile learning perceptions (Cheng 2014). Accordingly, this study hypothesized that:

H4a: Personal innovativeness will moderate perceived usefulness of mobile learning among young adults in Luang Prabang
H4b: Personal innovativeness will moderate perceived ease of use of mobile learning among young adults in Luang Prabang
H4c: Personal innovativeness will moderate perceived enjoyment of mobile learning among young adults in Luang Prabang

10.3.4 Social Influence

Social influence in technology adoption refers to an individual's belief that important others (for example family and friends) believe they should use a particular technology (Venkatesh et al. 2012). Social influence is a determining factor for technology acceptance, including mobile learning (Tan et al. 2012; Venkatesh et al. 2012). As argued by López-Nicolás et al. (2008), people's perceptions and behaviour are affected by the information they receive from the social environment. In an empirical study, they found that social influence affects beliefs about perceived usefulness and perceived ease of use, as modelled in TAM, in addition to other perceptions related to technology acceptance (López-Nicolás et al. 2008). Similar findings have been reported in mobile learning contexts, where social influence affects perceived usefulness (Park et al. 2012). Findings from Dorner and Gorman (2011) suggest that Lao society is a high collectivism society. A high collectivism society emphasizes the group's identity and stresses group goals over individual goals (Lee et al. 2015). While it requires further investigation in the Lao context, in other places, social influence has been an influencing factor in shaping individual's intention to use technology, including mobile learning (Venkatesh et al. 2000; Wang et al. 2009). Hence, there remains a knowledge gap with regard to the extent to which social influence affects mobile learning acceptance among the society in Luang Prabang. Following evidence in the literature showing that social influence may affect individual perceptions, this study hypothesized that:

H5a: Social influence will moderate perceived usefulness of mobile learning among young adults in Luang Prabang
H5b: Social influence will moderate perceived ease of use of mobile learning among young adults in Luang Prabang
H5c: Social influence will moderate perceived enjoyment of mobile learning among young adults in Luang Prabang

10.4 Methodology

A questionnaire was administered in March 2012 at two local higher education institutions in Luang Prabang which consisted of demographic questions and mobile learning perception questions. Perception questions were adapted from the literature and were measured using five-point Likert scale (1 = strongly agree to 5 = strongly disagree). Items for perceived usefulness, perceived ease of use and perceived enjoyment were adapted from Davis (1989), Heijden (2004) and Park et al. (2012). Items for personal innovativeness were adapted from Agarwal and Prasad (1998) and Cheng (2014), and items for social influence were adapted from Venkatesh (2000) and Wang et al. (2009).

The questionnaire was reviewed by DPL professionals to ensure face validity and was then translated into the Lao language. Initially, there were three question items for each construct. However, the translation from English to the Lao language resulted in a reduction in question items due to less word differentiation in the Lao language. Pilot testing was carried out with ten staff members in DPL to ensure questionnaire validity. The refined questionnaire was then sent to a university representative for review. The final questionnaire adapted in this study is shown in Appendix A. Each construct was represented by two question items except perceived ease of use and perceived enjoyment, which were represented by three question items.

10.5 Data Analysis

Before questionnaire distribution, the idea of a mobile learning application to promote World Heritage Site preservation awareness was explained to the students by DPL experts in the Lao language. A total of 484 questionnaires were distributed, and a total of 199 out of 200 questionnaires were returned from Souphanouvong University, while 244 out of 284 questionnaires were returned from Northern Law College, yielding a total response rate of 99.5 % and 86 %, respectively. Questionnaire validation was performed on collected questionnaires to ensure completeness of answered questionnaires. Questionnaires with blanks in the mobile learning perception section were discarded. Finally, a total of 334 returned questionnaires were deemed acceptable for the purpose of data analysis.

10.5.1 Respondents' Demographic

Table 10.1 shows respondents' demographic profile, covering gender, age, level of study, owned devices and the use of computing devices for learning. A total of 213 males and 121 females participated in the survey, the majority of whom were in the

Table 10.1 Respondent demographic profile

Item	Options	Frequency	Percentage (%)
Gender	Male	213	63.8
	Female	121	36.2
Age	15–19	62	18.6
	20–24	240	71.9
	25–29	23	6.9
	>29	4	1.2
	No answer	5	1.5
Level of study	Foundation	1	0.3
	Year 1	48	14.4
	Year 2	4	1.2
	Year 3	67	20.1
	Year 4	188	56.3
	Year 5	26	7.8
Owned devices (multiple responses)	Laptop	175	32.6
	Mobile phone	327	60.9
	Desktop PC	24	4.5
	Tablet	11	2.0
Device used for learning (multiple responses)	Laptop	213	56.5
	Mobile phone	99	26.3
	Desktop PC	42	11.1
	Not using	23	6.1

age between 20 and 24 years old ($N = 240$) and were studying in year 4 ($N = 188$). The multiple response results show that the number reporting mobile phone ownership ($N = 327$) was almost twice the number reporting laptop ownership ($N = 175$). With regard to the type of device that was used for learning, the result shows the number of users of laptops ($N = 213$) was greater than for mobile phones ($N = 99$).

10.5.2 Scale Item Reliability and Validity

Reliability of the questionnaire was measured by Cronbach's alpha (Cronbach's α). The Cronbach's α scores of each dimensional scale are as follows: perceived usefulness (USE) at 0.764, perceived ease of use (EASE) at 0.763, perceived enjoyment (ENJOY) at 0.757 and behavioural intention to use (INTENT) at 0.712. This indicates that the questionnaire has sufficient homogeneity (internal consistency) by exceeding the acceptable coefficient alpha of 0.70 (Anderson and Gerbing 1984; Lee 2010). Table 10.2 shows the reliability analysis of the constructs. Following reliability assessment, validity assessment was conducted using factor analysis to determine whether the questionnaire items were measuring the intended underlying constructs. The first step was to evaluate Kaiser-Meyer-Olkin (KMO) index to determine

Table 10.2 Reliability, mean, standard deviation and factor loadings of each construct

Construct	Items	Cronbach alpha	Factor loadings	Mean	SD
USE	USE1	0.764	0.819	1.991	0.8664
	USE2		0.894		
EASE	EASE1	0.763	0.784	1.897	0.6852
	EASE2		0.843		
	EASE3		0.737		
ENJOY	ENJOY1	0.757	0.799	1.824	0.6614
	ENJOY2		0.764		
	ENJOY3		0.765		
INTENT	INTENT1	0.712	0.777	1.908	0.7091
	INTENT2		0.889		

whether the data were fit for factor analysis, indicated by a KMO value greater than 0.60 and a statistically significant Bartlett's sphericity (Uzunboylu and Ozdamli 2011). This was followed by the examination of the factor loadings under principal component analysis with varimax rotation. The minimum acceptable factor loading on the underlying construct is 0.5 (Tan et al. 2012). Results for each index are reported next.

A KMO index of 0.819 was achieved with a statistically significant Bartlett's sphericity ($\chi^2 = 1{,}053$, $p = 0.000$) which was greater than the recommended threshold, suggesting that the data were suitable for factor analysis. A total of four components were extracted with Eigenvalue greater than 1 under principal component analysis. Inspection of the rotated component matrix revealed that each item loaded onto the respective underlying construct, with loadings ranging from 0.737 for item 3, "perceived ease of use", to 0.894 for item 2, "perceived usefulness". No items were dropped as all items had loadings greater than the 0.5 recommended threshold. Table 10.2 shows the Cronbach's alpha for each construct, factor loadings for each item and mean value and standard deviation (SD) for each construct.

10.5.3 Multiple Regression Analysis

Multiple regression analysis was conducted to analyse the relationship between mobile learning perceptions and behavioural intention to use mobile learning. Results showed that perceived usefulness ($\beta = 0.175$, $t = 3.251$), perceived ease of use ($\beta = 0.227$, $t = 4.198$) and perceived enjoyment ($\beta = 0.231$, $t = 4.085$) had statistically significant positive effects on behavioural intention to use mobile learning. The total variance explained (R^2) was 0.242, suggesting that the independent variables explained 24.2 % of the variance in behavioural intention to use mobile learning among the respondents. A multicollinearity test showed that VIF for each independent variable ranged between 1.256 and 1.390, suggesting that there were no multicollinearity problems in this study. Table 10.3 shows the results of multiple regression analysis.

Table 10.3 Results of multiple regression analysis

Model		Unstandardized coefficients		Standardized coefficients			Collinearity statistics	
		B	Std. Error	Beta	*t*	Sig.	Tolerance	VIF
1	(Constant)	0.707	0.122		5.796	0.000		
	USE	0.146	0.045	0.175	3.251	0.001	0.790	1.265
	EASE	0.239	0.058	0.231	4.085	0.000	0.719	1.390
	ENJOY	0.243	0.058	0.227	4.198	0.000	0.784	1.276

Dependent variable: Behavioural intention to use mobile learning

Table 10.4 Result of multigroup regression analysis moderated by personal innovativeness

	Moderator: personal innovativeness			
	Low personal innovativeness		High personal innovativeness	
Constructs	Standardized coefficient	*T*-value	Standardized coefficient	*T*-value
USE	0.103	1.435	0.260**	3.124
EASE	0.134	1.767	0.332***	4.329
ENJOY	0.262***	3.493	0.153	1.750

Dependent variable: Behavioural intention to use mobile learning, $^{**}p \leq 0.01$, $^{***}p \leq 0.001$

Table 10.5 Result of multigroup regression analysis moderated by social influence

	Moderator: social influence			
	Low perceived social influence		High perceived social influence	
Constructs	Standardized coefficient	*T*-value	Standardized coefficient	*T*-value
USE	−0.015	−0.162	0.240***	3.672
EASE	0.240**	2.627	0.213***	3.219
ENJOY	0.223*	2.334	0.230***	3.345

Dependent variable: Behavioural intention to use mobile learning, $^{*}p \leq 0.05$, $^{**}p \leq 0.01$, $^{***}p \leq 0.001$

10.5.4 Moderator Effects

In the first step, multigroup analysis was conducted by median splitting the moderating variables (Cheng 2014). Both personal innovativeness (INNOV) and social influence (SOCIAL) were separated into high and low groups, according to the sample median. Table 10.4 shows the result of multiple regression based on high and low personal innovativeness groups, and Table 10.5 shows the result of multiple regression based on high and low social influence groups.

Analysis showed that there were differences among the perceptions of mobile learning between groups with low personal innovativeness and high personal innovativeness. In the group with low personal innovativeness, only perceived enjoyment ($\beta = 0.262$, $t = 3.493$) affected behavioural intention to use mobile learning. On the other hand, perceived usefulness ($\beta = 0.260$, $t = 3.124$) and perceived ease of

Table 10.6 Result of two-way interaction multiple regression analysis moderated by personal innovativeness

Model		Unstandardized coefficients		Standardised coefficients		
		B	Std. Error	Beta	*t*	Sig.
1	(Constant)	1.874	0.034		54.656	0.000
	Std. USE	0.080	0.038	0.113	2.094	0.037
	Std. ENJOY	0.138	0.039	0.195	3.559	0.000
	Std. EASE	0.149	0.040	0.211	3.781	0.000
	Std. INNOV	0.052	0.039	0.073	1.339	0.182
	INNOVxUSE	0.135	0.036	0.272	3.804	0.000
	INNOVxEASE	0.016	0.033	0.032	0.478	0.633
	INNOVxENJOY	−0.057	0.031	−0.123	−1.824	0.069

use (β = 0.332, t = 4.329) affected behavioural intention to use mobile learning in the group with high personal innovativeness.

Further analysis showed that there were differences in the perceptions of mobile learning between groups with low perceived social influence and high perceived social influence. In the group with low perceived social influence, behavioural intention to use mobile learning was affected by perceived ease of use (β = 0.240, t = 2.627) and perceived enjoyment (β = 0.223, t = 2.334). On the other hand, behavioural intention to use mobile learning is affected by perceived usefulness (β = 0.240, t = 3.672), perceived ease of use (β = 0.213, t = 3.219) and perceived enjoyment (β = 0.230, t = 3.345) in the group with high perceived social influence.

10.5.5 Simple Slope Analysis

In order to visualize the pattern of interaction effects, simple slope analysis following the approach of Aiken and West (1991) was adopted. First, two-way interaction multiple regression analysis was conducted by obtaining the standardized values of independent variables and the moderators. The standardized independent variables and moderator were entered into the regression equation. Subsequently, interaction terms were entered into the regression equation. Interaction terms were computed by multiplying the standardized independent variables with the standardized moderator. Table 10.6 shows the result of two-way interaction multiple regression analysis moderated by personal innovativeness. Analysis indicated that the regression model was statistically significant with R^2 = 0.300. The interaction term between perceived usefulness and personal innovativeness was statistically significant (β = 0.272, t = 3.804), suggesting personal innovativeness moderated the relationship between perceived usefulness and behavioural intention to use mobile learning.

Table 10.7 Result of two-way interaction multiple regression analysis moderated by social influence

Model		Unstandardized coefficients		Standardised coefficients		
		B	Std. Error	Beta	*t*	Sig.
1	(Constant)	1.838	0.033		55.250	0.000
	Std. USE	0.033	0.038	0.047	0.877	0.381
	Std. ENJOY	0.113	0.037	0.159	3.036	0.003
	Std. EASE	0.148	0.039	0.208	3.773	0.000
	Std. SOCIAL	0.070	0.036	0.098	1.920	0.056
	SOCIALxUSE	0.193	0.037	0.361	5.274	0.000
	SOCIALxEASE	−0.014	0.039	−0.023	−0.362	0.718
	SOCIALxENJOY	−0.002	0.031	−0.005	−0.081	0.935

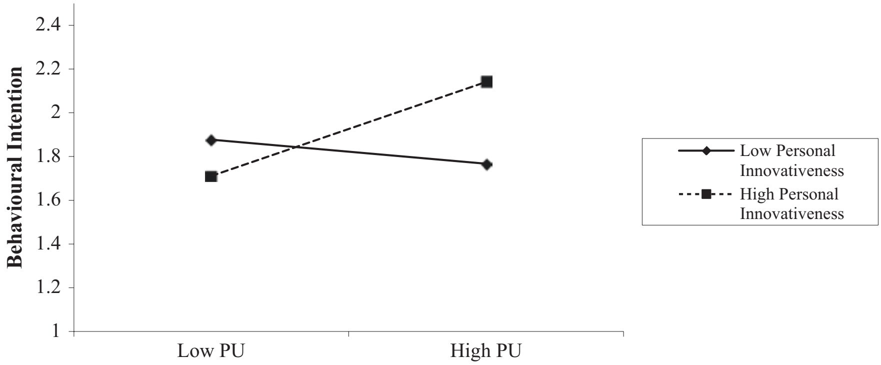

Fig. 10.2 Effects of perceived usefulness by personal innovativeness interaction on behavioural intention to use mobile learning

Next, Table 10.7 shows the result of two-way interaction multiple regression analysis moderated by social influence. Analysis indicated that the regression model was statistically significant with $R^2 = 0.361$. The interaction term between perceived usefulness and personal innovativeness was statistically significant ($\beta = 0.361$, $t = 5.274$), suggesting that social influence moderated the relationship between perceived usefulness and behavioural intention to use mobile learning.

Coincidently, two-way interaction multiple regression analysis demonstrated that personal innovativeness and social influence moderated the relationship between perceived usefulness and behavioural intention to use mobile learning. Based on the standardized statistics, moderator effects were plotted as shown in Fig. 10.2 for personal innovativeness and Fig. 10.3 for social influence. Given that the lines are not parallel, it can be concluded that there was an interaction effect of personal innovativeness on the relationship between perceived usefulness and behavioural intention to use mobile learning. Specifically, at low levels of perceived usefulness, respondents with low personal innovativeness had higher behavioural

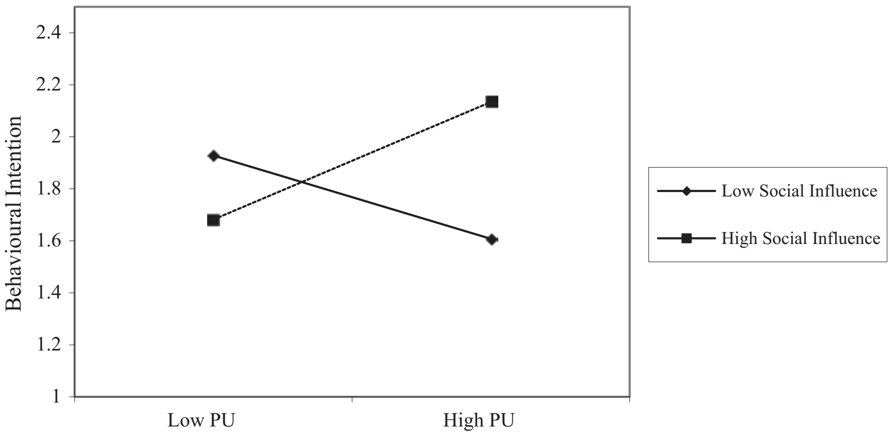

Fig. 10.3 Effects of perceived usefulness by social influence interaction on behavioural intention to use mobile learning

intention to use mobile learning than those who had personal innovativeness. However, the difference is not large. Conversely, at high levels of perceived usefulness, high personal innovativeness respondents had higher behavioural intention to use mobile learning than low personal innovativeness respondents. Differences between the two groups based on personal innovativeness were larger at high levels of perceived usefulness than low levels of perceived usefulness.

Similar trends can be observed in the moderating effect of social influence. Given that the lines are not parallel; it can be concluded that there was an interaction. The graph reveals that at low levels of perceived usefulness, respondents with low perceived social influence have higher behavioural intention to use mobile learning than those with high perceived social influence. However, the difference was smaller compared to the outcome at high levels of perceived usefulness. At high levels of perceived usefulness, respondents with high levels of perceived social influence had higher behavioural intention to use mobile learning than those with low perceived social influence.

Multiple regression analysis showed that the relationships between perceived usefulness, perceived ease of use and perceived enjoyment with behavioural intention were found to be statistically significant; therefore, H1, H2 and H3 were supported. Further, moderator analysis found there were interaction effects exhibited by personal innovativeness and social influence; hence, H4a and H5a were supported. Hypotheses H4b, H4c, H5b and H5c were not supported as there were no interaction effects found for personal innovativeness and social influence on perceived ease of use and perceived enjoyment. Discussion of the result is presented next.

10.6 Discussion

Understanding potential users' behaviour is important in the process of technology implementation, such as mobile learning (Magni et al. 2010; Tan et al. 2014). Motivated by the need to implement mobile learning for the promotion of World Heritage Site preservation awareness, this study investigated the factors affecting mobile learning acceptance among the young adults in the world heritage town of Luang Prabang, Lao PDR, based on the TAM. The results showed that perceived usefulness, perceived ease of use and perceived enjoyment influence behavioural intention to use mobile learning. This finding is consistent with other mobile learning literature (Tan et al. 2014). Among the three perceptions, perceived ease of use appeared to be the strongest determinant of behavioural intention to use mobile learning, followed by perceived enjoyment and perceived usefulness.

In addition to direct factors, this study examined two moderating variables, derived based on the cultural characteristic of Lao people. First, personal innovativeness was found to moderate the relationship between perceived usefulness and behavioural intention to use mobile learning. Specifically, there was a significant difference in behavioural intention to adopt mobile learning between young adults with high and low personal innovativeness when perceived usefulness was high. Empirical evidence of a moderation effect in mobile learning adoption is scarce as many studies have investigated only the direct effect of personal innovativeness on perceptions as well as behavioural intention (Gerow et al. 2010; Park et al. 2012; Tan et al. 2012). Nevertheless, the findings of this study are consistent with the claim by Agarwal and Prasad (1998) that personal innovativeness moderates technology perceptions, such as perceived usefulness. As presented in the literature review section, evidence from literature indicates that there is high uncertainty avoidance culture among the society of Lao PDR. A society with high uncertainty avoidance exhibits low innovativeness (Mangundjaya 2011). However, the findings from this study show that there are variations in how personal innovativeness affects young adults' mobile learning acceptance, especially with regard to perceived usefulness of mobile learning. This shows that young adults who are willing to try out new technologies and who have a high level of favourable beliefs about mobile learning usefulness will have higher tendency to adopt mobile learning than those who have less willingness to try out new technologies at the same level of perceived usefulness.

This study also found an interaction effect of social influence on behavioural intention to use mobile learning among the young adults in Luang Prabang, albeit only perceived usefulness was statistically significant. Based on the result of this study, as perceived social influence gets stronger, the power of perceived usefulness affecting behavioural intention to use mobile learning also increases. There appear to be limited empirical studies reporting the moderating effect of social influence in the context of mobile learning acceptance. However, the finding of this study is consistent with studies in other domains showing that social influence moderates perceptions of technology acceptance (Lee et al. 2011). A possible explanation could be related to the strong collectivist culture in Lao PDR. Hwang and Kim (2007) conducted a study examining collectivist culture and social influence in the context of technology-mediated learning. They found that a collectivist society has a positive relationship with social influence. In other words, individuals in a society with tightly coupled networks would adhere to the salient norms of the society. The literature review confirmed that social influence is strong in Lao PDR. It could be inferred that the environment of the young adults in this sample may be supportive towards the use of technology. This kind of environment may be coming from the influence of teachers, lecturers and friends. Although requiring empirical support, influence from Thailand (an upper-middle income economy country) through television and commercial programs may also be a possible factor towards a more technologically open society, which may strengthen perceived usefulness, and eventually higher intention to adopt new technology among Lao communities.

10.6.1 Implications for Research

This study has contributed to an understanding of the factors affecting mobile learning acceptance among the young adults in Luang Prabang, Lao PDR. The main contribution is the empirical validation of TAM in the context of Lao PDR. Another important contribution of this research is the placement of fundamentally important variables – personal innovativeness and social influence – as moderators of mobile learning acceptance. The investigation of mobile learning acceptance through the moderators of personal innovativeness and social influence provides a deeper understanding about what may alter the strength of beliefs related to mobile learning adoption. In particular, the moderators are derived based on the cultural characteristics of Lao PDR, namely, uncertainty avoidance and collectivism. Therefore, this research has provided a glimpse into the effect of culturally related variables affecting mobile learning adoption among the young adults in Lao PDR.

10.6.2 Implications for Policy

Given the proliferation of mobile phone possession in developing countries, using mobile phones for learning is a promising approach to meet the needs of practitioners involved in education. Results suggest that practitioners should create and foster positive perceptions of mobile learning among the young adults in Luang Prabang because perceived usefulness, perceived ease of use and perceived enjoyment were directly related to behavioural intention to use mobile learning. In addition, practitioners should also pay attention to individual differences towards technology adoption. Drawing from the moderating effect of personal innovativeness on perceived usefulness, mobile learning practitioners should consider promoting the usefulness of mobile learning to young adults who are willing to try new technology. Following the theory of personal innovativeness, these pioneers can act as change agents and opinion leaders for mobile learning implementation. This can be an incentive to the diffusion of mobile learning as Lao PDR is culturally high in collectivism. These results support the hypothesis that social influence moderates mobile learning acceptance. For young adults with high perceived social influence, developing strategies to increase favourable beliefs towards mobile learning usefulness can be a more effective way to encourage mobile learning adoption.

10.6.3 Implications for Pedagogy

Results of this study indicate that there is a high degree of intention to adopt mobile learning among higher education students in Lao PDR. At the same time, investigation identifies that there is more work to be done to facilitate the implementation of mobile learning in education institutions. First, educators need to acknowledge the different degrees of innovativeness among students. Authors' fieldwork experience showed that while smartphone ownership among students was high, there was a distinct difference in how students utilized the smartphones. In view of this, educational institutions' support for educators in integrating appropriate pedagogy to use mobile learning is vital for its effective use. Second, the analysis shows that demonstrating mobile learning usefulness can be one of the strategies to increase the success rate of its implementation in schools. This can be done by demonstrating mobile learning characteristics, such as interactivity, portability and mobility to support learning subjects. Another discovery of this study suggests that mobile learning can be useful in curriculum involving collaborative learning, given strong social influence in communities of Lao society.

10.6.4 Limitations and Future Research

Several limitations of this study should be mentioned, which call for future research. First, the sample of this study may not be generalizable to the population of young adults in Lao PDR. The sample of this study was college and university students, who are educated and therefore may possess a positive attitude towards technology acceptance. Future research should acquire samples outside of educational institutions in order to better represent the drivers of mobile learning acceptance in Lao PDR. Second, since perceived usefulness, perceived ease of use and perceived enjoyment together explain only 24.2 % of the variance in behavioural intention to use mobile learning, effort should be made to also examine other contributing factors. Third, this study did not directly evaluate cultural variables but inferred cultural variables through personal innovativeness and social influence concepts. Future research should incorporate cultural dimensions to provide insights on the impact of Lao culture in mobile learning acceptance.

10.7 Conclusion

This chapter illustrated a specific example of mobile learning acceptance with over 300 higher education students in Luang Prabang. This chapter has advanced the knowledge of mobile learning acceptance among higher education students in higher education context in Lao PDR. The findings from this chapter are expected to benefit practitioners and policy makers in integrating mobile learning to improve the quality of learning in neighbouring countries in Asia, as well as countries with similar context.

Appendix A: Measurement Items

Construct	Items
Perceived usefulness	1. I think using mobile phone for learning is useful in increasing my knowledge of preserving World Heritage Site
	2. I think using mobile phone for learning can increase my understanding to preserve World Heritage Site
Perceived ease of use	1. I think it is easy for me to learn how to use mobile phone for learning
	2. I think I can use mobile phone for learning in a short time
	3. I think it is easy to use mobile phone for learning
Perceived enjoyment	1. I think using mobile phone for learning will be interesting
	2. I think it is fun to use mobile phone for learning
	3. I think using mobile phone for learning will stimulate my curiosity
Personal innovativeness	1. I think it is very interesting to try new information technologies
	2. I like to experiment with new information technologies
Social influence	1. I think people who are important to me think that I should use mobile phone for learning
	2. I think my friends think that I should use mobile phone for learning
Behavioural Intention	1. In the future, I intend to use mobile phone for learning
	2. I plan to use mobile phone for learning in the future

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Chapter 11
Creating Apps: A Non-IT Educator's Journey Within a Higher Education Landscape

Emelyn Sue Qing Tan and Yuen Jien Soo

Abstract Our journey into mobile application (app) creation was instigated by the realisation that the learning of certain concepts and content could be significantly improved by technology-enhanced educational methods over traditional methods. A ubiquitous platform to place these educational tools are on mobile devices as apps. Our four phases of mobile app development were conceptualisation, content gathering, development and implementation and evaluation, which are extensively elaborated within this chapter. The main intention of this chapter is to provide non-information technology (non-IT), content expert educators with technical insights to create their own apps specific for the content they teach, in collaboration with computing trained educators, both within the context of a higher education institute. The two app examples discussed throughout this chapter are "SYM MO" (symmetry and molecular orbital theory) and "SM2 Chem" (Chinese-English translations of Chemistry terms), which were both developed by the authors. At present, "SM2 Chem" is the more popular app between the two, with an upward total count of 800 downloads per year; an acceptable number given the class size is approximately 100 per year. Apart from download counts, evaluation on the impact of this app was carried out with a pretest and an identical post-test at the start and end of the course, respectively. Students who used the app very frequently/frequently showed an improvement that was a significant threefold greater than those who used the app rarely/very rarely. Further evaluations are essential to prove that the learning of the concepts and content using the developed apps is indeed better than traditional methods.

E.S.Q. Tan (✉) • Y.J. Soo
National University of Singapore, Singapore, Singapore
e-mail: emelyntan@nus.edu.sg; sooyj@comp.nus.edu.sg

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11.1 Introduction

Of the learning approaches in psychology, the cognitive approach is one of the most prominent in the study of Science, Technology, Engineering and Math (STEM). Cognitivism is the study of mental processes, including perception, thinking, memory and judgements (Stangor 2014). More specifically, spatial visualisation abilities are positively related to performance on STEM tasks (Hinze et al. 2013). With learning of Chemistry, a positive correlation exists between students' visual-spatial abilities and their performance in problem-solving and good three-dimensional (3D) visualisation tools enhance students' understanding of molecular structure (Raiyn and Rayan 2015). Visualisation tools promote the formation of mental models or images in students' minds, such as tools that depict particle behaviour during chemical processes and better connect particulate natures of the chemical phenomena (invisible to the human eye) and the macroscopic (visible to the human eye) (Williamson 2011). Visualisation tools that are preferred by undergraduate university students are 3D computerised models or 3D photographs of molecules over other representations such as plastic models or two-dimensional (2D) stereochemical formulas (Tuvi-Arad and Gorsky 2007).

Along with spatial visualisation abilities, knowledge and understanding of scientific language is a necessary factor for understanding Chemistry as a subject. For most students, scientific language represents a new, foreign-seeming language (Markic 2015). This difficulty is essentially doubled for English as a Second Language (ESL) speakers who are learning Chemistry terms in English. Recommended approaches to teaching Chemistry to ESL speakers include using vocabulary and technology (Kimbrough and Cooper 2009). Vocabulary lists should be accompanied with pronunciation and images and incorporated into conversations and writing. Many students find access to technology highly motivating and one reason is that it requires minimal reading or prior instruction while allowing students to learn the Chemistry content. The use of technology also allows for differentiated instruction, offering multiple platforms of representation to meet students' diverse needs (Kimbrough and Cooper 2009).

As an educator within the Chemistry discipline at the National University of Singapore (NUS), concepts and content that could be taught by leveraging mobile technology, specifically apps, were identified. Here, app is short for an application that a software performs when installed on a mobile device. For example, with respect to molecular symmetry, are the students able to view the water molecule in 3D and can they touch a button so that the water molecule reflects through a vertical plane? For ESL students, could the more than 1,000 chemical terms from their lecture notes, together with translations, audio recordings for pronunciation, and images, be accessible anywhere, anytime? Such problems are difficult to solve using traditional methods such as a physical model and a glossary textbook, respectively.

But why specifically apps? The motivation for creating apps for educational purposes was driven by four factors. First, apps on mobile devices allow an anywhere and anytime learning experience (Oller 2012; Sharples et al. 2007). Second, compared to textbooks and lecture notes which can be considered static, apps can be made dynamic as they incorporate animations, real-life videos, audio and interactivity (touch and response). Third, apps allow customised, personalised and situated learning (Jeng et al. 2010). For example, an app can consolidate information pertinent to the topic or course, which can be quickly searchable in class. Finally, the education value of an app is scalable to reach more students over time and locations (United Nations Educational, Scientific and Cultural Organisation [UNESCO] 2013). Once created, apps can be used for several cohorts over the years and since apps are readily available to any smartphone user with internet connectivity, it is not restricted to only one educational institution. With apps being a relatively recent educational tool, much of the literature focuses on educators recommending subject based, educational apps to students rather than assessing the educational effectiveness of apps. Addressing the question of the effectiveness of apps in helping students learn the subject would eventuate as usage of this innovative tool becomes widespread in teaching and learning (Jameson 2013; Rogers 2003).

App creation mimics the "traditional" software development life cycle phases which include requirements, design, develop, test and maintenance (Inukollu et al. 2014; Sommerville 2015). In this chapter, our journey of app creation with its phases, peaks, valleys and plateaus is charted out. Implementation and assessment of the app's educational value is also briefly covered. The value our experience adds to the current app creation landscape is that non-IT, content expert educators are able to create their own apps within the context of a higher education institute. The intention is that this chapter would be technically useful to other educators who would like to embark on their own adventure into app creation at their universities.

11.2 The Beginning

This section begins with funding and the reason is twofold. Firstly, when funding opportunities come from the top governing body of the university, support from multiple divisions within the university, such as the Centre of Instructional Technology and Computer Centre, were readily rendered. This is in line with a culturally embedded top-down management style in Singapore, where staff and students are more receptive towards direction coming from the top-down (Hogan 2014). Secondly, pragmatically, for non-IT educators who have little app programming knowledge, funds were needed to pay app programmers.

The journey began in December 2012 when our university's Office of the Provost invited all NUS Teaching Staff to apply for the inaugural Learning Innovation Fund – Technology (LIFT) 2013. LIFT is a grant that provides monetary support for projects that promote the integration of technology-enhanced education in NUS. Its goals are threefold – (i) encourage educators to rethink the way they design their curriculum and structure and deliver lessons and manage the changed roles of educators and students in a technological context; (ii) improve the capacity of educators to integrate technology effectively into curricula and instruction; and (iii) expose students to new forms of teaching with an emphasis on higher skills development and collaborative/team-based learning.

The prelude to the LIFT grant was at the State of the University Address on 12 October 2012. At this annual event, the NUS President announced the establishment of a $5 million funding pool, called LIFT or "Learning Innovation Fund-Technology" to support technology-enhanced learning at NUS (Tan 2012). He consistently highlighted the need to create a learning environment where students are encouraged and challenged to think about issues differently, to question assumptions and to explore novel approaches, to acquire twenty-first-century skills for the global knowledge economy. Recognising that technology is and will continue to be a driving force in workplaces, communities and personal lives in the twenty-first century, an appropriate institutional response to move towards a technology-enhanced education is essential (Tan 2012).

The lead author had 6 years of teaching experience in undergraduate Chemistry by 2012 and had identified certain concepts and content that could be better taught by leveraging mobile technology. However, with expertise limited to content knowledge and its communication; the glaring gap was technical and computing capabilities. The question was where to find app programmers. Cross department collaborations did not easily eventuate as academics typically work in silos striving to rise to the top of their specialised fields. Serendipitously, a meeting occurred between the co-author from Computer Science and the lead author on an immersion trip. The motivation for him and the School of Computing students we work with is that the Department of Chemistry students for which the apps are built for provide a large user database for their creations, which they normally may not have. Additionally, rather than having to self-search for content and data to build an app around, the Department of Chemistry would also provide these. Hence, a mutually rewarding LIFT grant application titled "Creating Chemistry-related Mobile Apps" was submitted in February 2013.

The rationale for our project arose from the observation that students learn from multiple platforms, from lectures, textbooks, the internet and now more commonly on their mobile devices such as phones and tablets. They use their mobile devices for several hours a day, and it is one of the preferred platforms for education resources (Tan and Teo 2015). These education resources are accessed on the go, especially when students are travelling, anywhere and anytime.

The deliverables of the 3-year project were up to five mobile apps, each available for free on both the Apple App Store and Google Play Store. This meant that each app had to be developed separately with the Apple version developed using the "Xcode" programme on iOS and the Android version using the "Eclipse" programme on Windows or iOS. A quantitative gauge of the reception of our created apps is download count. Considering that the Department of Chemistry cohort by year is 200–250, the ownership share is approximately 50:50 between Apple and Android and projecting that 80% of students would download the apps, a conservative number for expected total downloads for each app would be 160 downloads per academic year, i.e. 80 downloads from Apple App Store and 80 from Google Play Store.

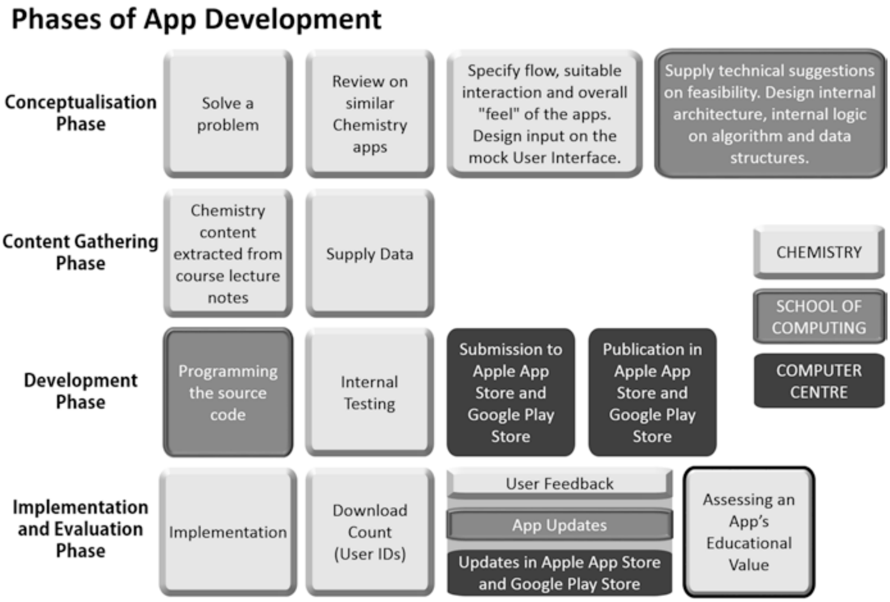

Fig. 11.1 Phases of app development

The project was approved in May 2013 and funds allocated to the project were primarily for the payment of Undergraduate Student Researchers. The funding amount was calculated from the estimated number of hours required to create two versions of each app which was 160 h for Department of Chemistry and 300 h for School of Computing (split evenly between both versions).

11.3 Phases

This section journals through our four phases of app development (Fig. 11.1), namely, conceptualisation, content gathering, development and implementation and evaluation. The four phases closely resemble a typical software development process, namely, requirement gathering, analysis, design and testing (Sommerville 2015). In the first phase, *conceptualisation*, content expert educators identified specific concepts and content for which the use of apps would be significantly valuable in its teaching and learning, compared to traditional methods. After identification of such content, an app user interface that aids guided self-learning was designed. Following this was the meticulous, tiresome process of *content gathering* including text, images and audio. The content gathering phase carried out by the discipline expert was in tandem with the *development* phase that was largely undertaken by the app programmers. Multiple iterations of the app were exchanged with several rounds of internal testing prior to deployment to the two app stores. Implementation involving recommendations to student users, app demos and use in class and pre-tests and post-tests together with surveys to assess the educational value of the created apps, were undertaken in the *implementation and evaluation* phase.

The anecdotes that follow are specific to our first two apps, “SYM MO” and “SM2 Chem”. For each of these apps, the conceptualisation phase occupied about a month with the following two phases, content gathering and development, consuming approximately 5 months. Three students (Department of Chemistry student, iOS app part-time developer and Android app part-time developer) were involved in these three phases. Implementation and evaluation is an ongoing process that occurs repeatedly each semester with new classes reading the courses for which the apps were created.

11.3.1 Conceptualisation Phase

11.3.1.1 Solve a Problem

Molecular Orbital Theory: “SYM MO”

“SYM MO” is an abbreviation for Symmetry (SYM) and Molecular Orbitals (MO), and this app was created for the learning of MO theory. Within MO theory, MO diagrams allow the explanation of a molecule’s magnetic, electronic and spectroscopic properties. Steps for constructing an MO diagram is reflected in the design flow of the “SYM MO” app, depicted in Fig. 11.2. In order to construct an MO diagram, students have to firstly be able to visualise the molecule in 3D, together with the molecule’s symmetry elements such as rotation axes (C), reflection planes (σ), inversion points (i) and improper rotations (S). This visualisation is aided within the “SYM MO” app by a movable, scalable 3D model together with symmetry operations, for example, rotation by 180° that is performed on touch (Fig. 11.2). Once the symmetry elements are identified, the point group is determined via a flow chart, and for a point group, a character table is available. In the first row of a character table, symmetry elements of the molecule are listed and the first column has the symmetry labels of orbitals. The general rule for constructing an MO diagram is that only atomic orbitals (AO) of the same symmetry and similar energy possess non-zero overlap and can interact to form a bond as a molecular orbital (MO). Within the MO diagram section of the app, this is explained for eight different molecules pictorially, audibly and visually with a transcript. The users are also able to scroll down and view all the AO and swipe to view their combination to MO. Only eight molecules were available in the app as they are from six common point groups covered in the undergraduate courses that teach MO theory.

Fig. 11.2 Screenshots showing the construction of the MO diagram of water within the design flow of the "SYM MO" app

Chinese Chemistry: "SM2 Chem"

Having learnt Chemistry in Mandarin, all their school years and now having to learn it in English is not an easy feat, particularly because of the vast number of unfamiliar Chemistry terms. The "SM2 Chem" dictionary app (Fig. 11.3) was created

Fig. 11.3 Screenshots of the four modes (periodic table, syllabus, dictionary search and quiz) within the "SM2 Chem" app

specifically for ESL students reading Senior Middle 2 (SM2) Chemistry, one of the subjects in a bridging course catered for Chinese students. One thousand one hundred sixty Chemistry terms extracted from the SM2 Chemistry lecture notes, in both Chinese and English, along with hanyu pinyin (pronunciation of Chinese word in English), phonetics, definitions, structures and audio pronunciations, are presented chapter-by-chapter or searchable in a user-friendly design. There is a chapter-by-chapter Quiz mode for self-assessment and learning. Additionally, the app also consists of a Periodic Table mode with elemental data relevant to topics in their syllabus including atomic weight, electronegativity, ionisation energy, atomic radius and images of the elements.

11.3.1.2 Review on Similar Chemistry Apps

An initial thorough review and annual additions of Chemistry-related apps available on Apple App Store and Google Play Store are consolidated on our website named "Appsolutely Chemistry" (Tan 2013a). Launched on 30 October 2013, the website has over 100 Chemistry apps, recommended by students for students, suggested specifically for 20 out of the 38 Department of Chemistry major courses and categorised into 12 app types. Apart from a direct search on the stores, apps were sourced from journal articles (Libman and Huang 2013; Williams and Pence 2011), other universities' databases such as The Mobile Chemist & Chemical Engineer by Stanford University (Stanford University Libraries n.d.) and independent websites including Mobile Learning in Action: Our 101 Favourite Apps (Best Online Universities n.d.) and Apps for Learning Chemistry – Best Chemistry iPad Apps to Learn Elements & Molecules (AppNews123 n.d.). The "Appsolutely Chemistry" website was the result of the search to see what was already available to undergraduate Chemistry students, to acquire inspiration for our apps and avoid duplication of the apps that were already available from the Apple App Store and Google Play Store. From what was akin to a literature search, there were no apps similar to "SYM MO" or "SM2 Chem" in terms of design flow and content, in 2013.

11.3.1.3 Specify Flow, Suitable Interaction and Overall "Feel" of the Apps; Design Input on the Mock User Interface

These two sub-conceptualisation phases are linked in that the former involves mind mapping of the flow of content within an app and the user experience, which results in the latter and the creation of a mock user interface. Within Microsoft PowerPoint, a familiar software, a mock phone with appropriate dimensions was drawn. Each page required for the app was drawn out including icons, logos, images, text and importantly, hyperlinks were inserted to transition between pages and hence mimic the functionality, flow and feel of the app. This mock user interface file for a given app was typically presented at the first meeting with collaborators from the School of Computing. In layman terms and using colloquial language, the Department of

Chemistry team would mimic and explain the user experience on the app. Snippets of the presentation for the "SYM MO" app went as follows – "First splash screen, then touch this, then it goes to this page, then this 3D model can be rotated, manipulated and I can zoom the model, then next I can search for other molecules using the drop down list,…" and for the "SM2 Chem" app – "For the quiz section of the app, tapping the slider would allow the chapter list to appear, user selects the chapters they wish to be quizzed on and then start quiz. Questions are multiple choice, if user taps an incorrect selection, a red box appears, if selection is correct, proceed to next question. At the end of ten questions, a score appears with a list of English and Chinese terms, with those answered incorrectly displayed in red with the correct answer and those answered correctly in black", as shown in the final screenshot in Fig. 11.3.

11.3.1.4 Supply Technical Suggestions on Feasibility; Design Internal Architecture, Internal Logic on Algorithm and Data Structures

As this sub-conceptualisation phase was managed by the School of Computing team, this part of the journey was written from their perspective and context. The app development process has great similarity to the "traditional" desktop software development process (Sommerville 2015), with several unique points. Firstly, the software development was handled by a colleague and students from the School of Computing, while the software "client" was our colleague from the Department of Chemistry. Being from different fields, there are background and conceptual differences between the development team and the client base. The development team has only very basic understanding of the Chemistry concepts to be depicted in the apps, while the client does not have a comprehensive software development background. Despite the large conceptual gap, there was a mutual understanding and trust that the other party has the required competency and the motivation to complete the apps on time. This allowed the collaboration to safely navigate the minefield of scepticism, distrust and lacklustre effort. Secondly, most of the development team members were relatively inexperienced. Since the "developers" were commonly undergraduate students from the School of Computing, they have limited exposure to the higher standards of real-world development.

Due to the above circumstances, the Agile software development model (Sommerville 2015) was chosen to be closely followed. Here, it is worth quoting the Agile Software Development Manifesto by Beck et al. (2001) (Fig. 11.4). It was this ethos adopted by the School of Computing which provided the motivation to collaborate with other departments of different backgrounds.

For this sub-conceptualisation phase, considering user requirement and initial design, the School of Computing team drew up the software system architecture. This included construction of an overall system architecture, targeted mobile platforms and for each target platform (iOS or Android), an internal component structure, interactions with the backend (if applicable) and use case flows.

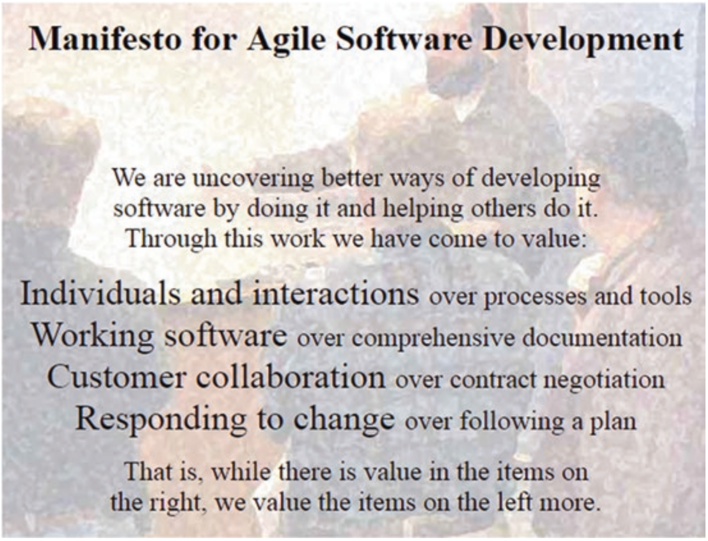

Fig. 11.4 Agile software development manifesto

Fig. 11.5 Logic-data independence approach

To ensure optimal deliverables within a limited budget and time of 3–6 months, parallelisation of the process of software implementation (logic) and the process of providing contextual data for the app (data) was required. This allowed both the School of Computing and Department of Chemistry teams to work in tandem with logic-data independence. A concrete example is the "SYM MO" app which showcases molecular symmetry. Essentially, each molecule structure is shown to have a number of rotations, reflections, inversions and/or improper rotations. These symmetries are visualised through 3D model manipulation. Following the principle "separation of concerns" (Sommerville 2015), the data format and software interface was agreed at the very beginning of the project by both teams. This data format and software interface serves as an abstraction for both teams, such that the School of Computing team implements the logic needed to interpret and manipulate the data, while at the same time, the Department of Chemistry team starts preparing the molecular data. This logic-data independence approach allowed both teams to work separately but in tandem. Graphically, the arrangement is summarised in Fig. 11.5. Alternatively, a less than optimal design may require the School of Computing team to develop the visualiser entirely, before the Department of Chemistry team could provide the information about the molecule structure and other properties.

11.3.2 Content Gathering Phase

11.3.2.1 Chemistry Content Extracted from Course Lecture Notes

Apart from assets that include icons, logos, images and text that were inserted in the mock user interface, Chemistry content was tediously extracted from lecture resources or created.

Molecular Orbital Theory: "SYM MO"

For each of the eight molecules, the following information is featured in the "SYM MO" app – Lewis structure, symmetry elements list, symmetry elements depicted on the molecule, point group flowchart, point group, MO diagram, atomic orbitals (AO), molecular orbitals (MO), bond order and molecular electronic configuration. All of the items were originally illustrated to avoid copyright issues and saved as .png as assets for the app. Several of the text elements had symbols and subscripts, for example, the point group $D_{\infty h}$, which were unreadable as text in code, hence, were saved as .png images. Additionally, to accompany the MO diagram, AO and MO images, audio recordings as .mp3 and explanation transcripts were created.

Chinese Chemistry: "SM2 Chem"

Over 2 months, an extensive Excel spreadsheet with 1160 rows and columns labelled as chapter number, English term, phonetic, Chinese term, hanyu pinyin, English definition, Chinese definition and file fetch name was compiled. Additionally, 1160 audio files with Chinese followed by English pronunciations of the term were recorded, and for 25 terms, 2D drawings using ChemDraw were created to better represent the terms.

For the Periodic Table segment of the app, a Periodic Table was drawn from scratch in PowerPoint, accompanied by an alphabetic list of the 112 elements. For the first 40 elements, an Excel spreadsheet with columns marked with the elements' Chinese name, hanyu pinyin, English name, phonetic and the important chemical terms of atomic number, atomic weight, electron configuration, melting point, boiling point, heat of fusion, heat of vaporisation, density, phase, element classification, oxidation state, electronegativity, ionisation energy, atomic radius and van der Waals radius. In addition, to be featured on the elements' characteristic pages were audio files with Chinese followed by English pronunciations of the elements' names and photos of elements. The 40 audio files were recorded as .mp3, and the 40 photos were extracted and used with permission from Periodensystem (Pniok n.d.).

11.3.2.2 Supply Data

To facilitate logic-data independence mentioned above, initial samples of data files in pre-agreed formats were provided to the School of Computing team to test their logic (Fig. 11.5) within the first month of app development. For the subsequent months, the School of Computing team continued to build the system and the Department of Chemistry team persevered with content gathering. When a segment of data was complete, it was supplied during the weekly meetings or via our app's Facebook group. For each app, a Facebook group was created at the start and members were from both teams. Having such a group facilitated the arrangement of weekly meetings, sharing of files and instant discussions about the app's progress.

11.3.3 Development Phase

11.3.3.1 Programming the Source Code

As of 2015, the mobile app platforms were currently cornered by two major operating systems (OS), iOS (for iPhones) and Android (for most other smartphones). Windows phones and other OSes had a negligible ownership share (<5%). To reach the majority of the smartphone users, both the iOS and Android systems were targeted for all our apps.

Unfortunately, the two OSes have substantial internal design differences, which ruled out a common codebase. Although there were development tools which allowed a cross-platform development effort, the tools were deemed inefficient and inadequate for our requirements. Hence, two subdevelopment teams (iOS and Android), typically two separate students, were needed for each app. The iOS app development was carried out using "Xcode" on iOS whereas Android app development was conducted using "Eclipse" on Windows or iOS.

Assets shared between the subdevelopment teams were (i) common user interface design, with tweaks to match common user expectation on each platform. For example, iOS devices do not have a back button built into the hardware whereas devices running Android typically do; (ii) common data format and software interface and (iii) common communication protocol with the backend server (if applicable).

Other than these common assets, the subdevelopment teams implemented their version of the app with minimal restrictions. This allowed the apps to conform to the idiosyncrasies and commonly expected code structure on each desired OS. In other words, the resultant apps should look "native" on each of the chosen platforms. However, the drawback of our approach is also substantial. With two separate subdevelopment teams, the coding, testing and maintenance are essentially doubled.

11.3.3.2 Internal Testing

Rigorous internal testing by the Department of Chemistry team was ramped up in the last month of app development. This necessitated testing of all aspects and functions of both versions of the app (iOS and Android) and typing out a checklist of changes required. During the weekly meetings, the errors were re-created via demonstration within the app and possible solutions were provided by the School of Computing team. However, some errors were not able to be re-created and so were verbally described.

During the course of a week, the School of Computing team worked on bug and error fixes. If the iteration of the build was completed prior to the next weekly meeting, for the Android version, the revised Android Application Package (commonly known as an APK file) was shared via the app's Facebook group. The iOS version was more inconvenient to share as it could only be placed on an Apple device that has had its unique device identity (UDID) registered on the Developer Team account by the Apple Developer Team Admin. The device then had to be physically connected via cable to the MacBook that runs "Xcode" logged in using an Apple ID that is also on the same Developer Team account. When both the device (iPhone or iPad) and Apple ID (used on "Xcode") are registered on the same Developer Team account, then "Xcode" has the provisioning to deploy the app to the registered device. Hence, the transfer of the iOS app to a device for internal testing required face to face meetings.

The new iterations were then tested and checked against the checklist of changes, and changes were either crossed off or still outstanding, and even new required changes were discovered. Typically, up to ten iterations were needed to achieve publishable versions.

11.3.3.3 Submission to Apple App Store and Google Play Store

Deployment of all apps developed within NUS to the Apple App Store and Google Play Stores was centralised and carried out only by staff at the Computer Centre under the university's developer licences. The NUS app list is at their Mobile iPortal website (National University of Singapore Computer Centre n.d.).

For each of the app's two separate versions (iOS and Android), five items were emailed via Dropbox link to the staff at the Computer Centre for their final testing and submissions. The items were:

1. Checklist for Native App Submission (see Table 11.1)
2. Icon.png
3. Application Source Code
4. Screenshots .png for display on app store and app website
5. Video for display on app store and app website

Table 11.1 Checklist for native (iOS, Android) app submission

Information required for review purposes:
The background and what the app does
Is it a commercial app that charges for downloads or displaying advertisements?
Note: For our existing license, we can only deploy free apps
Is there any credit card or payment processing on the app?
Note: For our existing license, we do not support credit card and payment processing on the app
Data related:
Are the data presented for public usage? (i.e. non-sensitive data)
Do you send data to any servers? If so, what are they? Does the app use HTTPS or any secure communication channel when sending data?
Note: For sensitive data it is a requirement to use HTTPS or any secure communication channel
Does the app store any data on the phone? If so, what are the data and are they public or confidential? If confidential data then are they protected?
Note: For confidential data stored on the phone, it is a requirement to encrypt the data
Does the app store any data on any cloud services? If so, are they protected?
If the app is retrieving data from a database or system via the server, has the data steward and/or the system owner agreed to the usage of the data?
Note: If sensitive data/personal information is involved, the data steward and/or the system owner need to be sufficiently informed of any potential risks
Does the app use interface with Facebook and Twitter and for what purpose?
Note: The app store license agreement requires you to accept the license agreement of any third-party services used in the app
Is there a login implemented? And does it use NUSNET accounts?
Is the NUS logo used in the application icon?
Note: Please take note of the minimum size and clear space required as stated in the NUS identity website: http://www.nus.edu.sg/identity/logo.php/
Things to prepare for app submission to Apple App Store
Application source code
Application icon: 1,024 × 1,024 in PNG
No transparent background, no alpha channel
Screenshots
For iPhone apps, all four sizes are required. Each size requires 1–5 screenshots. The total number of screenshots can go up to 20 (4 × 5)
Screenshots must be at the exact pixel size:
1,024 × 768, 768 × 1,024 for iPad (only if supported)
960 × 640 for iPhone 4, 4s
1,136 × 640 for iPhone 5, 5s
1,334 × 750 for iPhone 6, 6s
2,208 × 1,242 for iPhone 6 +, 6s +
App demo video, <30 s, must be at the exact dimension:
1,080 × 1,920 for 5 series and iPhone 6 plus
750 × 1,334 for iPhone 6
900 × 1,200 for iPad and iPad Pro

(continued)

Table 11.1 (continued)

Product details	
App name in iTunes (not necessary the same as the app name on iPhone)	
Category (refer to App store on your iPhone)	
Description	
Keywords (one or more keywords that describe your app. Keywords make App store search results more accurate. Separate keywords with a comma)	
Support URL	
Support email	
First name	
Last name	
Email address	
Phone number	
Demo account if your app requires login (if app requires login but no demo account provided, Apple's review staff will reject the app)	
Things to prepare for app submission to Google Play Store	
Application source code	
Application icon: 512 × 512 in PNG	
Feature graphic (mandatory):	
In the Play Store, the **feature graphic** is shown at the top of the store listing and is a powerful tool to show off your app	
1,024 w × 500 h	
JPG or 24-bit PNG (no alpha)	
See an example: https://support.google.com/googleplay/android-developer/answer/6066610	
Screenshots:	
JPEG or 24-bit PNG. Min length for any side: 320px. Max length for any side: 3,840px	
At least two screenshots are required overall. Max eight screenshots per type	
Types of screenshots:	
Phone	
7-inch tablet (optional)	
10-inch tablet (optional)	
App demo video, 30 s to 2 min, uploaded on YouTube and submitted as URL	
Product details:	
Title (30 characters)	
Description (4,000 characters)	
Short description (80 characters) (mandatory)	
In the Play Store, the short description is the first introduction to your app that your potential customers will see. Make sure that the short description gives a good enticing summary of what your app is about	
See an example: https://support.google.com/googleplay/android-developer/answer/113469?rd=1	

(continued)

Table 11.1 (continued)

Recent changes: (500 characters) (optional)	
Categorisation:	
Application type: application or game	
Category (refer to https://support.google.com/googleplay/android-developer/answer/113475?hl=en/)	
Content rating: low maturity (usually)	
Contact details – please provide either a website or an email address	
Website	
Email	
Phone (optional)	

11.3.3.4 Publication in Apple App Store and Google Play Store

The time between the Computer Centre's submissions to stores for publication and for users to be able to download from stores onto their mobile devices ranged from 6 to 24 days for the iOS version of the apps and 1–10 days for the Android version of the apps. In general, Apple was more stringent in its internal testing of submitted apps compared to Google, hence, the longer delay for the iOS version becoming available to users. Accompanying the publication of an app on the respective stores are individual websites (SM2 Chem 2014; SYM MO 2013).

11.3.4 Implementation and Evaluation Phase

11.3.4.1 Implementation

Implementation of the created apps to the student users adopted a multifaceted approach. This included in lecture app demos, use during weekly Chemistry tutorial classes, email blasts at the start of semester, demo videos on YouTube, Tech NUS article (Tan 2013b), other sites including app review websites Appsolutely Chemistry (Tan 2013a); Mobile iPortal (National University of Singapore Computer Centre n.d.) and on my work webpage (National University of Singapore Department of Chemistry n.d.), as well as posters on the office door (Fig. 11.6) as my office is beside tutorial rooms and hence has high student footfall.

Sharpening of implementation methods is possible by knowing the ways in which students become aware of and subsequently download apps on their mobile devices. Extracted from Tan and Teo (2015), Fig. 11.7a shows that the primary mode was app recommendations from friends (78.5%), and the second was through searching on Apple App Store or Google Play Store (51.1%). Considering that the Department of Chemistry is looking into creating apps specific to students' learning of Chemistry courses, determining the best ways for educators to recommend educational apps is pertinent. App demo and use in lectures, tutorials or labs has the

Fig. 11.6 Display of apps on the office door

highest percentage of 83.9% compared to other ways (Fig. 11.7b). For the implementation of the "SM2 Chem" app, out of all the ways in Fig. 11.7b that were carried out, app demo and use in lectures was the widest reaching as class attendance was compulsory. These sets of data reaffirm that students are social beings relying heavily on relationships, be it friendships or educator-student associations, to dictate the apps they have on their smartphones (Tan and Teo 2015).

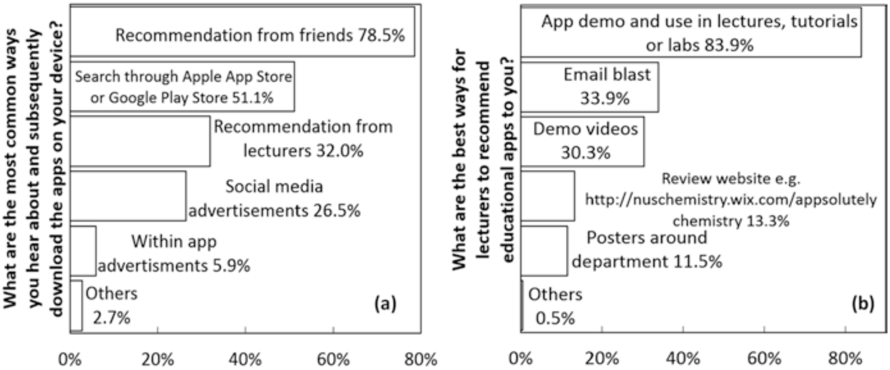

Fig. 11.7 Methods by which (**a**) students hear about and download apps; (**b**) educators should recommend educational apps to students

11.3.4.2 Download Count (User IDs)

The most direct way to assess the success of an app is its download counts. An app's download counts are the number of unique user identities used to log into the Apple App Store or Google Play Store to download the app. Whenever reporting was required, an email was sent to the Computer Centre requesting up-to-date download counts, extractable from the respective university developers' accounts. The download counts could be viewed by regions, Apple App Store split them into five regions – Asia-Pacific; USA and Canada; Europe; Africa, The Middle East and India; and Latin America and The Caribbean; whereas Google Play Store divided them by three – Singapore, China, and Others. The Google Play Store also reported an app's *total* downloads and to date *active* downloads, i.e. the app was still installed on the users' devices on that date.

For our first app "SYM MO", in the 2 years after the publish date in 2013, the total downloads of both versions was approximately 800 per year, with the iOS version being six times more popular than the Android version. For the second app "SM2 Chem", in the 1.5 years, after it was launched in 2014, total uptake exceeds 800 per year, with the iOS version being eight times more common than the Android version. These download counts surpassed the conservative number for expected total downloads of each app which was 160 downloads per academic year, i.e. 80 downloads from Apple App Store and 80 from Google Play Store, as stated in the grant proposal, by five times. The value of 160 was arrived at by considering that the Department of Chemistry class size is typically 200–250, the ownership share is approximately 50:50 between Apple and Android and 80% of students would download the apps. However, from the actual download counts which significantly exceeded class size, it is evident that users are not limited to the Department of Chemistry students at NUS, but there are users beyond. On a side note, Android devices purchased from China may not have Google Play Store inbuilt and disallow its installation. The handful of students with such devices installed the "SM2 Chem" app manually from the Android Application Package (APK) file shared via a Dropbox link.

11.3.4.3 User Feedback, App Updates and Updates in Apple App Store and Google Play Store

Improvements beyond version 1.0 of the apps were mainly motivated by user feedback which led to an updated version of the app being published in the stores. Hence, these three sub-implementation and evaluation phases are sequentially linked together. One instance was the iOS version of the “SM2 Chem” app, where a student reported that its quiz mode only used words and answer options from Chap. 1 despite having selected a different chapter to be quizzed on. The cause of this was the app’s incompatibility with iOS 8. The app developer kindly wrote an updated compatible version 1.1 and the Computer Centre assisted in its submission to the Apple App Store. Long-term maintenance of compatible app versions with inevitable OS changes is an important aspect for the extension of an app’s lifespan.

11.3.4.4 Assessing an App’s Educational Value

As an educator who is interested in new technologies or methodology, one pertinent question is to ask if implementing this change impacts positively on student learning. This sub-implementation and evaluation phase may be part of one’s own app development or could be carried out for any educational app available in stores and used by educators and students. To assess an app’s educational value, a pretest and an identical post-test coupled with a survey was completed by the 89 students of the SM2 Chemistry class. The intention was to evaluate if students who used the app frequently had a greater pretest versus post-test improvement compared to those who used the app less frequently. The frequency of app usage was one of the survey questions – “3. How often do you use the SM2 Chem app on your smartphone?” with the available responses: Very frequently (more than two times a day); Frequently (one to two times a day); Occasionally (two to three times a week); Rarely (two to three times a month); Very rarely (once a month or less); or Do not use /Do not have. Figure 11.8 depicts the timeline of implementation and evaluation for the “SM2 Chem” app.

Since the key functionality of the “SM2 Chem” app is for Chinese-English translations of Chemistry terms, the 31 questions in the pretest and identical post-test

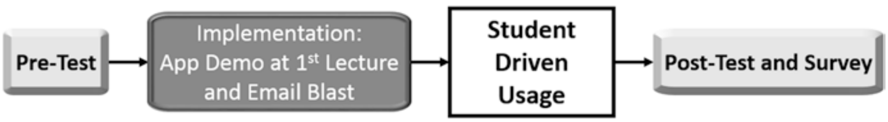

Fig. 11.8 Timeline of implementation and evaluation

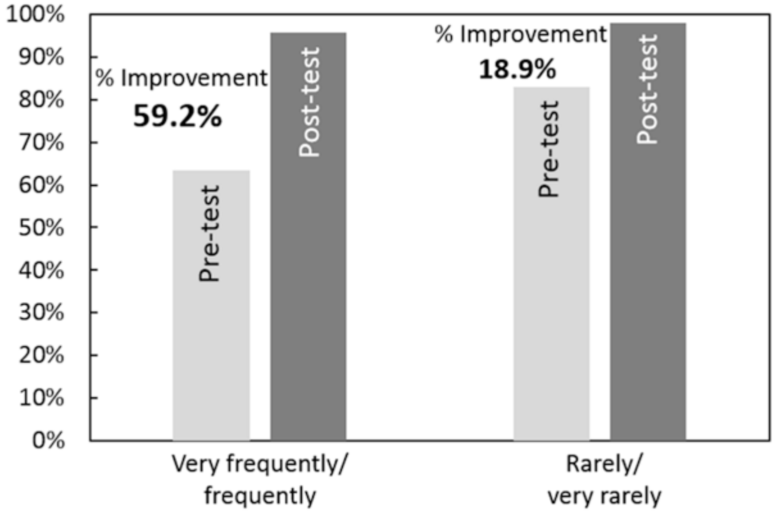

Fig. 11.9 % pretest versus post-test improvement against frequency of "SM2 Chem" app usage

were in the form of matching Chinese terms to the English terms and vice versa. Depicted in Fig. 11.9, the 31 students who used the app very frequently/frequently showed a 59.2% pretest versus post-test improvement. This is three times that of the ten students who used the app rarely/very rarely, whose pretest versus post-test improvement was only 18.9%. Using a pooled t-test at 99% confidence level, the % means for pretest versus post-test improvement for those who used the app very frequently/frequently were statistically different from those who used the app rarely/very rarely ($t = 3.1$). Even though the students that used the app more frequently had more room for improvement as compared to those who used the app rarely, these results imply that the "SM2 Chem" app is an effective tool in students' learning of the various Chemistry terms.

Responses to the other survey questions (Fig. 11.10) showed that students agreed that the "SM2 Chem" app improved their understanding of the lecture material, helped improve their grades and is overall effective.

In our opinion, what educators do in the white box in Fig. 11.8 is crucial. On one extreme, once told about the app, educators rely solely on students' personal motivation to drive their usage. At the other end of the spectrum, the app is frequently used as a teaching tool during classes. This end is ideal and is possible when an educator is assigned to teach the course for which the app was specifically created. However, caution is not to push too hard as mobile phones were originally personal communication devices for which the user determines what functions it serves (Baron 2011; Chatterjee 2014).

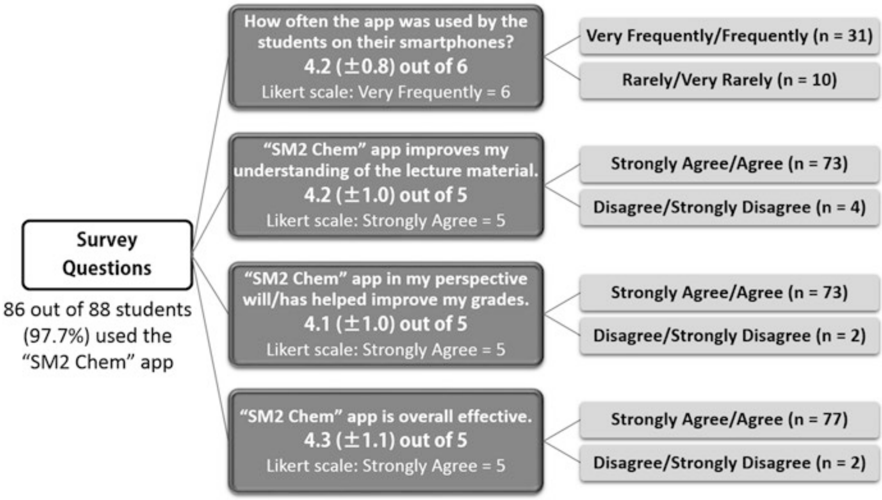

Fig. 11.10 Survey responses on the receptiveness, frequency of usage and effectiveness of the "SM2 Chem" app

11.4 Reflections and Implications

11.4.1 Reflections on App Development at a Higher Education Institution

11.4.1.1 Peaks

The LIFT grant is administered by the Office of the Provost and in a generally top-down work culture, the Associate Provost who chairs the grant was pivotal in inter-divisional coordination (Hogan 2014). At the start of the project, we were called to a meeting with the Associate Provost, heads from the Centre of Instructional Technology (CIT) who provided hardware support and colleagues from the Computer Centre who facilitated app publication. As a result, collegiality and support were readily rendered whenever required throughout the development and deployment of five apps, two versions each, across 3 years. A lesson learnt is that interdivisional collaboration is valuable and often required in such a cross expertise project such as app development at a university. Rather than engaging external commercial app developers, because of this top-down driven coordination, it was possible to harness the untapped potential within and between different divisions. Keeping it in-house was also cost-effective and aids long-term maintenance. Our experiences in this work are testament that leadership that believes and drives innovation in education is key to its success.

For the first app, there was a heightened and warranted sense of satisfaction and the app was shown to colleagues, family, friends and generally anyone willing to view it. In the first year of the grant, invitations to present at department meetings and faculty workshops presented themselves as we were the first pioneers, in the Science Faculty to our knowledge, to venture into in-house app development for academic purposes.

Apart from the encouraging download counts of more than 800 per year, students who used the "SM2 Chem" app very frequently/frequently showed a significant pretest versus post-test improvement of threefold greater than those who used the app rarely/very rarely. Further long-term, inter-year evaluations of the developed apps are planned so as to prove that the learning of the concepts and content using apps indeed has significant educational value.

11.4.1.2 Valleys

In any collaboration, there are factors out of an individual party's control. An example is the untimely recruitment of capable School of Computing students or graduates as paid part-time app programmers. For certain apps, during the content gathering phase, certain software system architecture needed to be in place for viewing and preliminary testing. However, because of the lack of competent School of Computing students or graduates, delays, though rare, were unavoidable. This was especially problematic when the Chemistry portion was embarked on by a student on a time limited project such as a final year (honours) project.

11.4.1.3 Plateaus

App fatigue and app retention on devices are important factors in sustainability (Schippers 2016). App fatigue develops as app stores become increasingly saturated. In September 2015, the number of educational apps available on the Apple App Store was 182,356 (Pocketgamer.biz n.d.) and 139,399 educational apps were downloadable from the Google Play Store (AppBrain n.d.). Knowledge is freely available and accessible anywhere and anytime. One role of the educator is to filter this vast knowledge and pass it onto students. Similar to this, for our apps, while it is imperative to know what apps are already out there, fatigue from using our own apps can be reduced as we educators use our apps to teach in classes. App use in classes by educators is also the method of implementation which students prefer (Fig. 11.7b).

App retention is the duration between download and deletion from a device. The ideal situation for an app's lifespan on a student's device is the length of a semester, 4 months, during which time the students are reading the course for which the app was designed. However, this is difficult to track and may only be encouraged by an educator's use of the app in class. For the first two apps, "SYM MO" and "SM2 Chem", the data and parameters are hard-coded and any additions required an entirely new version of these static apps from the developers. With the later apps, as app development confidence grew, the apps are linked to a backend server that allows the Department of Chemistry team to add new content to the app periodically and in real time. The backend server also facilitates push notifications to accompany the new content. This dynamic nature, hopefully, encourages continuity and app retention by users.

11.5 Conclusions

Four phases of app development – conceptualisation, content gathering, development and implementation and evaluation – were followed in the creation of "SYM MO" and "SM2 Chem" apps. These apps on mobile devices allow spatial visualisation in 3D and the learning of scientific language anywhere, anytime.

On our app creation journey, three implications surfaced. Firstly, regarding organisational leadership, it is important to obtain funding from the highest office possible within the university. This is because in our cultural context, having top-down management is significantly beneficial to ground-up initiatives, especially those that involve interdivisional collaboration. Secondly, with respect to technical aspects, weekly meetings with the non-IT, content expert educators and the app programming team for consistent tweaking and a reasonable timeline for submission to the app stores is imperative to plan for an app's implementation during the upcoming semester. Lastly, with pedagogy, as much as within an educator's control, is to be assigned to teach the course for which the app was specifically designed. This is to minimise students' app fatigue, maximise their app retention and facilitate assessment of an app's educational value on their learning over a long term.

Innovation in education is inevitable, yet intimidating and worthwhile at the same time. We hope that this documentation of our journey is beneficial to other educators to embark on their own adventure into app creation at their higher learning institutions.

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Chapter 12
Facebook on Mobile Phones: A Match Made in the Cloud?

Serge Gabarre, Cécile Gabarre, and Rosseni Din

Abstract This chapter relates the findings from an action research study conducted in a French language course at a Malaysian public university where Facebook on mobile phones was used instead of a dedicated learning management system (LMS). Students reported that they encountered several problems when using the university's LMS. They were not able to initiate forum discussions, post multimedia documents and generally lacked the motivation to use the target language in the online environment. A study of the literature revealed that similar problems were resolved through the incorporation of social networking sites in the classroom. Furthermore, past studies have highlighted the pedagogical advantages of mobile learning with anywhere and anytime learning. Therefore, it was anticipated that combining Facebook with mobile phones could provide a solution through the affordances provided by both technologies. A two-cycle action research study was conducted over the course of one semester with one cohort of students. Every student was provided with a smartphone and permanent access to mobile Internet. All activities that were previously conducted on the LMS were transferred to Facebook. At the end of each cycle, semi-guided individual interviews were conducted with nine students to evaluate the new pedagogical setup. Data was subsequently coded and analysed with the ATLAS.ti software. Findings revealed the positive impact of using Facebook and mobile phones to promote motivation and participation. Although this research

S. Gabarre (✉) • C. Gabarre
University of Nizwa, Nizwa, Sultanate of Oman
e-mail: sergegabarre@unizwa.edu.om; cecile@unizwa.edu.om

R. Din
Universiti Kebangsaan Malaysia, Bangi, Malaysia
e-mail: rosseni@ukm.edu.my

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advocates using alternatives to the more classic LMS, several issues such as lack of privacy and cyber-pressure were encountered. This paper offers solutions to facilitate the transition to a novel form of LMS, thereby empowering the students.

12.1 Introduction

In this chapter, we describe how the use of Facebook on mobile phones was introduced in our French language classroom and how it changed the more conventional method of delivery of course material. We also provide information on how new learning features became available with the introduction of this mobile platform. The LMS was an in-house development that had the following limitations. Its main flaw, as observed by the teaching staff and students, resided in the lengthy time required to post documents online. Furthermore, the university's LMS did not enable students to initiate forum discussions.

In order to circumvent some of the difficulties encountered in the distribution of course materials, we took our teaching towards a different path and ventured into mobile learning. Our first attempt made use of the SMS and MMS functions (Gabarre and Gabarre 2010). In spite of several flaws, incorporating mobile devices in the learning process proved quite beneficial. The main advantages were not related to delivery, but instead arose from all the tools available on mobile devices. Indeed, with mobile phones students could record their voice, take pictures in class or even film role plays. All these enabled the students to capture moments from their learning and to review them at a later time. By placing the students in a more productive stance, mobile phones were engaging them to become more active in their learning. Furthermore, it was discovered that the use of these personal devices boosted the student's motivation to learn French.

Wanting to capitalise on the benefits of the adoption of mobile devices, we searched for ways to incorporate the LMS on the mobile phones. In order to achieve this, we openly shared our difficulties with our students. After all, students as the recipients of the course materials were the main stakeholders concerned with this problem of delivery. When discussing the matter with them, they suggested the use of a social networking site (SNS) as most SNSs are readily available on mobile devices. It was hoped that by investigating the possibilities they offered to teaching and learning, we would resolve the issue of course material delivery. Accompanied by a cohort of 16 students who majored in French, and as a team of two lecturers sharing the teaching hours in the French course, we decided to trial this approach in our French language classroom.

The first step was to carry out a survey to investigate the students' membership and use of SNS, as well as their ability to access mobile Internet. This survey revealed that 15 out of 16 students (94%) were members of Facebook which most accessed on a daily basis. Regarding accessing mobile Internet, although a majority (69%) of students owned smartphones, hardly any of them used 3G data and instead relied on free public Wi-Fi hotspots.

12.2 Literature Review

The second step was to search for prior experiments conducted in similar settings. In order to thoroughly search for similar research, a meta-analysis of the literature pertaining to learning with SNS as well as those incorporating mobile devices was conducted. This rigorous analysis of the literature led us to review all publications indexed in ISI and Scopus since the year 2010. Through this meta-analysis, we identified 59 articles which dealt with mobile learning, SNS learning and in a few rare cases with both. Being slightly more recent, articles on SNS learning accounted for 47% of all publications, whereas those on mobile learning made up 53%. Although a majority of these studies were conducted in Asia (52%), only two (3%) reported investigations which took place in Malaysia. The first one was conducted by Hassan et al. (2010) and investigated the effects of mobile learning on the teaching of the design process in architecture. The second study authored by Kabilan et al. (2010) focused on the possibilities offered by Facebook for learning English. These studies suggested some benefits provided by the SNS such as an increased exposure to the target language through the online medium.

Studies on SNS can be sorted in three categories: (1) those which sought to replace the LMS with an SNS, (2) those which focused on the learning communities and finally (3) those which investigated the effectiveness of SNS in education. In the first category, authors such as LaRue (2012) investigated the potential of Facebook as an LMS. Although it was noted that Facebook was mostly beneficial to younger students, findings highlighted the increased motivation provided by the SNS. One disadvantage which was observed stemmed from the lack of educational features such as grading and exercises which are commonly offered in most LMS. However, it was noted that the SNS was often a cheaper alternative to the more educationally oriented LMS.

Among studies concerned with the learning communities thriving on SNSs, Domínguez-Flores and Wang (2011) noted that these sites represented a perfect environment to nurture an online community of practice. This is particularly true for courses entirely conducted on the Internet. In our case, the students met with us on a regular basis. As such, we searched for studies investigating the use of SNS in a blended learning scenario. Junco et al. (2011) reported on their use of SNS in a blended classroom. For them, the benefit of the SNS resided in the community building which was conducted online, thus leaving more class time to concentrate on learning activities.

Regarding the effectiveness of this technology in education, Junco et al. (2013) remarked that adding Facebook or Twitter to the learning environment clearly increased engagement and boosted overall assessment scores. With radically different results, Wood et al. (2012) noted that Facebook could be a distraction with students who tried to multitask between learning and social activities. Consequently, in order to reap the benefits of these networked environments, the proposed learning task will need to be carefully tailored to incorporate the SNS.

Studies on mobile learning primarily fall in one of two categories: (1) the delivery of learning material and (2) the use of these tools to produce learner-generated content. Similarly to our past experiments (Gabarre and Gabarre 2009). Goh et al. (2012) explored the use of SMS to deliver learning content. However, as Wang and Shen (2012) judiciously noted, the SMS is not the best medium to deliver course materials as students generally expect rich multimedia documents on their portable devices. In order to achieve this, the easiest method of delivery is through mobile Internet as advocated by Oberg and Daniels (2013). However, before mobile Internet may be used in the foreign language classroom, the question of access to the network needs to be addressed. As our preliminary investigation revealed, very few students purchased a data plan, thus leaving them at the mercy of finding a free Wi-Fi hotspot. This financial concern was similarly addressed in other similar studies venturing into mobile learning (Nah 2011; Santos and Ali 2012).

As described by Ellis (2000), task-based learning can become the cornerstone of language learning, as it enables the students to practice their language skills with a purpose. In the research field of language teaching and learning, task-based learning is a development from the communicative approach. It focuses on meaningful applications of the target language. This is achieved through the use of close to real-life tasks which place students in situations where they need to resort to using the language they are learning. For Wong and Looi (2010), the shift from content delivery to authentic mobile learning activities is apparent in recent research on mobile-assisted language learning. This is clearly visible in a study conducted by FitzGerald (2012) who noted the positive effect of using mobile devices for learner-created tasks. 'By creating content, the user is engaging in experiential thinking (a learning process relating to personal experiences)' (FitzGerald 2012, p. 205). These findings were consistent with our own (Gabarre and Gabarre 2010) which revealed the positive impact of these tasks on motivation and consequently on language learning. Strongly influenced by Vygotsky (1934/1962), we believe that foreign language students fare better when working together to complete a task. In order to incorporate a social constructivist element in the task, we planned to include an element of collaboration.

12.3 Methodology

In order to gauge the immediate effect of our intervention, we opted for an action-research method. This method enabled us to bring a change to our teaching and evaluate its impact through our students' feedback. The action research was conducted over a period of 14 weeks which was divided into two equal cycles of 7 weeks. In the first cycle, our planned intervention to improve on our teaching was implemented and subsequently evaluated. Problems encountered in the first cycle were assessed before a revised action plan was designed. In the second cycle, the revised action plan was implemented and evaluated.

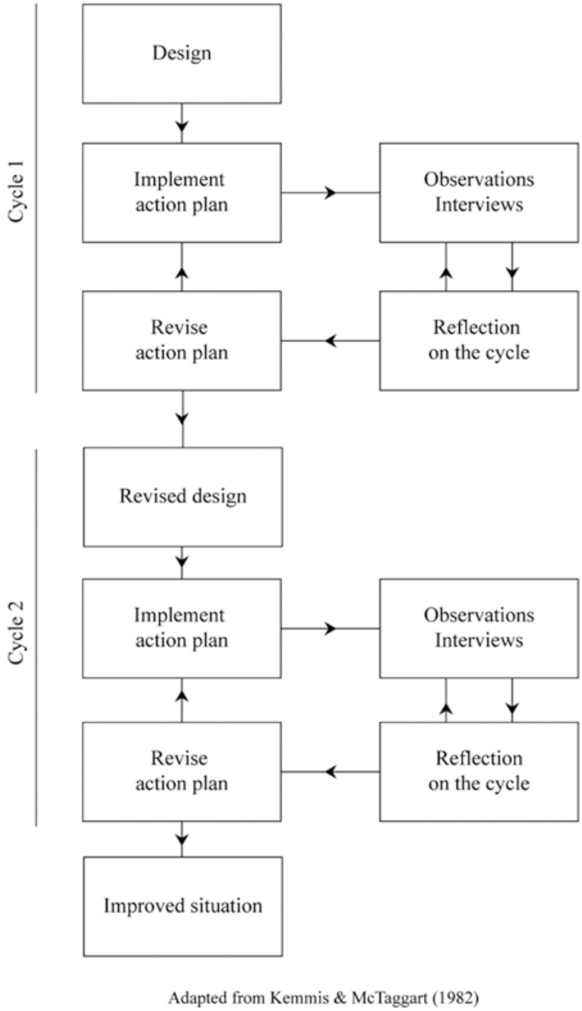

Fig. 12.1 Two cycle model of action research (Kemmis and McTaggart 1982)

As can be seen in Fig. 12.1, the methodology we adopted was cyclical. The first step consisted of the design of the action plan. This included fine-tuning the delivery method and designing the language learning tasks.

12.3.1 Action Plan

For the delivery of the course materials, we explored the possibilities offered by the Facebook page. Our initial plan was to adapt the notes to every different mobile platform. Yet we were faced with the issues of multiple devices as students did not all own the same device. We, therefore, searched for a way to deliver our course materials that would be independent of the operating system used, of the installed applications or of the screen size. By exploring mobile Facebook's features and the way students used it, we noted that pictures were often posted. It appeared that the pictures could instantly be viewed by all smartphones irrespective of their specifications. Moreover, students readily posted photo albums which contained different pictures forming a set related to an event or an outing. This feature provided some organisation by combining several pictures in one place. As such, our plan was to transform the course materials from the PowerPoint format to the photo album provided by mobile Facebook.

After thoroughly consulting with the teaching team and the students, both the delivery and the tasks were incorporated in the course. We believed that conducting the implementation during the first half of the semester would provide us with a sufficient timeframe to observe arising problems with this new method of delivery. Over a period of 7 weeks, both the teaching team and the students were able to experience first-hand the changes generated by incorporating Facebook on mobile phones in the language classroom.

As for the in-class collaborative tasks, we planned to have two types of tasks. The first one involved having the students discuss various topics in the target language by using the status update of the page. One student posted an initial message in French which was replied to by the others. This is similar to what had been conducted previously on the faculty's LMS (Gabarre and Gabarre 2012). The second type of task required the students to collaboratively shoot videos in or around the classroom where they used the target language to express themselves. The theme and the language style of these videos followed the content of the lessons. Once uploaded on mobile Facebook, students were required to provide constructive feedback on their peers'.

12.3.2 Data Collection

Throughout the research, students' artefacts from the collaborative tasks were downloaded from Facebook, and online comments were periodically copied to a Microsoft Word document. This enabled observation data to be imported into ATLAS.ti, the qualitative data analysis software used in this study. At the end of the initial cycle, an interview protocol was devised which focused on the problems the students had encountered while learning French with Facebook on mobile devices. From the group of 16 students, 15 agreed to participate in the interviews. Due to time constraints, only nine students were selected as informants. The selection of these students was not based on their level of French or their results in assessments. Instead the criterion for selection was based on their ability to openly share their experience. One-on-one interviews with these nine students were conducted at the end of the first cycle.

12.3.3 Data Analysis

A verbatim transcription of each interview was typed, before the name of each informant was altered to preserve their anonymity. The transcriptions were then imported into the ATLAS.ti qualitative data analysis software where they were coded. Adhering to the grounded theory coding method recommended by Strauss and Corbin (1990), we initially applied an open coding scheme before proceeding with an axial coding. This two-level coding scheme enabled us to reflect on the changes brought about in each cycle of the research.

12.4 Findings and Reflections

The findings from this study enabled us to improve our teaching by responding to students' request to adapt our course materials to the mobile format. Students' apprehensions with issues of lack of privacy on the SNS were addressed. Transitioning to a Facebook group provided us with additional mobile features which proved beneficial.

12.4.1 Cycle 1: Adapting to the Mobile Format

Having implemented our action plan, we observed that for the most part, the issue of delivery appeared to have been resolved. As anticipated, initial problems with the setup were noted. Students complained that they sometimes had difficulties reading the course materials as the text was often too small. Students with touchscreen devices used finger motions to zoom-in on specific parts of texts which were illegible. Indeed, this problem stemmed from the direct conversion of PowerPoint course materials to the photo album mobile formats. Students requested that we post pictures where the text would be in a larger typeface. This request was our trigger to immediately revise our action plan. Having learned from our mistake, the issue was henceforth quickly resolved by editing the original course materials so that less text appeared on the slide, and thus, the text could be made larger. Apart from this complaint, both students and lecturers were enthusiastic about this new method of delivery. Editing and converting existing course materials did not require a significant amount of work. Students were able to view them on their mobile phones but also on their laptops which they used in the residential colleges.

12.4.2 Students' Apprehensions

The interviews conducted at the end of the initial implementation phase provided some valuable feedback on students' experiences over the 7 weeks. One of the negative themes which emerged from this first cycle was related to the lack of privacy encountered on mobile Facebook. Students claimed that they were disturbed by this apparent lack of privacy. It appeared that due to the absence of confidentiality, students were reluctant to freely express themselves. A distinct example of this feeling was given by Yolande, a female student who said: 'I'm not very comfortable, comfortable when, when the public sees the video about my video, or my friend's video if I upload it'. For Yolande, the problem stemmed from the nature of the SNS where her friends and acquaintances could view all the documents that she posted on the French course's page. Although we initially believed that the network that had been forged on the ground of friendship would not be a hindrance, it rapidly appeared that the Facebook friends' scrutiny could pose a threat to free expression. Indeed as Zoé, another female student, made very clear:

> …not all of my friends are taking French, sometimes, they like to discriminate my course. They will ask: "What will you do after this? What's your future like? If you study medicine, you will become a doctor, bla, bla, bla." And I feel like I don't want to let them know what I am doing, and then when I'll succeed, they will be surprised.

This dual notion between online and offline friendship has been described by Tokunaga (2011) who found that young adults make a clear distinction between the two environments. Offline friendship is characteristically different from its more recent online variant. For these reasons, Zoé did not feel confident about posting her videos on Facebook. She added that she was deeply disturbed that her online friends who were not learning French, and therefore not part of her class, could view the work she posted online.

This feeling was also shared by other students, although to a different degree. Annaelle, a third female student, explained that she knew her friends had watched her French class videos. Considering that they had not posted comments on her work or even used the Facebook 'like' function, she discovered that her friends were aware of her class production when they started acting out the video in front of her. When reflecting on this event, Annaelle explained that it was all right for her, but that in her 'heart, [she felt] really shy'. In another instance, a student explained that one of her friends asked her to translate word for word what she was saying in French in the video. For a different student, her friend openly criticised her pronunciation of French words, although this friend was not familiar with the language. As the social peer pressure from the network of online friends caused some of the students to feel uncomfortable, it was resolved that some forms of corrective measure would be implemented in the second cycle of the research. Although having a Facebook page, as suggested by the students, seemed a feasible option, it appeared that we had erred by not sufficiently considering the issue of privacy.

12.4.3 Cycle 2: Increased Privacy

Having duly noted the difficulties encountered with the lack of privacy in the way the Facebook page for the study was setup, we reinitiated a planning phase where we searched for an alternative solution. We did not wish to switch to a more private SNS as we believed that the strength of the system had its roots in the popularity and ease of access of mobile Facebook. Instead we searched for a way to adapt Facebook to our needs. Ractham et al. (2012) had successfully experimented with the Facebook group format in a Thai institution of higher learning. In their article, the authors explained that privacy could be maximised by creating a private group for the course so that 'all activities within the learning environment will be kept private and will only be shared with other members' (Ractham et al. 2012, p. 180). As this was the main problem which had been encountered in the first cycle of the study, we planned to follow this option and create a Facebook group in the second cycle of this study.

Similarly to the first cycle, the implementation of the second cycle lasted for 7 weeks. In terms of delivery, the photo album was still used; however, with the group environment new features became available. Unexpectedly, a button allowing us to post files appeared above the group's status update bar. We thus opted to post the course materials in three different formats: the photo album, the PDF format and as PowerPoint files. The PowerPoint files were already available as this was the format that we used in class. The PDF file was the format that we used as an intermediate step while converting the slides to a photo album. Consequently, delivering the course materials in three formats did not pose any additional challenge.

For the in-class tasks, due to the positive feedback of the assignments given in the first cycle, we opted for a similar format. Students were thus once again required to use mobile Facebook as a forum where they posted their messages in French. Once again, they used their mobile phones to shoot videos which they now shared in the mobile Facebook group.

Data collection in the second cycle was conducted in an identical fashion as the first cycle. The protocol devised for the second cycle of interviews focused on two aspects: (1) the resolution of the privacy problem and (2) the identification of new difficulties. In the second cycle, students no longer voiced their dissatisfaction due to the size of the text in the slides as this had been taken care of in the first cycle. Moreover, with the added formats available, students now had a choice. The groups differently voiced their satisfaction as some were already content with the photo albums, while others favoured either PDF files of the PowerPoint format. Having more choices was thus an improvement for part of the group. More importantly, we were relieved to observe and hear that the perceived lack of privacy had been resolved. Zoé, who had been initially disturbed by the openness of the page, explained that: 'Because it's private [laugh]. It's different because others that do not learn French, they cannot watch it, so it's better, secure'. This was echoed by Yannick, a male student who saw the group's privacy as an environment where he could do anything he liked. When asked to clarify this point of view, he said that: 'For example maybe sometimes… hmm… something crazy like we can play some jokes in the group also, just like friends'. This comment provided additional support for our decision to switch from a page to a group as we wanted the students to feel sufficiently comfortable to express themselves freely.

12.4.4 Learning from Others' Mobile Posts

As we had initially not suspected that young adults would be reluctant to share a part of their privacy on the SNSs, we wondered if the same feeling might not also be present toward the group. While conducting the interviews, we asked the students whether they would rather privately post their videos to their lecturers, so that their course-mates would not be able to criticise their work. The students insisted that the issue of privacy was not relevant to the confined group of the class. They stressed that they still wanted to see their course-mates' productions and that they could learn from them. This was exemplified by Valérie, a female student, who stated that:

> If got the chance to see others, I can know: "is it I got the problem, is it I have the same problem with them, or not?" Because if like the pronunciation, if others people read like this, is it they're any different from me, then I can, I can compare. [sic]

The pedagogical value of seeing others' work was also noted by Zoé who explained that: 'They're our course mates, so… it should be better if there is more people see it because we have different opinions, so improve the video, more people' [sic]. Adding on the opportunities gained from sharing the videos in the online group, Zoé stressed that peer feedback was truly valuable to improve one's level of proficiency in the target language. She explained that:

> Because sometimes when the lecturers view it the feelings is different right? So when we have the opinion from the students, because the students in the same level with us. Then, I think we can add in something better… …Because, if we can see the others' video, we can get some information, and what to add to our video, like comparing, so it's good, and then have fun watching it. [sic]

Another advantage offered by the group was the ease with which students could post their in-class productions. With the group, students were no longer required to post their videos on their own page before linking them to the course's page. This facilitated the uploading process which was conducted directly from the class. Consequently, other students could more rapidly review their peers' work and help them improve.

12.5 Reflection

Although we felt that the switch from the page to the group was beneficial, feedback from several students led us to ponder whether this had been for the best. Although we had listened to complaints from students who voiced their dissatisfaction with the lack of privacy, it appeared that some students were not affected by it. This was the case with Sarah, a female student who was not affected by issues of privacy as she did not belong to a large network of online friends. Nolwenn, another female student, expressed a similar view that for her switching from a page to group had not made much of a difference: 'Actually for me, it's not much different, because it's all in French. If… one of my friends or other people go and find this page, they also will not really understand what we are talking about, or understand our situations'. These reports led us to investigate whether some students saw the change as a negative move and if so in which fashion. After several interviews, Yolande informed us that she would prefer if her videos were visible to everyone. When asked why, she explained that recruiting agents used Facebook to gain more knowledge on potential employees. She added that: 'If we use the page is, the company can, can see our activity. The company know that we can speak well. Although we are not native, we, we try to speak although there is homework, there is homework, but at least we try' [sic]. We had not envisioned that the students' in-class oral productions could be used as a digital portfolio of their language proficiency. Providing more privacy stripped them of this opportunity. Nevertheless, Yolande clarified that she could link the videos posted in the group to her own Facebook page, thus solving this issue. Other students explained that they were proud of their work and that they wanted their family or their friends to see it. For some, this was a way to show their family that they were making progress in French, and for others the videos were seen as a way to interact with their friends. Indeed, friends posted comments seeking clarification on the videos which in turn lead to online social exchanges.

It is clear that by switching from the page to the group, not all students viewed it as an improvement. This pushed us to reflect and evaluate whether the change had indeed been the ideal solution for the class. We reviewed the interviews and triangulated them with the online observations. Observations revealed that the number of students' posts had increased, particularly from students such as Zoé who had mentioned the issue of privacy during the interviews. From our judgement of the quality of the students' artefacts, we perceived an improvement in the students' level of French. We would be hard pressed to quantify the extent to which the increase in the perceived privacy of the online environment contributed to the group's progress in French. Furthermore, a gradual improvement in the students' level of French is always expected as they attend the course. However, we also recorded that as the students felt more secure, they were able to push themselves harder without any second thoughts on who would see their videos. This was confirmed by Valérie who added that: 'We already know each other's level, so it's okay for me to post for everyone in our class'. Additionally, recreating the course online by including only classmates had the advantage of stimulating peer learning.

Chantal, a female student, explained that: 'If we see our others' video, we also can learn from them and improve ourselves' [sic]. She added that she would review the video from the top student in the class in order to improve her own grammar which she believed was weak. This observation further strengthened our positive opinion on social constructivist learning, and other students explained that they would view others' videos in order to gain inspiration and ideas on what to include in their own productions. By doing so, they explained that it enabled them to make their role play more natural. Moreover, due to the multimedia nature of the videos, students explained that they would improve their pronunciation by listening to how their peers pronounced French words.

Lessons learned from this project have enabled us to improve our teaching with successive cohorts. We ensure that the students' privacy is respected by only using Facebook groups rather than Facebook pages. We also make sure that all students have access to mobile phones. Having several smartphones which students can borrow resolves issues encountered by those who own feature phones. Access to mobile Internet for all is also addressed by bringing a mobile hotspot to the classrooms we teach where the university's Wi-Fi is either absent or inadequate.

12.5.1 Implications

This study has several implications for various practitioners in the field of education. First of all, due to the nature of action research, the researchers as practitioners benefitted from the findings of this study. Enhancements were made based on the data that was collected and analysed which resulted in an improved pedagogical setup. It is expected that the findings should benefit other lecturers and language instructors faced with similar issues. This setup also had positive implications for the students who used the mobile platform to learn French. Language proficiency was positively improved as an increase in motivation to use the platform, and a permanent mobile access resulted in more exposure and practice of the target language. These results have implication for other students who could similarly benefit from learning with an SNS on mobile devices. The use of this novel platform also has far-reaching implications for universities and schools where languages are taught. This is on one part due to the reduced cost of such a system and on the other part due to the ease of setting up a mobile platform riding on the back of an existing SNS. Because a vast majority of students are already active members of social networks such as Facebook, deploying a similar platform with a low learning curve would not require extensive training. However, teaching staff of such institutions would need to be aware that being continuously connected with students does bring new challenges and may need to consider new pedagogies for teaching using social media. This would require a reflection on appropriate times for connecting to the platform and on expected timeframes for responding to queries. Lastly, this study has implications for policy makers who would need to address issues related to the use of mobile devices in schools and universities and particularly on their use during examinations.

12.6 Conclusion

This action research provided us with a new insight into the students' needs and perception in term towards using an SNS on mobile devices. Armed with this new understanding, the two cycle action research study was essential in changing our implementation of mobile learning as has been described above. Owing to the adoption of mobile Facebook to host the French course, students brought their learning out in the open under the scrutiny of their family and their friends. The communitarian nature of Facebook drew comments from their external network with some dire consequences for privacy. Such a situation was novel to them since their prior online experience of learning French had been cantoned to the university's LMS. In the 'traditional' LMS, students did not share their resources and productions with their network outside of university. As a matter of fact, they neither shared them with their course mates as the platform did not favour peer exchanges. With the Facebook group, a Vygotskian perspective of learning was possible as students were able to improve themselves by reviewing their peers' written and oral productions.

Adopting mobile Facebook for academic purposes required some changes. Although not major, the lecture notes needed to be adapted to the different environment. The main change we experienced was being able to gain an insight into student interactions in real time and identify which students had viewed a comment we had posted or had accessed the lecture notes. Furthermore, we were happily surprised to see that students would use the Facebook 'like' function on the documents and information we posted. This enabled us to get real-time feedback from students on the teaching materials. Students used this function for two reasons: to show that they liked the materials and to note that they had viewed them. Overall, the project was deemed a success. Exchanges with students in the target language became more frequent as the semester progressed and as students became more proficient. We noted an increase in motivation to use the mobile platform. With an always on connection to the LMS, students posted messages from the class and from other locations they visited before and after class. By using Facebook on our own mobile phones to replace the LMS we became more involved with the online evolution of the course. Another key benefit of using a mobile platform was the ability to instantly receive notifications of postings in the group through our phones. This gave us the opportunity to provide immediate feedback and monitor the students' activities. In one instance, after having inadvertently posted an incomplete document to the platform, we received a notification from one student informing us of this. We were able to rectify this directly from our phone as the complete document was with us. It should be noted that there were times when we did not access our phones. These include obvious no-phone moments such as eating, sleeping, driving or exercising. For the rest of the time, mobile notifications were always checked at the earliest convenient time. By listening to the students' suggestion of using mobile Facebook in the French course, we entered an online realm which belonged to them. Some students responded that they felt grateful that we would bring teaching to their environment, and no one expressed that bringing a university's course to their environment had spoiled the fun of Facebook. As such, we believe that by becoming more attuned to the students' need, we have changed to become better foreign language lecturers who are now more attentive to the group's requirements. The constant feedback provided by the action research method has enabled us to fine-tune our teaching and to provide improvement to the classroom.

Following this research project, we have found it difficult to return to the university's LMS. Consequently, from the lessons learned with Facebook on mobile devices, we have opted to implement the same delivery system with our other courses. The lessons learned from the adoption of mobile Facebook could effectively be implemented in other universities. Taking into account issues of privacy by using a Facebook group rather than a Facebook page, a similar method of mobile delivery and of in-class task could readily be deployed. In our project, the use of mobile devices can be divided into two aspects. First, the mobile devices were used as a means to both send and received course materials. The communication feature of the devices was also used when videos were posted and viewed online. Second, the mobile devices were used to support language production tasks. The built-in cameras of the mobile phones ensured that students were always able to record role plays without resorting to additional tools. This would not require a substantial financial investment since using mobile Facebook does not incur any cost besides access to the Internet. A university's Wi-Fi could be used to allow access to mobile Internet for students who do not have a mobile data plan. Furthermore, Facebook is a free platform which advertises itself as a service that will always remain so. This might not be the case with a commercial LMS. Furthermore, as students tend to bring their own devices, universities would no longer need to invest in computer labs.

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Chapter 13
Authentic Mobile Application for Enhancing the Value of Mobile Learning in Organic Chemistry and Its Pedagogical Implications

Othman Talib, Tenku Putri Norishah Tenku Shariman, and Azraai Othman

Abstract This article discusses the application of a prototype educational mobile application for higher education, known as the Organic Chemistry Reaction Application (OCRA), which has been designed to run on any mobile device with touch-screen commands. OCRA allows its users to create their own organic molecules using hydrogen, carbon, oxygen, and halogen atoms. Users can use the touch-screen feature to demonstrate the organic reaction mechanism explicitly through an electron-moving technique, which is used to conceptually visualise the mechanistic steps in organic reaction mechanisms. This enables the users to understand the macroscopic and microscopic concepts of organic reaction mechanisms. OCRA provides a gamelike setting with the objective of acquiring correct answers through achieving specific goals. It uses a touch-screen feature to demonstrate the organic reaction mechanism explicitly, while the electron-moving technique is employed to conceptually visualise the mechanistic steps in the organic reaction mechanism. OCRA is used as an alternative tool to aid learning and understanding of organic reaction mechanisms. As a user-controlled tool, OCRA provides convenience and flexibility as well as being capable of enhancing a user's confidence in learning organic reaction mechanisms. Hence, OCRA is a practical example of an application that has been innovatively designed to enhance the value of learning in the mobile education context. The next challenge is to implement a generic pedagogical

O. Talib (✉) • A. Othman
University Putra Malaysia, Seri Kembangan, Malaysia
e-mail: zahinothman@gmail.com; azraaiothman@yahoo.com

T.P.N.T. Shariman
Multimedia University, Cyberjaya, Malaysia
e-mail: tpnorishah@gmail.com

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model underpinning the design of any mobile application for educational purposes to replace traditional pedagogical approaches.

13.1 Introduction

Mobile learning has made a positive impact on learning since most mobile devices, especially smartphones and tablets, are affordable and equipped with the technical specifications to download mobile applications (apps) that enhance learning. The ubiquitous availability of mobile devices has transformed education in innovative ways by transferring computer technology from a stand-alone app in the classroom environment to a mobile app in the virtual learning environment (Bidin and Ziden 2013; Crisp 2014; Fowler 2015). A variety of mobile apps, such as games, music, and messaging apps, can be downloaded for free from Google Play or the Apple store via the Internet, as can a number of mobile learning apps. Well-known mobile apps that support the process of learning include TsoiChem (Tsoi 2011), SHERPA (Schweitzer and Teel 2011), Isains (Abd Majid and Husain 2014), and SMILE (Buckner and Kim 2014). The existence of these types of mobile learning apps provides educators with the opportunity to explore, search, and use mobile learning apps that can be applied in classrooms as an alternative pedagogical approach to enhance students' learning. For most students, particularly those considered to be the Internet-era generation who grew up surrounded by computer technologies, mobile apps are not new, but they lack an appropriate educational content model (Hardyman et al. 2013; Kong and Song 2014; Mac Callum et al. 2014) that could be applied to support their use for learning.

A number of industries such as the entertainment, banking, construction, and tourism industries are using mobile apps prolifically, especially those designed for smartphones. Globally in the education field, researchers, as well as educators, are developing mobile learning apps to create educational content that is aimed at augmenting students' understanding of subject areas. Mobile apps have the potential to become a favoured tool in all areas of education in order to engage and motivate learners, "especially among university students" (Khmelevsky and Volodymyr 2013, p. 8), facilitating learning in a more productive environment.

This chapter introduces a mobile app developed for the purposes of teaching and learning organic reaction mechanisms. The Organic Chemistry Reaction Application (OCRA) is an educational mobile app specifically developed for students who are enrolled in an introductory organic chemistry course. Developed for both students and instructors, this mobile app can be used at anytime, whether in or outside the formal classroom. This chapter describes an overview of the concept of the educational mobile app and discusses its application, design, and functionality in chemistry education.

13.2 Mobile Apps Developed for Teaching and Learning

In the context of education, facilitating learning using mobile devices has been recognised as a new challenge (Gadhiya et al. 2012; Kopackova 2014; Sahu et al. 2014; Simic et al. 2014; Teng and Helps 2010; Tsoi 2012; Wanga et al. 2015). Fujita and Fujimoto (2013) from the Graduate School of Engineering, Toyo University, for example, have developed an advertisement system using a mobile app for healthcare to understand one's obese state. Meanwhile, a study conducted in Malaysia by Ismail et al. (2013) showed that teachers, who are also distance learning students in an educational institution, are receptive to mobile apps as an approach in teaching pedagogy, and they are motivated to use the apps for teaching and learning. Another study carried out in India by Mehdipour and Zerehkafi (2013) investigated the impact of mobile devices on teaching and learning practices. The study showed that mobile app is able to support the teaching and learning process as long as the devices are unobstructive, available, adaptable, useful, and easy to use. Meanwhile, in another survey on the use of "app user behaviour and challenges" that involved 4824 respondents from 15 countries, including the USA, China, Japan, Germany, France, Brazil, the United Kingdom, India, Canada, Australia, and South Korea, showed that there is a significant difference in app user behaviours across different countries. For example, users from the USA prefer to buy medical apps, users from the United Kingdom and Canada are more selective based on the price of the apps, and users from Japan and Australia are less likely to give feedback to developers to improve the apps. Therefore, software engineering researchers need to take into account user behaviour differences across countries when developing and improving apps.

Consequently, studies have been conducted to determine the factors that would lead to the effective use of mobile apps in both formal and informal educational contexts (Chen-Chung et al. 2012; Kanala et al. 2013; Schweitzer and Teel 2011; Simic et al. 2014; Tsoi 2011) as mobile devices are "learning anywhere at anytime" educational tools (Bidin and Ziden 2013; Khmelevsky and Volodymyr 2013). The features of mobile devices, which are often portable and easy to handle, make them suitable not only for predetermined and formal classroom times but also for flexible and informal out of the classroom learning times. The accessibility of learning materials "anywhere and anytime" is in line with students' preference for on-the-go activities, like making phone calls, watching videos, finding information, playing games, communicating through social networking apps, and sending short messages in real time. The same principle has now convinced educators to take advantage of mobile devices by developing mobile learning apps that deliver subject content to students "anywhere and anytime". Furthermore, the design should cater to diverse students' needs, the content should enrich the formal learning context, and the use should align with specific and achievable learning objectives in an easy, interactive, and engaging way (Tsoi 2011; Yan et al. 2013).

Pollara and Broussard (2011), in their analysis of 18 cases, found that the mobile devices used by most students, particularly smartphones, are suitable for mobile learning. In another study by Schweitzer and Teel (2011), mobile apps in smartphones have helped teachers to communicate directly with other teachers for administrative tasks as well as interact with students to obtain feedback on classroom activities and instruction. Another interesting study at the higher education level was conducted by Noguera et al. (2013) at the Faculty of Health Sciences of the University of Jaen in Spain which utilised a 3D mobile app for a physical therapy class that had helped students to revise the anatomy subject. The study concluded that students and lecturers were satisfied with the mobile app as a supportive learning tool.

However, there are questions that need to be answered related to the suitability of mobile learning within the mainstream educational system. For instance, what are the criteria of a mobile app that are appropriate for the formal educational system? Not all mobile apps used in learning are developed in a form specific to any kind of subject matter in formal education. There are several mobile apps designed for general learning, for writing purposes (Kanala et al. 2013), for English language learning purposes (Chen-Chung et al. 2012), or for problem-based learning purposes (Simic et al. 2014). Another example of a mobile app is "iDoc" which is often used by doctors in the medical profession where it acts as a library of medical textbooks which provides instant information in the workplace (Revell 2014).

One of the aspects that should be taken into consideration is "…..the device should support the objectives of the course and be user-friendly enough that the learner is engaged with the content supported by the device" (Tsoi 2011, p. 544). The study conducted by Kanala et al. (2013) explored the potential of a mobile writing app, Ruff, to enhance motivation to engage in writing activities among 9- to 11-year-old students. The students utilised a mobile app that was designed to encourage writing outside formal class hours. This is part of the progressive inquiry approach where students are able to engage in consultation with their teachers as well as discussions among peers. This is in contrast with the usual students' writing skill activities that depended on teachers during class hours only. The findings revealed that the students who are exposed to Ruff as part of their school assignment were more positively motivated to write. At the same time, the curiosity and self-efficacy of the students using Ruff were slightly improved after using this mobile writing app as compared to students who were not exposed to Ruff.

In chemistry education, Revell (2014) conducted a study using three technologies: (i) a tablet computer which included PowerPoint presentations, (ii) a lecture capture and replay software programme that enabled students to download lecture recordings online, and (iii) an online homework programme with assignments given on a weekly basis. The tools were used as part of an Introductory Chemistry Course in spring 2013 in order to investigate whether each tool contributes to teaching effectiveness. A comparative study was conducted after one semester to compare the students' progress in a standardised examination. The results showed that students who used the online homework system outperformed students who used tablets and lecture replay. However, this research revealed that the combination of the three tools showed better performance on retention compared with previous semesters, and the usage of these tools showed a positive correlation with performance.

Many have argued on the suitability of mobile apps to replace classroom learning and the limitations within certain subjects that impact negatively on the ability to deliver content via mobile devices (Neo et al. 2012; Revell 2014). In addition, it is argued that mobile apps can only bring about short-term excitement and engagement in learning (Kinash et al. 2012; Nicholson 2014; Rogers et al. 2010). However, incorporating mobile apps in education has now been widely recognised as an alternative approach to teaching and learning. Mobile apps deliver information using dynamic forms of visual presentations and have multimedia capabilities which are useful either in a formal or an informal education context. Moreover mobile apps are supported by the significant growth of mobile devices, which have been repurposed not only for socialisation but also to deliver information effectively, especially for the new generation of students, who are known as the "net generation" or a technology-focused generation (Bidin and Ziden 2013; Crisp 2014). Students, therefore, feel empowered since they are able to access education content and activities from anywhere and at anytime through autonomous and individual learning.

To date, many educators have explored the potential of mobile apps in the context of higher education (Aghaee and Larsson 2013; Cairncross and Mannion 2001; Inglese et al. 2007; Ismail et al. 2013; Tsoi 2011; Baharom 2013; Corbeil and Valdes-Corbeil 2007; Schüler and Morisse 2011; Teri et al. 2013). However, in comparison to game apps in the market, the mobile app for higher education is still limited. According to Bidin and Ziden (2013), the two factors that have influenced the tremendous use of mobile apps are the features and usability of mobile devices. Mobile devices are portable due to their relatively small size and light weight. Hence, users can easily download an app to their mobile device which can then be used as a portable educational platform since it can be brought anywhere and used anytime to access educational content.

Contemporary students perceive learning to be an active and continual process that should not only occur in the classroom, on condition that the learning materials are accessible anywhere and at anytime (Chen-Chung et al. 2012; Zhang and Looi 2011). Besides being affordable, mobile devices are also equipped with the technical specifications that enable the operation of simple yet powerful apps that promote learning. The leading author in digital games, Prensky (2005), has suggested that learning could be part of a game app. For example, an educational mobile app can involve students in an interactive gameplay environment that spurs them to achieve certain levels or goals in an exciting and engaging way. The most popular term when a game app is used in education is gamification (Codish and Ravid 2014; Robson et al. 2015; Su and Cheng 2015; Urh et al. 2015). Gamification can be defined as an app that uses game principles in other environments such as management and education (Su and Cheng 2015) or applying gamelike experiences in a non-gaming context (Hamari et al. 2014). Robson et al. (2015) mentioned that people are now spending most of their time at work, at home, during their leisure time, or even in transport using mobile apps which gives them a gamelike experience. One of the main goals of gamification is to increase user's ownership or engagement with the tasks within the mobile app through gamelike principles such as feedback and scores (Barata et al. 2013; Muntean 2011; Seaborn and Fels 2014; Sillaots 2014). However, it is unclear how the gamelike principle can be implemented in mobile apps for higher education purposes. Thus, the current challenge for educators is to create realistic, authentic, and engaging gamelike educational mobile apps that are suitable for particular target groups.

13.3 Nature of Organic Chemistry

As an essential subject for students who study science-based academic programmes, organic chemistry is a prerequisite and compulsory subject for other courses in universities like chemical engineering, forestry, food technology, agriculture, medicine, and pharmacy. Wright et al. (2009) found that students who had not completed the organic chemistry course, as a prerequisite subject for most subjects in the biochemistry programme, were more likely to withdraw from their major subjects in biochemistry and register for other programmes such as ecology, evolution, and neuroscience than those who had completed the organic chemistry subject. Meanwhile, Levy (2008) argued that most students regard organic synthesis as a difficult topic to study. The concept of organic synthesis is one of the most crucial topics to understand in organic chemistry since the nature of organic reaction mechanisms involves a dual understanding of abstract and dynamic concepts.

In learning organic chemistry, students need to know how to select electrons that should be moved and rearrange the atoms or molecules after the formation or breaking apart of the covalent bonds to yield a final product (Lopez et al. 2013). All the processes in organic chemistry from reactants to products are abstract which involve processes at the microscopic (showing electron, atom, or molecule) and symbolic (showing equation and arrow) levels and also dynamic (involve the movement of electrons). Consequently, students face difficulties with understanding the organic reaction mechanisms phenomena as most educators have failed to explain and visualise these abstract and dynamic concepts explicitly (Kozma 2003). As a result, many students are not able to distinctly visualise the organic reaction mechanism at the particulate level. To assist students with this issue, educators have begun using animations to visualise and represent the particulate levels of an organic reaction mechanism. This approach can be further enhanced through the use of a mobile app which would enable students to access the animations of these organic reaction mechanisms as an autonomous and individual learning tool.

The main concept in organic synthesis is the mechanism of organic reactions, which demonstrates how the reactants are converted to products. Traditional organic chemistry classes rely on textbooks and teachers' explanations to teach the topic. Most educators use the "arrow-pushing" technique, a widely used tool (Berg and Ghosh 2013) with the talk-and-chalk approach, to present the mechanical aspect of the organic reaction mechanism under investigation. However, this technique does not portray what is actually happening during the organic reaction mechanism. This, in turn, causes students to be confused; they are incapable of "seeing" the organic

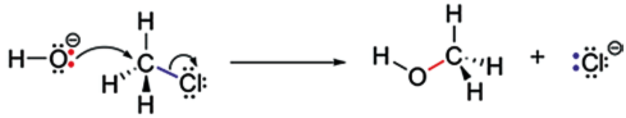

Fig. 13.1 Example of arrow-pushing technique

reaction mechanism in the same way as their teachers. As an alternative, students will use the direct "memorisation" technique, which they believe to be the most effective way to understand the basic principles of an organic reaction mechanism. Unfortunately, this technique ignores the fact that they will encounter more complex organic mechanism reactions in the future.

Figure 13.1 below shows an example of the arrow-pushing technique to portray the organic reaction mechanism. This example is taken from http://chemwiki.ucdavis.edu/.

Realising that teaching organic chemistry has always been dependent on talk and chalk, this chapter introduces an alternative approach that integrates animations in a mobile app that provides an opportunity for students to demonstrate their own step-by-step discrete sequences of the organic reaction mechanism. Teachers nowadays find it challenging to support students' learning with authentic instructional materials on the organic reaction mechanism. It is believed that mobile learning apps will provide viable solutions for engaging students in a straightforward manner. Today there is limited literature available that specifically addresses the implementation of a mobile app for organic chemistry, especially one that optimises the use of animation to employ abstract and dynamic organic reaction mechanism at the particulate level of presentation.

After an intensive literature search, most mobile apps found on the Internet are concerned with general chemistry concepts, such as Sym MO (http://comcen.nus.edu.sg/technus/go_mobile/sym-mo-chemistry-app/), and chemistry apps for Android (http://www.appszoom.com/android_applications/chemistry). An example of a mobile app on organic chemistry is called TsoiChem (Tsoi 2011), which emphasises only the topic of "functional groups". However, none of the mobile apps on chemistry focus on helping students to visualise, understand, and practise the process of organic reaction mechanisms through a dynamic and interactive format.

Hence, the study described in this chapter was conducted to investigate the use of a mobile app to enhance students' comprehension of organic reaction mechanisms. Focusing on describing the mobile app as a tool to visualise, practise, and understand chemical processes, the app integrates animations to display the organic reaction mechanism that involves the rearrangement of atoms and electrons, as well as the formation and breaking apart of covalent bonds. Educators are positive that an educational mobile app is a promising means of fostering effective teaching and learning outcomes for the organic reaction mechanism content.

13.4 Mobile App for Organic Chemistry Reaction

Most students use smartphones not only to communicate with their peers but also to search for information and play games (Chen-Chung et al. 2012). Based on this fact, educators and researchers have started to develop mobile apps for teaching and learning purposes. TsoiChem, for example, was developed by Mai Yin Tsoi (Tsoi 2011) for learning organic functional groups using the multi-touch feature of iPhones. The research has attempted to employ the idea of "seamless learning" as highlighted by Zhang and Looi (2011, p. 2148) and not just focus on using textbooks as practised in conventional classrooms. Organic chemistry cannot simply be understood by relying only on printed materials. Teachers need to use models, 3D drawings, and simulations to visualise, identify, and draw the functional groups in organic chemistry. Thus, Tsoi (2011) had applied the instructional scaffolding learning theory, originated from Bruner, that states students usually learn best when supported by appropriate materials. Mobile apps can be developed as "an ideal" instructional scaffold to support the learning process. The main obstacle discovered in this study is to integrate this learning theory in the development of the TsoiChem mobile app. To adhere to the learning requirements of organic chemistry and enhance students' understanding of the topic, the mobile app should not only clarify the basic concept of functional groups but also be able to visualise the functional group molecules.

These obstacles have long been a debate among science educators as organic chemistry is a core subject for science-based courses from secondary school through to university level. Comprehending the processes in organic chemistry, such as the reaction mechanism occurrence, is crucial in the synthesis of new organic molecules. The three most fundamental organic reaction mechanisms are addition reactions (such as electrophilic, nucleophilic, and radical reactions), elimination reactions (E_1 and E_2 reactions), and substitution reactions (SN_1 and SN_2) (Azziz et al. 2013). In an organic reaction mechanism, a single bond between atoms consists of two electrons that are generally connected by one single covalent bond. Other electrons, which are not involved in bonding, are usually shown as dots on the atoms, representing the so-called free electrons. It is crucial for students to understand these three basic concepts of organic reaction mechanism before they can proceed to learn more advanced topics.

The most popular approach of showing these processes in the organic reaction mechanism is called the "arrow-pushing" technique (Levy 2008). The arrow is used to show the movement of a pair of electrons from an electron-rich location to an electron-poor location. The arrow-pushing technique is used to show the movements of electrons during the formation and breaking apart of chemical bonds. Using "arrows" to show the movement of electrons is actually an additional "load" during the thinking process of students because they cannot see what is actually occurring during the process.

This chapter presents an educational mobile app, namely, the Organic Chemistry Reaction Application (OCRA), to demonstrate the usefulness and flexibility of the app for learning fundamental concepts of organic reaction mechanism. OCRA is not a full game app, but it has a few gamelike activities with the objective of acquiring correct answers or achieving a specific goal.

OCRA uses a touch-screen feature to demonstrate the organic reaction mechanism explicitly, while the electron-moving technique is employed to conceptually visualise the mechanistic steps in an organic reaction mechanism. With a touch-screen feature, OCRA allows users to form and break apart a chemical bond between atoms by sliding their fingers on the screen to move selected electrons or atoms and predict logically the mechanistic steps of the three fundamental organic mechanism reactions: addition, substitution, and elimination. This kinaesthetic action is an authentic experience for students to actually see and practise with the atoms and molecules which is not possible through the conventional learning process. This technique enables the users to understand the particulate nature of an organic reaction mechanism.

OCRA is driven by simple and explicit content, although it does include animations to engage and stimulate users' thinking. This mobile app can be used effectively on mobile devices, such as smartphones and tablets. The touch-screen feature in these devices assists the users to demonstrate the organic reaction mechanism explicitly via the electron-moving technique; this technique conceptually visualises the mechanistic steps in an organic reaction mechanism.

The prototype mobile app discussed in this chapter is a convenient and flexible user-controlled learning tool which is capable of enhancing a user's confidence in learning organic reaction mechanisms. By using the touch-screen feature on the mobile device, users can practise forming or breaking apart an organic reaction mechanism without the necessity for typing or drawing any molecule, atom, electron, or even an arrow. OCRA, therefore, is perceived to be an alternative tool to learn and understand the organic reaction mechanism. The app is suitable for contemporary students who commonly make use of mobile apps in their daily activities.

The basic idea in the development of OCRA is actually based on the revised Bloom's taxonomy model: remember, understand, apply, analyse, evaluate, and create (Krathwohl 2002). The first step in learning organic chemistry is to know and remember how to draw organic molecules. Then, the students should understand the principles of the nucleophile, electrophile, and free radicals. After applying these principles in the organic reaction mechanism, the students can analyse every movement of the electrons, including the breaking apart and the formation of covalent bonds, whilst at the same time, they are expected to critically think of the arrangement of the molecules to create a possible final product. This critical thinking process by students involves the acts of evaluation and creation. Finally, the students can check if they have completed the process accurately. Thus, OCRA has the capability to activate users' learning by means of facilitating students to create their own molecules and organic reaction mechanisms.

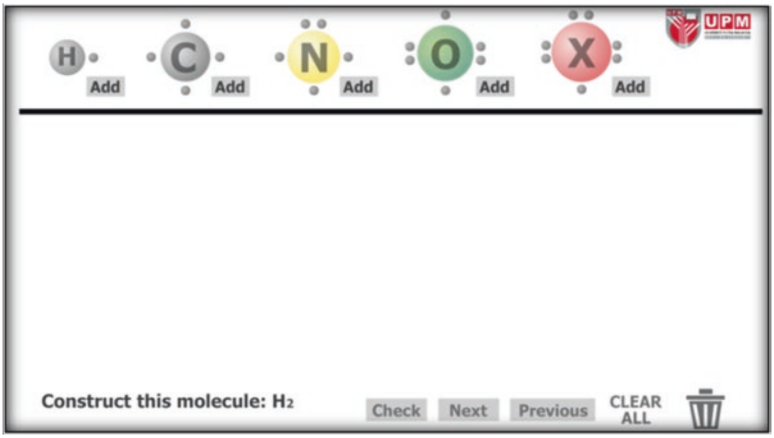

Fig. 13.2 OCRA interface – no need for a keyboard

13.4.1 Interface

As illustrated in Fig. 13.2, the interface of OCRA displays the five basic atoms in organic chemistry that are shown in different colours with their valence electrons (electron that participate in the formation of a chemical bond), as demonstrated with the Lewis dot structure. A dot represents an electron located in the outermost shell. These electrons are used to form bonding between atoms of a molecule. For example, the oxygen atom has six valence electrons and the carbon atom has four valence electrons. Meanwhile, X represents generic halogen atoms. There are five atoms in the halogen group, i.e. fluorine (F), chlorine (Cl), bromine (Br), iodine (I), and astatine (At). The students need to click or tap on the atoms to build a molecule with either a single, double, or triple bond.

At the bottom of the screen, a simple instruction explains the steps for users to construct the 20 different molecules listed before they proceed to try out the 20 basic organic reaction mechanisms. The exercise starts with the creation of an H_2 molecule. Next, users will continue by tapping on the “Clear All” button and, then, the “Next” button. After completing the task, users can tap on the “Check” button to examine their answers.

13.4.2 Creating an H_2 Molecule

OCRA starts with a simple task – creating a hydrogen molecule. In order to create an H_2 molecule, the users have to tap twice on the “Add” button under the H atom, and, then, two H atoms will appear on the screen. Next, they should move the electron valence from one of the atoms, so that the electrons of each atom are facing each other as shown in Fig. 13.3.

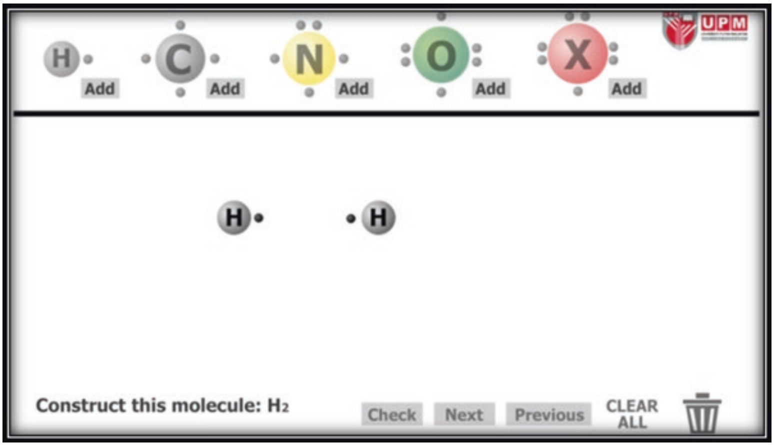

Fig. 13.3 Tap and move the atoms and electrons to face each other

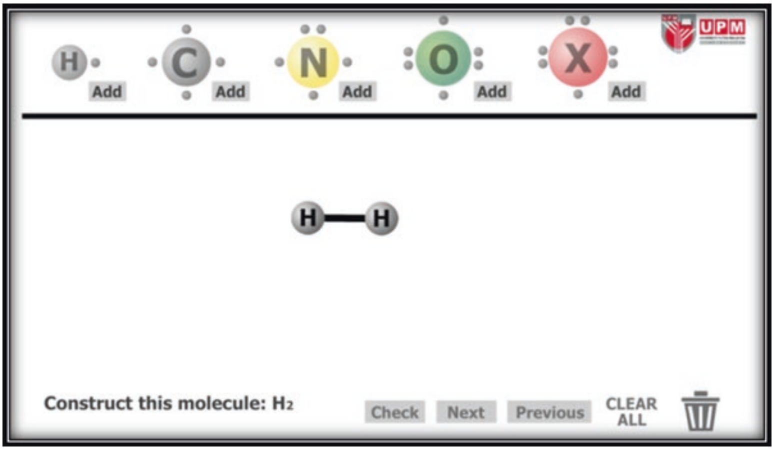

Fig. 13.4 The H_2 molecule is formed automatically!

Figure 13.4 shows that as users move the two atoms to approach each other; the electron valence from the atoms will attach to form one covalent bond. Finally, the H_2 molecule is formed!

13.4.3 Creating CH_4 Molecule

On the other hand, in order to create the CH_4 molecule, the students should tap the "Add" button to get four H atoms and one C atom. Next, they can move the electrons to connect them and form four covalent bonds, as shown in Figs. 13.5 and 13.6.

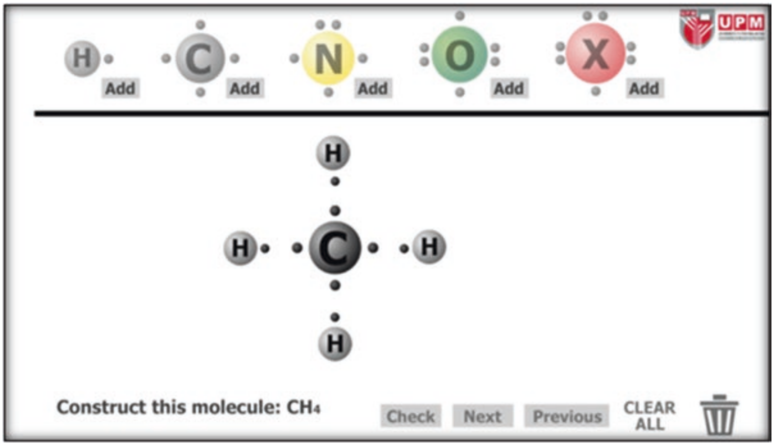

Fig. 13.5 Touch "Next" and create a new CH_4 molecule

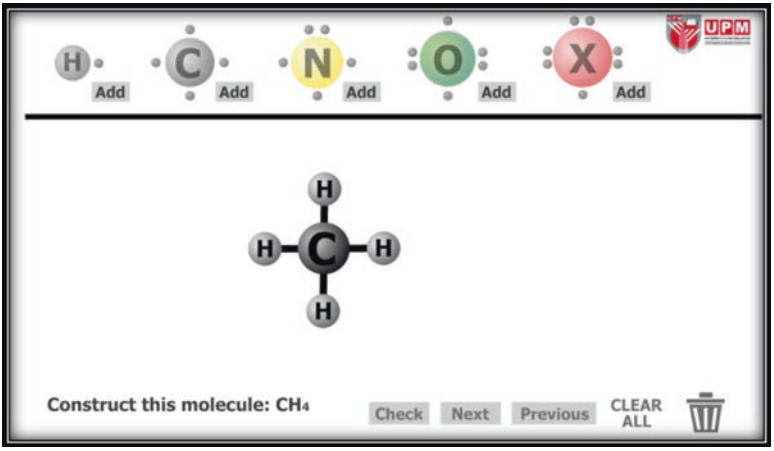

Fig. 13.6 The CH_4 molecule is formed

13.4.4 Creating C_2H_4 Molecule with Double Bond

The users can also create a double covalent bond. A double covalent bond is created when two pairs of electrons are shared between the carbon atoms. Figure 13.7 shows two carbon atoms sharing two pairs of electrons to achieve a stable molecular structure.

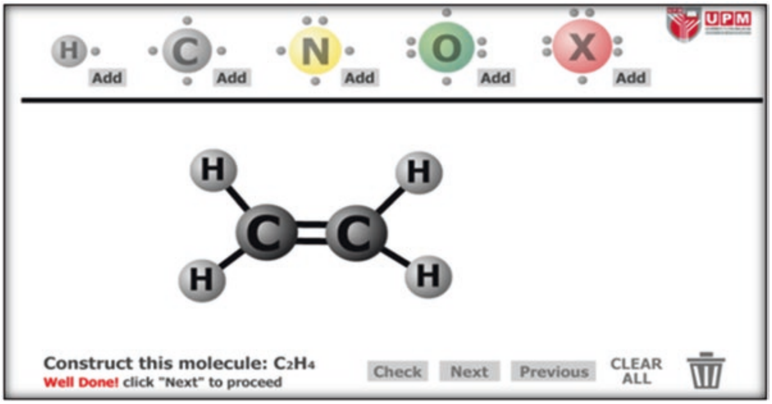

Fig. 13.7 The C_2H_4 with double bond

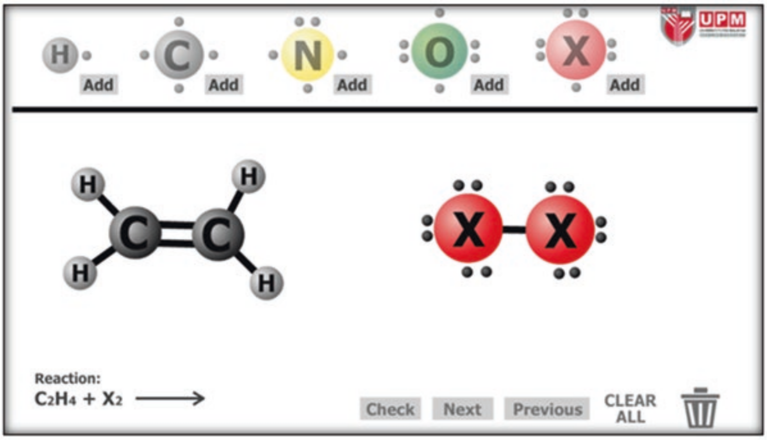

Fig. 13.8 This is an example of the addition reaction mechanism

13.4.5 Organic Reaction, $C_2H_4 + X_2$

Twenty basic organic reaction mechanisms are accessible in the OCRA. One of the reactions is between ethane and halogen: $C_2H_4 + X_2 \rightarrow$.

The user needs to create both molecules and predict the product by moving the electrons and atoms. The reaction between C_2H_4 and halogen is shown in Figs. 13.8 and 13.9. The double bond is broken apart to add two halogens in an additional organic reaction mechanism.

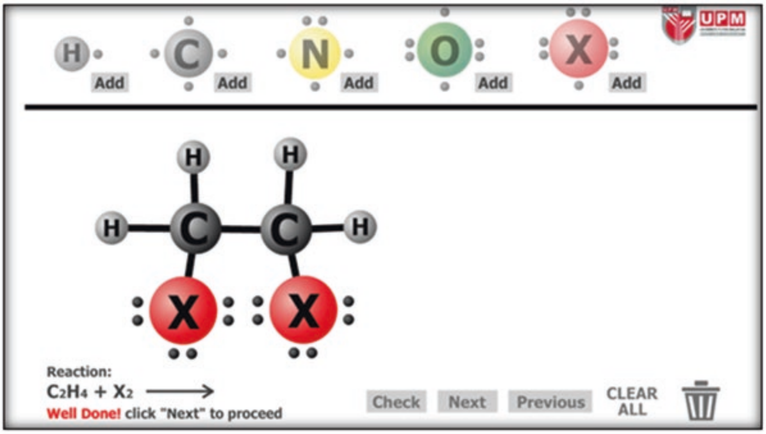

Fig. 13.9 The reaction is called halogenation

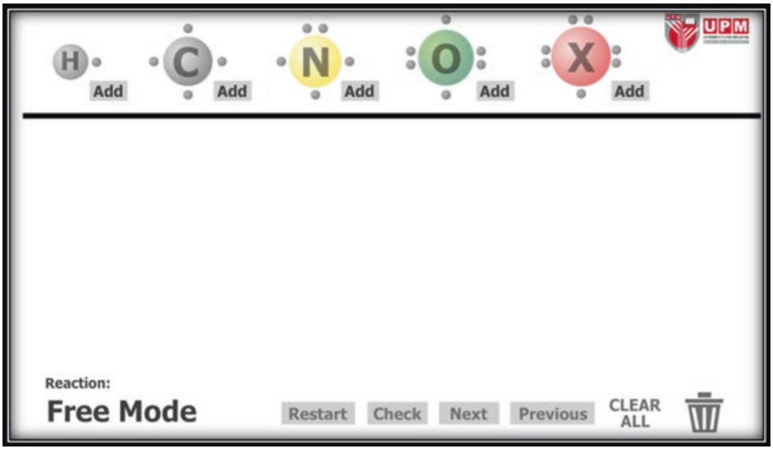

Fig. 13.10 Users can use the "Reaction: Free Mode" to create their own reactions!

13.4.6 Freestyle Mode

After the completion of all the tasks, a user can use the "Free Mode", as shown in Fig. 13.10, to freely create their own molecules and try out any reaction. This flexibility gives unlimited choices to the users and educators to create their own tasks.

The advancement in mobile apps should be exploited to complement the current "pushing-arrow" technique with more authentic tasks. These authentic tasks are able to demonstrate conceptually the mechanistic steps of organic reaction mechanisms through the movement of electrons during the breaking apart and formation of chemical bonds.

Moreover, OCRA is a mobile app that allows students to experience the technique of predicting their own organic reaction mechanism in an autonomous and interactive way. With OCRA, students can independently experiment and learn on their own how to move the electrons of atoms and molecules to create the final product of an organic reaction. Once they have completed this task, they can go on to evaluate their performance and understanding. As a result, this mobile app is not only interactive but also engages students to further improve their learning.

Additionally, the OCRA provides interactive teaching tools for demonstrating all three organic reaction mechanism topics. Hence, OCRA is a dynamic example of an educational mobile app that encourages students to actively practise their knowledge of organic reaction mechanisms in an effective and engaging way as they apply the abstract and dynamic concepts of organic reaction mechanisms. The app allows students to predict logically the products in any organic reaction mechanism. OCRA is not just another "drill and feedback" tool; instead, it establishes a "participatory simulation" environment where students are expected to independently learn and construct their understanding of organic reaction mechanisms in an authentic environment.

Finally, the authentic tasks promoted in OCRA are relevant for the secondary to higher education levels as they project the concept of "learning by doing" or practice-based tasks (Cronje 2014). OCRA can be downloaded on mobile devices as an Android mobile app, although a web-based version is also available. Therefore, OCRA is a potential educational mobile app that would attract the interests of the "net generation", who often use mobile apps to search for information (Foley 2012) and have preferences for a learning process that is similar to playing a game (Barata et al. 2013; Ibanez et al. 2014; Prensky 2005; Seng and Yatim 2014).

13.5 OCRA Evaluation: The Experts' Opinion

To further evaluate the OCRA approach, three experts – Expert1, Expert2, and Expert3 – were informally interviewed to obtain his or her feedback or comments on how OCRA can be beneficial to students. These experts were selected based on the criteria of having at least 10 years' experience as chemistry teachers while being active technology users. The interview sessions served to provide detailed information about OCRA, highlighting the advantages and disadvantages of using OCRA, its user-friendliness and usability, and if the educational mobile app has achieved its learning objective to enhance students' understanding of the organic reaction mechanism.

The interviews employed a semi-structured approach, focusing on three main questions: (i) Did the app meet its learning objective to enhance students' understanding of the basic organic chemical reactions? (ii) Can this mobile app be classified as a "user-friendly" learning tool? and (iii) What are the advantages and disadvantages of this app in learning organic reaction mechanisms?

Before the interview commenced, a brief demonstration on how to use the OCRA was presented to the experts. Based on the results from the interviews, all the experts agreed that OCRA is ready as a mobile app for learning. Expert2 mentioned that "this (mobile) app meets the need of helping students to learn basic organic chemical reactions, especially among students with a weak foundation in chemistry". This proclamation is supported by Expert3 who said, "this application meets the minimum requirements of learning organic chemistry, especially for the beginning or introduction to organic chemical reactions……". The results from the interviews indicated that OCRA is suitable to be deployed and blended in classroom lessons. The experts also expressed that OCRA would be helpful for students to learn organic reaction mechanisms independently. The experts interviewed revealed that they believed OCRA can support students with learning about the organic reaction mechanism.

Regarding the second question about the "user-friendliness" of OCRA, the experts unanimously concurred that the app was easy to use. By just sliding their fingers to move the electrons or atom, users are able to explicitly form and break the chemical bond between atoms and predict logically the mechanics of three fundamental organic mechanism reactions, the addition, substitution, and elimination. Nevertheless, Expert1 recommended that the mobile app should provide more meaningful feedback instead of just "well done!" "good job!" and other positive comments, whilst the first and the third experts requested a simple demonstration video or instructions on how to run the mobile app.

In response to Question 3 about the advantages of using OCRA as a mobile app, the answers given by Expert1, Expert2, and Expert3 can be summarised that OCRA provides the opportunity for students to move and visualise the movement of electrons in an easy way at the sub-microscopic and symbolic levels while demonstrating the formation and breaking up of chemical bonds. According to the experts, the disadvantages of OCRA encompass the inadequate feedback that it provides and that the content is solely focused on basic organic reaction mechanisms. However, since this is only the first prototype of OCRA, the suggestions of the experts will be taken into consideration for the next phase of development.

13.6 Pedagogical Implications

Scholars have defined mobile learning in various ways. For example, Laurillard (2007) defined mobile learning in the learning environment context, whereby learning activities involve support from digital devices that enable a communicative and collaborative environment regardless of time and location. The digital device is able to provide a source or a direct teaching tool. Meanwhile, Lindsay (2015) asserted that mobile learning is capable of personalised learning to cater for diversity, informal learning, transformed content production, collaborative inquiry, situated learning in contexts, and connecting with experts. Both definitions can be synthesised to mean that mobile learning provides the opportunity for personalised and collaborative learning in an informal and formal setting. This is according to the suitability of the individual while creating interactive communication actively in a wide range of learning activities via personal gadgets and some levels of technological skills. For the purposes of this study, the definition will focus its scope on mobile apps for educational purposes.

The first challenge is to understand a generic pedagogical model underpinning the design of any mobile app for educational purpose to replace traditional direct pedagogical approaches such as talk and chalk as well as drilling and memorisation practices (Lindsay 2015) in conventional classes. Because of the ability to access the sources from online devices, discussions can take place and be understood in a communicative and interactive manner among the students via the approach called student-centred communicative or collaborative approach. This is parallel with the principle of the zone of proximal development, which was introduced by Vygotsky in 1978, that enables the more capable and competent peers to assist their weaker friends with overcoming their difficulties in understanding the learning content. In fact, the students can interact with anyone within their study circle that uses a mobile app vis-à-vis learner-learner interaction, learner-content, and learner-instructors (Aghaee and Larsson 2013).

Next is the inquiry-based learning that is based on the constructivist approach to teaching and learning. This approach encourages students to learn actively through content discovery based on their own prior knowledge (Buckner and Kim 2014; Demissie et al. 2011; Kong and Song 2014; Laanpere et al. 2014). The conventional approach can be further enhanced as a collaborative inquiry (Lindsay 2015) by taking advantage of mobile app technologies. If a mobile app is related to gamification, then overlapping elements exist. In the context of education, gamification emphasises progression (Sillaots 2014; Tulloch 2014) in terms of earning points or scores and pass or fail to move to the next level. This is in line with the aim of education that is to master the foundations levels before progressing to the more difficult upper levels. Therefore, there is a need for the mobile app to possess the element of progression with various levels of difficulty as part of the pedagogical approach.

In addition to that, teamwork in gamification (Sillaots 2014) functions in the same manner as a collaborative interactivity (Adamson and Bailie 2015; Challco et al. 2015; Neo et al. 2012) in mobile apps whereby the students cooperate collaboratively online to solve or complete a task on their respective devices. In view of that, every mobile app must be designed to enable the students to create interactive learning environments (Mehdipour and Zerehkafi 2013; Sillaots 2014). The aim is to encourage students to be engaged in task completion without compromising the learning process. Another common feature for a game is the generation of immediate feedback (Codish and Ravid 2014; Crisp 2014), which takes place whenever students interact with the teacher or lecturer in the classroom. Therefore, giving immediate feedback mechanisms in real time is crucial as part of formative evaluation as well as to provide support for student progression (Clark et al. 2014) during learning activities via mobile apps.

Meanwhile, another issue is to ensure the app is functioning effectively as expected and is user-friendly to students (Nawi et al. 2014). For instance, with a mobile app, students could further improve their understanding of a specific subject or topic that they learned in school since learning can occur anytime, anywhere when learning content is delivered through a mobile device. Students can utilise their time after school for independent collaborative learning by participating in a one-to-one or group discussions with their peers or a mentor using an instant communication tool, either synchronously or asynchronously. At the same time, teachers can offer individual supervision to weak students and assist them in achieving learning objectives.

In the near future, the popularity and usage of a mobile app will dramatically improve as the number of users who are using mobile devices increase (Mehdipour and Zerehkafi 2013; Noguera et al. 2013). More studies are needed to provide data on the capabilities of mobile apps in fulfilling the requirements of teachers and learners as well as pedagogical needs. Issues such as a fast Internet connection (Eristi and Haseski 2011), the small screen size (Cortez and Roy 2012), the security of discussion and content, as well as providing a standardised app for all users should be addressed. However, the most significant challenge for the utilisation of a mobile app in education is the development of high quality and appropriate contents for learners (Giousmpasoglou and Marinakou 2013; Lindsay 2015), with the availability of self-assessment and feedback (Nguyen 2014) using appropriate pedagogy.

13.7 Conclusion

There is increasing demand for the development of more authentic learning tools especially for higher education that specifically optimises the use of mobile apps to provide educational materials, documents, content, and feedback (Codish and Ravid 2014; Khmelevsky and Volodymyr 2013; Nguyen 2014). In chemistry education, apps that can portray abstract and dynamic organic reaction mechanisms at the particulate level are needed for students who are unable to understand this concept. OCRA is a prototype mobile app that can be utilised to access this much-needed content using pedagogical models such as inquiry-based, collaboration, immediate feedback, situated learning, and interactive learner-content-instructor engagement in the formal and informal learning environment. The development of OCRA provides an avenue for teachers and students to overcome the most difficult aspect of organic chemistry. They are able to manage the more advanced and complex organic reaction mechanism topics and measure learning performance and level of comprehension. The content provided accommodates a variety of academic background and learning styles of students (Tsoi 2011; Urh and Jereb 2014); thus the mobile app enhances their motivational level (De-Marcos et al. 2014; Pollara and Broussard 2011). Based on the discussion above, it is believed that OCRA is an example of an educational mobile app that supports authentic learning in organic chemistry. Furthermore, future research will be conducted to study the effectiveness of OCRA for long-term understanding and to what extent this mobile app is able to help learners to understand not only the process of organic reaction mechanism but go further to understand the ratio of choosing such an appropriate mechanism.

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Chapter 14
The Use of Structured Academic Controversy in a Mobile Environment to Broaden Student Perspectives and Understanding in the Social Sciences

Kenneth Y.T. Lim and Horn Mun Cheah

Abstract This chapter describes a program designed around the use of handhelds and other mobile devices in a citizenship education program which has been implemented in a school in Singapore, in the Upper Secondary Social Studies syllabus. There is a general assumption that students are equipped with an adequate conceptual understanding of the theme of the macro concept of Conflict, one of the main themes of the syllabus. However, experience shows that this concept remains abstract to 15-year-old students who have limited experience, having been brought up in a relatively safe and secure environment in Singapore. The case studies in the Social Studies syllabus are much more complicated as they are multidimensional, involving clashes of interests, ideas, points of views and emotions. The program aims to afford students learning experiences which provide opportunities for the learning and examination of alternative, and often multiple, perspectives of controversial issues; the students will be given opportunities to discuss and express these perspectives through participation in a structured collaboration activity known as the Structured Academic Controversy (SAC). The pedagogy of the SAC is well known among Singapore teachers in Humanities departments and has been used to provide structure and focus to classroom discussions in various subjects. A primary

K.Y.T. Lim (✉)
National Institute of Education, Singapore, Singapore
e-mail: voyager@mac.com

H.M. Cheah
Singapore University of Social Sciences, Singapore, Singapore
e-mail: hmcheah@suss.edu.sg

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innovation of this program is that teachers will design SAC activities going beyond face-to-face interactions (as has been the practice in schools, so far). Building upon the work of Lim (Enhancing fieldwork in social studies through remotely conducted structured academic controversies. Teach Learn, *25*(2). National Institute of Education, Nanyang Technological University, Singapore, pp 189–195, 2004, Adolescent collaborative discourse through messaging. In: Aykin N, Preece J (eds), Internationalization, online communities, and social computing: Design and evaluation. 11th International Conference on Human-Computer Interaction, Lawrence Erlbaum Associates, 2005), the program investigates how SAC activities can be transposed beyond the confines of the classroom (field-based SAC), as well as augmented through practice using 1:1 handheld devices (mobile-based SAC).

14.1 Background: Culturally and Technologically Conducive Environment

The systemic introduction of information and communication technologies (ICT) into teaching and learning in Singapore schools formally took shape in 1997 with the launch of the first masterplan for ICT in education (Koh and Lee 2008). This plan recognised the transformative potential of the developing Internet for teaching and learning. Since then, three follow-on masterplans have been implemented, with the latest consisting of a strategic vision for 2015 (Infocomm Development Authority [IDA] of Singapore 2006). Each of these plans builds on the previous ones and, most importantly, while focusing primarily on the same 'success' factors, adapts strategies to the changing context. This ability to adapt seamlessly is a key aspect of the strength of ICT in education masterplan implementation in Singapore schools (Koh and Lee 2008).

Under these masterplans, the overall ICT infrastructure in the schools, and Singapore in general, has been developed to the current state that allows for high-speed broadband and 4G access literally throughout the country. At the same time, the ownership ratio of mobile devices to population reached about 150%, indicating that many students could have more than one mobile device (IDA Singapore 2016). With a technology-savvy generation of current students, who are more than comfortable with handling mobile devices and the associated applications, the setting and conditions are ripe for effective use of mobile technologies to support teaching and learning.

On top of this, there has been continual professional development of teachers, from ICT skills training to training in the peer-supported, collaborative and self-directed nature of ICT pedagogical developments. As such, teachers are, by and large, not only comfortable with using ICT for teaching and learning but have developed the mindset of a reflective practitioner in experimenting with a number of such pedagogical approaches. Thus, the education system has the cultural disposition, infrastructure and expertise to engage in mobile-based learning.

The school in which the intervention described in this chapter is being implemented is a state-funded school in Singapore. Over the past few years, it has enjoyed access to additional funds under the FutureSchool program of the Ministry of Education (IDA 2012). Under this program, the National Institute of Education works in partnership with the Ministry to administer the National Research Foundation's R&D program on Interactive and Digital Media (IDM) in Education.

The FutureSchool program operates under a centralised structure (known as 'eduLab') that couples the efforts of schools, institutes of higher learning (IHL) and industry to focus on IDM in Education projects. eduLab (http://edulab.moe.edu.sg/) has been an effective mechanism to develop Singapore as a 'living lab' for IDM in Education products. It builds on the capabilities developed in schools, industry and IHLs to drive the following objectives:

1. Prototype educational models and IDM tools with a view to effectively scaling up their adoption in the school system.
2. Strengthen the collaborative partnerships between schools, IHL researchers and industry.
3. Develop new knowledge and local manpower capability, including educational models and IDM tools that have the potential for commercialisation.

The leadership team in this school are strong advocates and supporters of the innovative and effective use of ICT for teaching and learning. For the past few years, such support has resulted in many ground-up initiatives from teachers. Besides providing support for bottom-up initiatives, the school leaders are also actively involved in leading curriculum innovation and research to promote higher-order thinking and collaborative learning among students.

In terms of teacher readiness, more than 85% of teachers in the school have been trained in Teaching for Understanding with Technology (Wiggins and McTighe 1998), and 30% of teachers attained the status of Microsoft Office Specialist; therefore, teachers have a common pedagogical language and expertise that allows active engagement and participation in the development of innovative curriculum. The school nurtures communities of practice among teachers to enable them to meet and collaborate on curriculum improvement and innovation. The active sharing, research and refinement of the learning and teaching processes have resulted in many spin-offs. Teachers are more reflective, proactive and confident in sharing and presentation at national and international conferences.

The school campus is WiFi enabled and has subscribed to a dedicated bandwidth of 20 mbps to support teaching and learning. In terms of student profile, the school conducted a research survey with 830 students in 2011. Based on the results, the students are regular and proficient users of Web 2.0 technologies; all students have access to an eLearning portal as well as Web 2.0 tools.

The Net Generation have begun to move into higher education since the early 2010s. The fear of them overwhelming the ability of universities to meet their digital demands has largely been unfounded thus far (Margaryan et al. 2011). It seems that while these students are very comfortable with digital technologies, their use of them does not generally extend to supporting learning. However, given how K-12 education has considerably ramped up the use of ICT for teaching and learning, it is likely only a matter of time before such students would come to expect similarly effective use of ICT for teaching and learning in higher education. In response to these anticipated needs, universities largely strived to introduce online learning, imagining that this will both make teaching and learning more efficient as well as being ‘plugged in’ to using ICT for teaching and learning. The success of such online learning strategies in the universities varies considerably and is quite often driven from a technology perspective rather than a pedagogical perspective (Song et al. 2004). Nevertheless, as the pedagogical understanding of using ICT for teaching and learning deepens, universities are generally paying increasing attention to strengthening this aspect of the university learning experience for students.

The need to provide effective and meaningful learning using ICT takes on an even more urgent tone as the very model of university learning rapidly evolves. Given that each individual can now potentially be connected to a wide array of sources of learning, both traditional and newly emerged, the future learner may acquire and develop values, skills and knowledge from many sources. In other words, the relationship between student and university will no longer be a many-to-one (university) relationship, but a many-to-many (sources of learning) relationship. This broadly means that universities will have to significantly increase engagement with using ICT for teaching and learning and, more importantly, to focus on learning outcomes that give their students a clear edge in values, skills and knowledge. The use of mobile learning in building up a reflective mindset in students when they engage with important issues is a good example of such efforts.

14.2 Theoretical Foundations and Key Definitions

The Structured Academic Controversy (SAC) has been defined as the ‘deliberate stimulation of intellectual conflict by creating a highly structured situation wherein one student’s ideas, information, conclusions, theories, and opinions are incompatible with those of another, and the two seek to reach an agreement by engaging in Aristotelean deliberate discourse’ (Johnson et al. 1997); such Academic Controversies permit investigations of the social distribution of intelligence, by building on traditional models of debate and encouraging participants to reach shared consensual values.

One of the primary theoretical constructs underpinning this study is Pea’s idea of ‘distributed intelligence’ as described in Perkins (1992). To quote Perkins:

> …people think and remember with the help of all sorts of physical aids, and we commonly construct new physical aids to help ourselves yet more. People think and remember socially, through interaction with other people, sharing information and perspectives and developing ideas… People sustain thinking through socially shared symbol systems – speech, writing, the technical argot of specialities, diagrams, scientific notations, and so on. (p. 133)

Perkins develops the idea further by elaborating on three ways in which intelligence can be distributed: namely, physically (describing the gamut of student output from completion of traditional problem sets, to journals and portfolios, to simple programming and desktop publishing), socially (co-operative learning) and symbolically (e.g. through diagrams and charts, mental maps, and role play).

The germ of these insights was planted in Vygotsky's (1978) cultural-historical theory of activity, first formulated in the 1920s, in which the relationships between human agents and objects in their environment are mediated by culture, tools and symbols. These same notions of 'culture, tools and symbols' are implicit in Perkins's writings. Perkins's contemporary at Harvard – Putnam (1993) – brings to the present discussion the term 'social capital'. This refers to social networks which go beyond traditional familial ties and connect friends and strangers for mutual benefit. This is important for the success of the project as building up the basis of successful collaboration affects how well the learning takes place. Social capital is, therefore, the basis of collaborative behaviour.

Such investigations exemplify Habermas' (1981, p. 288) concept of 'communicative action' – defined as 'the use of language with an orientation to reaching understanding'. Defined thus, Myerson (2001) explains that communicative action is shared action – such 'small-group engagement' is the 'process by which people come to an understanding about something'.

The program adopts a core-periphery model in its design philosophy; such a model was chosen because of its flexibility – both in terms of flexibility of implementation by the teachers and in terms of the scenario-based learning architecture.

Sharples et al. (2010) attempt to bridge the relationship between traditional and mobile learning, by defining learning as a global conversation, and that conversation is the driving process of learning. According to them, it is the means by which we negotiate differences, understand each other's experiences and form transiently stable interpretations of the world.

They also argue that learning requires more than channels of communication and a means for transmitting knowledge; a shared language is needed (among learners and between learners and computational systems), a means to capture and share phenomena and a method of expressing and conversing about abstract representations of the phenomena. Learning is a continual conversation with the external world and its artefacts, with oneself, and also with other learners and teachers.

The challenge then is to enable learners to have control over their conversation and seamlessly switch between different contexts, such as between formal and informal contexts and by extending the social spaces in which learners interact with each other. Certain educational activities, such as SAC, are explicitly designed to support this structure of conversation.

At the core of the program is the Grounded Experience of the student, with regard the issue identified by the teacher. For example, in the general theme of 'Conflicts' in the Social Studies syllabus, the particular issue might be 'varying perspectives and attitudes towards foreign talent in Singapore'. Traditionally, such an issue would typically be approached in class through the dissemination of notes and/or cases, which are often presented in an abstract and decontextualised manner (from the point of view of the student, who would likely have minimal embodied understanding of the issue). This traditional approach does not make for enduring understanding nor empathy; the result is that the students' written responses to the issue are shallow and lack sophistication and maturity of thought.

The Grounded Experience seeks to address this by approaching the given issue from a more personal, more multisensory orientation; these can include Learning Journeys to relevant Ministries/Statutory Boards/Non-Government Organisations/Civil Society groups, the design and conduct of interviews and oral histories and other similar field-based activities. From this Grounded Experience, the students would have gathered sufficient data to serve as evidence-based arguments to either support or refute the respective stands, as presented by the SAC. The students then engage in the SAC activity, in a face-to-face setting; this includes the reversal of perspectives and consensus building. This would then allow students to gain invaluable hands-on experience that would assist them in their prior knowledge in class. Twenty-first-century dispositions being practised would include self-directed learning (field-based research), active listening and critical thinking (evaluation of the argument) and collaboration (consensus building).

Critical to the Grounded Experience is the teacher-facilitated deconstruction (debrief) after the SAC. This will help the students to start building linkages from their particular case-based field research, back to the more general issue from the syllabus. However, it should be clear that a single instantiation of any design intervention would not result in lasting change and enduring understanding. Ideally, multiple instantiations should be enacted, from the point of view of the student. All too often, logistical and cost issues associated with any field-based activity (essential to the Grounded Experience) reduce greatly the likelihood of a second opportunity to practise, let alone a third.

This latter point highlights the importance of the second component of the program, namely, the Periphery. While the core is the Grounded Experience (field-based SAC), the Periphery is represented by the opportunities for the students to engage in SAC in their own small-group settings, without the teacher needing to design an elaborate learning activity for the entire class in a single sitting. This is achieved by letting the students practise SAC (or, be introduced to SAC) using handheld devices (mobile-based SAC).

The students can access the SAC via a website on their handheld devices, which would direct them to a simple two-dimensional newsroom environment that they can work on with a variety of news sources (the mobile-based SAC presents the student with a simple two-dimensional newsroom environment, from which the students have access to a variety of news sources) (drawn from a database array populated by the teacher). The newsroom environment is deliberately designed to be instantiated in a small-group setting. Once the group enters a newsroom, they are presented with the topic (the Controversy), and they will choose (or be assigned) their initial argumentative positions on either side of the topic. They are given a fixed amount of time to analyse the sources and review them critically for relevance to their stand. After the time is up, the newsroom metaphor continues, as they work in their (opposing) pairs to assemble an editorial, press kit or news feature within the environment, using the sources that they have identified earlier. In this way, they practise the skills of the SAC, including perspective reversal and consensus building. Consensus building is achieved when the pairs abandon their positions towards the end of the SAC and work together to come up with a press kit or an editorial in a suitably objective tone (or, at least one which makes its assumptions and biases explicit to the reader). The choice of focusing on mobile devices to support learning is a reasonably clear one.

Most adults and adolescents in developed countries now own mobile phones and media devices, and in a parallel development to the spread of personal technology, since the early 1980s, schools, colleges and universities have experimented with handheld technology for learning. More importantly, students now generally have the skills to navigate effortlessly through the interface and the myriad of applications, and therefore the need for technical training can be reduced considerably. In fact, the students' familiarity with social media exchanges using mobile devices also means that when judiciously designed, the Teaching and Learning (T&L) interactions that represent the mobile learning experience can be seamlessly incorporated into the students' daily use of mobile devices. This will make it easy for students to access learning materials as learning using mobile devices becomes a natural extension of daily activities. While ease of access can generally be expected for students, their ability to use mobile devices meaningfully cannot be assumed. This is where the designed T&L interactions need to be based on sound pedagogical principles. For instance, in attempting to get students to 'practise' the collaboration processes in a mobile environment, clear guidance using scaffolded activities with the devices will need to be enacted. One key aspect of mobile learning is the ability of the platform to capture the learning experiences of the students as they happen, which can then provide important feedback during any subsequent reflection processes to deepen the learning. These and other aspects are illustrated through the practice being shared in this chapter.

14.3 Teachers Tasks in Preparing for a Newsroom SAC

14.3.1 Teacher Activity: Populating and/or Updating of Student Database

A teacher or administrator (not necessarily the same teacher who is running the class) logs into Newsroom SAC and enters student data into the database. The student data consists of the student's name, class and index number. This will only have to be done once per student; the data can subsequently be updated annually as the students are promoted.

Fig. 14.1 Teacher template preparation page

14.3.2 Teacher Activity: Preparation of Template

The teacher logs in to Newsroom SAC and creates a new SAC template by entering the topic name and the two opposing argumentative positions and by populating the SAC template's news source list (initially empty) with news sources in the form of text, pictures, audio or video (see Fig. 14.1). These can be uploaded from the teacher's device or linked from the web. In the case of linked multimedia clips, the teacher can also select the start time and end time for playback. Teachers can also select sources from a small default library.

The teacher can assign unique sources to each argumentative position. Once the teacher finishes populating the source list, he/she saves the template, which can now be used for future SAC sessions.

Teachers may choose to add their source data or full templates to a larger library of persistent shared teacher-generated content; if so, it is noted as 'added by <name of teacher>'.

14.3.3 Teacher Activity: Scaffolding the Review of Sources

Teachers may seek to guide students in source review and selection, through the use of learning scaffolds – an example of which is given below:

Study the caption	(a) Are provenance details given? (i.e. Who took the photograph? When was it taken? Where was it published?)
	(b) What information does the caption provide that might help you understand the photograph?

(continued)

Study the details in the photograph and draw inferences	Study the photograph for 2 min. Form an overall impression of the photograph and then examine individual items. Next, divide the photo into quadrants and study each section to see what new details become visible. Identify the main character(s)
	Note: You may need to use your contextual knowledge to help you understand the source, identify the character(s) and infer the attitude of the photographer and the mood of the photograph
	(a) What types of detail did the photographer include? Is he selective?
	(b) Does the photograph have people in it? Is the person doing anything? What significance does his action have?
	(c) What is the attitude of the photographer to what he has taken? How has he taken the photograph – favourably or unfavourably? How does his attitude reflect on the types of details he includes in the photograph?
	(d) What is the tone/mood of the photograph? When you look at the photograph, what do you feel – sad, happy or angry? Why? What evidence in the source make you feel this way?
Infer the motive of the photographer and possible responses to the photograph	Note: You will have to study both the caption and the photograph to question the intention of the photographer
	(a) Who is the general audience of the photograph?
	(b) What do you think is the photographer's intention?
	(c) What are the possible responses/reactions to the photograph? Propose reasons for these responses

For the purposes of the lesson program, the students are divided into a number of groups, each of which will be further subdivided into two sides. The typical group size will be four students, subdivided into two sides of two students.

14.3.4 Overview of Lesson Activities

Each session within the program constitutes a self-contained lesson which may be enacted within or outside of class time. By using the program on their mobile devices, students and teachers do not have to be co-located in order to facilitate the learning and teaching process. Within class time, the control of the learning activities usually rests with the teacher. Through the program on their mobile devices, the teacher can easily set the time limit for each stage of the activities, the topic and the types of sources the students have access to. Outside of class time, the students may in their own groups use the technology to discuss and analyse issues that they have identified. They may locate their own sources and use them in their activities. Since the technology is web-based, the student can interact with each other using different devices and not be confined to a single location. The technology therefore benefits the ways in which learning can occur: the learners can access materials when convenient, and they can control the pace and style of interaction. They can also search for materials during their discussion as the program is used on mobile devices.

At the beginning of the lesson, each group is assigned a topic with two opposing stands or viewpoints. Different groups within the class may be assigned the same topic or different topics. The two sides within each group are each assigned a specific stand. The lesson consists of several stages, each of which has a time limit.

The timer will begin, and interaction with the interface is allowed, only when all the stage participants are logged in and choose to begin the session. The stages are as follows:

1. Source review and selection. During this stage, the students use the newsroom interface to review the sources (text paragraphs, images, audio or video data) which have been made available for their group or stand and select sources which they would like to present in order to support their stand. Each side within each group has their own separate newsroom for organising source material. The process of review and selection is updated in real time, i.e. when two students from the same side are logged in, their actions will update the state of the newsroom such that they can observe the changes that each other makes. The teacher is also able to log in and view the state of the newsroom of any side, at any time. This activity is asynchronous between sides; the two different sides within a group do not need to log in at the same time. However, it is synchronous within each side; in order to begin the timer and interact with the newsroom, all of the members of a side will have to be simultaneously logged in and choose to begin the session. Depending on the total amount of time set aside for the entire lesson unit, this particular stage has a typical duration of between 30 and 60 min.
2. Presentation of stands. In this stage, the entire group (both sides) logs in at the same time; the stage is synchronous within the group. The two sides each use the presentation interface to present their respective stands, using the sources which they have chosen to support those stands. While each side is presenting a source, the other side can use the interface to write comments about the arguments presented. Typically, each side might take (or be allotted) 10–15 min each.
3. Preparation for perspective reversal. This stage uses the newsroom interface again. Here, the two sides now exchange their stands, and must prepare to present the opposite stand, by reviewing and selecting sources. They are able to view the comments which they have written during the previous stage. In all other matters, this stage is similar to stage 1, source review and selection. This stage typically lasts between 20 and 45 min.
4. Presentation of reverse stands. Now that the two sides have exchanged stands, they proceed to present their new (reversed) stands in the same way as stage 2, presentation of stands. Again, each side might take 10–15 min each.
5. Collaborative creation of a final artefact. At this point, both sides are able to view their own prior newsroom activities. Their task here is to write a final report which presents a stand on the topic which they have been debating about – either to choose one of the stands or to present some synthesis of the two stands. This activity is synchronous within the group. At the end of this activity, the final report is submitted to the teacher. This stage might typically take between 30 and 60 min.

Fig. 14.2 Screenshot of SAC activity overview page

14.3.5 SAC Stages in Relation to Sequences of the Newsroom Environment

Source Review and Selection Students log into the newsroom environment (see Fig. 14.2) using web browsers (on desktop or laptop PCs or on mobile devices). From the home page, they can select the name of the topic (which their teacher has assigned to their group) to enter an overview page which shows them the topic name, their side's initial argumentative position and their current progress in the activity flow.

Once the (typically two) members of the same side within their group have both logged in and indicated that they are ready to begin the activity, they move on to stage 1 of the activity, where they review the sources that have been made available to them and select the ones which they feel best support their stand.

Newsroom Screen Students can scroll through the source list on the left or search through the source list by typing into the search box above the list of source icons (see Fig. 14.3). To view a source, they simply click or tap on its icon. The source media (text, image, audio or video) is shown at the centre of the screen. Members of the same side can view sources independently of each other, though each member can only view one source at a time. They can write notes about the source that they are currently viewing (if they then add that source to their selection, the notes that they make here will be visible to them during their subsequent presentation) and click or tap on a button to add the source that they are currently viewing to their selection. They can also use a notepad (labelled 'Sketch Pad' in the screenshot) to discuss how they would like to present their stand with the other member of their side.

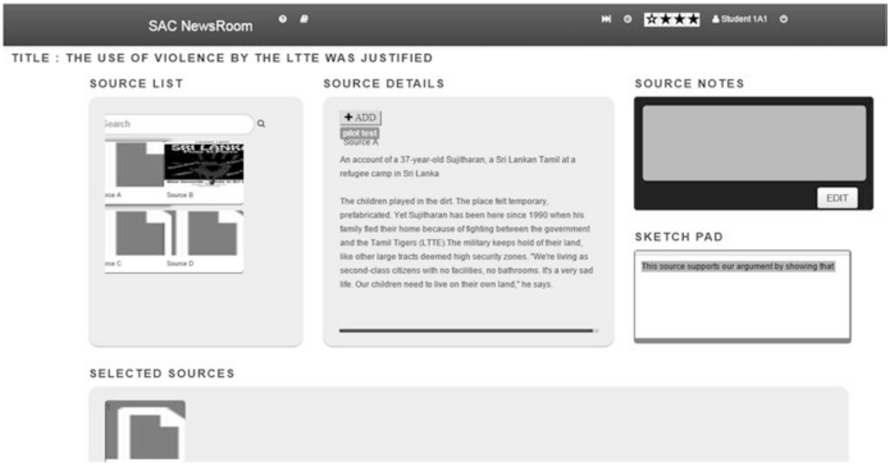

Fig. 14.3 Newsroom screen where students review and select sources to support their side

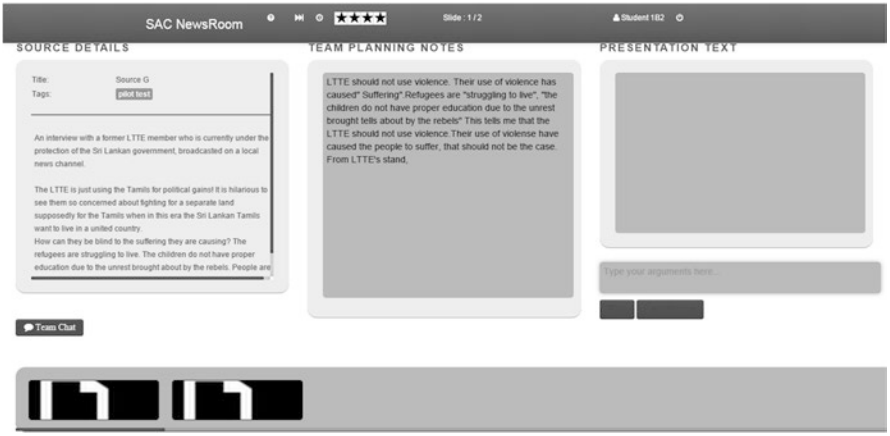

Fig. 14.4 Screenshot of presentation interface (presenting side's view)

Each side's newsroom is shared in real time, meaning that any change made by one member is seen by the other member as well. If the teacher logs in, he/she can choose to view the shared newsroom as well. The two sides work on this stage independently, but all the members on both sides must be online at the same time for the next stage to begin (or at least one member from each side must be online, in cases where sides are sharing devices).

Presentation of Stands Once both sides within a group have completed source review and selection, they go back to the activity overview page, where they can indicate that they are ready to move on to subsequent stages, during which each side will present their case to the other side in turn, using the presentation interface (see Figure 14.4 and Figure 14.5).

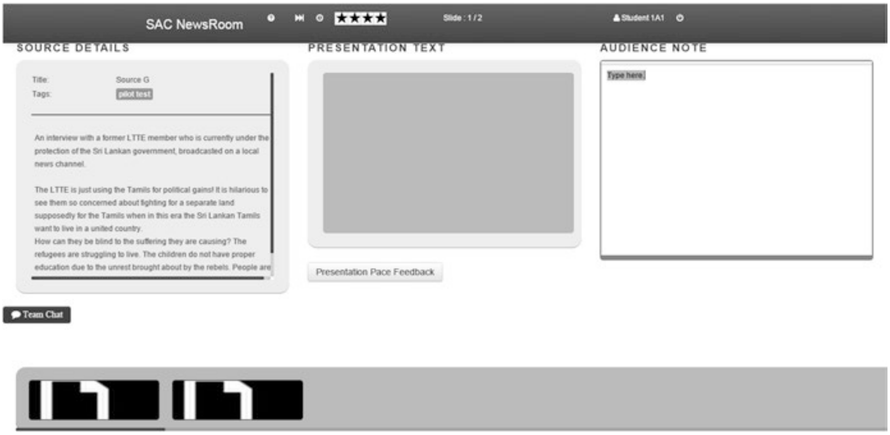

Fig. 14.5 Screenshot of presentation interface (audience side's view)

Presentation Screen (Presenting Side's View) The first source from the presenting side's selection is shown at the left side of the screen. The notes which they wrote during stage 1 regarding this source, here labelled 'Team Planning Notes', are shown at the centre of the screen (these notes are not visible to the other side, to whom this side is presenting). The presenting side's arguments as to how this source supports their case are shown at the right side of the screen (under the label 'Presentation Text'), underneath which is a text box for the members of this side to enter their next statement. Once the members of the presenting side are satisfied with their statements for the first source, they can click or tap on a button to move on to the next source in their selection. Once the presenting side has presented their case for each of the sources in their selection, they can end the presentation.

Presentation Screen (Audience Side's View) The source which the presenting side is currently presenting is shown at left, and the presenting side's arguments regarding this source are shown at screen centre. On the right is a text box for the audience side to write their own comments on the presenting side's arguments (regarding this source).

Once one side has finished presenting, the other side presents. Once both sides have finished presenting to each other, they are able to have a chance to discuss each other's presentations and can seek clarification regarding any points made during their respective presentations (Fig. 14.6).

All students in the group must log in together to start this discussion stage. Students can see the list of sources that their side selected, as well as the list of sources that the other side selected. If they click or tap on a source that their own side selected (and then presented on), they can view the source, their own notes on that source as well as the arguments that they presented regarding that source. If they click or tap on a source that the other side selected (and then presented on), they can view the source, the other side's arguments regarding that source and their own comments regarding the other side's presentation. Finally, students can use the

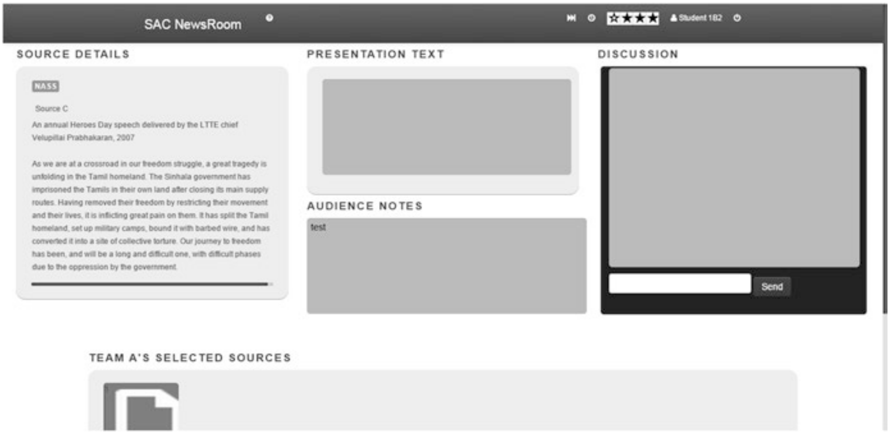

Fig. 14.6 Screenshot of post-presentation discussion

discussion box on the right to discuss their respective presentations using a chat interface.

Preparation for Perspective Reversal Once the students have completed this discussion, the sides are now informed that they must reverse their positions from before and are given time to prepare a new presentation on their new stand. They are taken back to the newsroom interface, except that the list of sources that they can select from are limited to those which the other side selected during their first presentation (pre-reversal of position). For each of these sources, they can see their own comments on the other side's presentation, but they cannot see the presenting side's original statements. From their original notes, they are to take what they deem to have been the best arguments from the other side and represent them in their own words. Once this stage is complete, each side will again present their cases (this time with their positions reversed) to each other.

Presentation of Reverse Stands Once the group is online, the reversed presentations will begin. The presentations proceed in a similar manner to the previous round of presentations. Once the presentations have completed, the final stage begins.

Collaborative Creation of a Final Artefact In the final stage, both sides are informed that they must reach a consensus and produce a final artefact: a press release, news report or series of tweets. All four students log in simultaneously and work together on a common text workspace to do this; at this point, they are able to review (but not edit) all the newsroom spaces and presentations generated in the course of the session. Once the time is up, the state of the text workspace is captured automatically and submitted as a final artefact.

After the final stage is submitted, the teacher can view the students' output, including the text artefact, newsroom spaces and presentations, and is able to assess them. The teacher is able to write comments on the text artefact as well as on the presentations, which the students can log in and view.

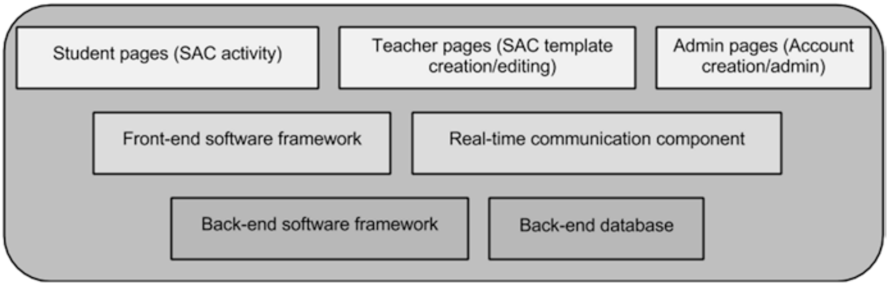

Fig. 14.7 Newsroom major components and underpinning core technology

14.3.6 Technical Description

It was not envisaged for the newsroom environment to be a complex rendition of an actual newsroom in 3D. Instead, it might easily be rendered using HTML5, for maximal platform independence. The newsroom environment is therefore a web-based application, designed to be accessible from any computer (desktop or laptop) or mobile device that supports HTML5. It comprises of three major components (see Fig. 14.7):

1. A tool for groups of students to engage in a SAC activity online
2. A tool for teachers to create and edit SAC topics (templates), as well as to create and edit SAC sessions for their students
3. An administrative tool, for an administrator to manage user accounts

The core technology that underpins these components can be broken down into four layers:

- Front-end software framework: built using HTML5 and CSS, to ensure accessibility across a range of devices running different operating systems.
- Real-time communication technology: built using Socket.IO. This technology allows students to view and respond to actions taken by the other students within their groups in real time (e.g. during a presentation, the arguments made by the presenting side are made visible to the audience side almost instantaneously, and comments on the argument made by one member of the audience side are shown to the other member of the same side in real time as well).
- Back-end software framework: built using the Node.js platform, which is designed for real-time web applications.
- Back-end database: stores a list of the user accounts, the SAC topic and session information, as well as a record of student activities, including the text artefacts that they generate over the course of the activity.

The newsroom environment is fairly versatile as it can be deployed either as an online web server (hosted on a commercial web host) or locally by running the software on any mid-range desktop or laptop PC from 2013 or newer. This gives schools/institutions more flexibility in how they would like to use the environment, depending on their needs and available resources. It would also give students more incentive towards their study as it encourages group discussion and facilitates existing class-based knowledge.

This chapter has described one way in which the popular pedagogical approach of the Structured Academic Controversy might be enacted in a learning setting in which learners are not necessarily co-located. We have chosen mobile learning to exemplify the pedagogical approach because the infrastructure, participants' comfort with the technologies and teachers' enhanced pedagogical understanding in using ICT for teaching and learning have colluded at the right time.

It is therefore hoped that through the use of the newsroom environment, and with the affordance of multiple opportunities to practise perspective-taking through Structured Academic Controversies, students would be able to practise these valuable citizenship dispositions till they become second nature.

This concept is increasingly relevant in view of one of Singapore's challenges of ensuring social cohesion with the changing demographics in society. In addition, it contributes towards Character and Citizenship Education. At a more micro-level, it takes the form of Values Education in terms of how an individual relates and responds positively to other people in his milieu. At a more macro-level, a deeper understanding of geopolitics and the implications for Singapore is a critical aspect of developing responsible and engaged citizens with a global outlook. Another application could be the co-development of conflict management skills, which is an integral part of developing social-emotional competencies (in the domains of self-management as well as relationship management).

The newsroom environment was chosen because it is the most appropriate and flexible metaphor for the students to be able to adopt the epistemic frame of journalists or media analysts and, by doing so, have first-hand embodied experience of the importance of critically analysing sources, even those which at first glance might seem authoritative and unbiased. This is an important skill in Social Studies and in terms of citizenship education in general.

The newsroom environment has been in development since February 2013 and underwent testing in classroom contexts during 2015. Initial problems pertaining to network stability and server load balancing have been resolved, and present usage cases centre primarily around small-group instantiations, as opposed to concurrent activities for class sizes of 40.

A teacher who conducted a lesson where students engaged in a SAC activity on the topic of international conflict using the newsroom environment in August 2015 gave the following feedback regarding the students' discourse:

> Given that these were 15-16-year-old students discussing sensitive and controversial macro topics, they handled the dialogue maturely and attempted to provide a balanced point of view. In trying to rationalise their stand, the students provided strong viewpoints and recognised the importance of elaborating their points clearly (which is needed for their Social Studies essay component). The students were also able to view the issue from a macro perspective and were reflective of the situation by providing inputs and pre-empting on possible future consequences.

Future work on the newsroom environment will seek to afford students the opportunities to populate the database of learning resources with multimodal sources of their own choosing. This would therefore serve to increase student ownership over the controversies and over the pace and settings of their own learning.

Note

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Chapter 15
Enhancing Oral Communication Skills Using Mobile Phones Among Undergraduate English Language Learners in Malaysia

Ramiza Darmi and Peter Albion

Abstract The study introduced the use of mobile phones in an English language learning course to second-language learners studying at a higher-education institution in Malaysia. Mobile phones have multifunctional capabilities that can be used anytime and anywhere at the convenience of the learners; therefore, the study aimed to investigate the possibility of using mobile phones as tools to improve the oral interaction skills of the learners. The study explored the basic functions built into mobile phones relevant for an oral communication skills course. A class of 50 learners was assigned as the treatment group and another class of 26 learners as the no treatment group. The treatment group was introduced to the audio recording devices in mobile phones and encouraged to practice the tasks assigned before the evaluation. This study adopted a quantitative research design, and the tools employed were a survey questionnaire and the course assessments. Data in the classroom were collected over a 10-week period. The findings demonstrated an increase in the performance of the learners at the end of the semester; nevertheless, the results must be interpreted with caution as use of mobile phones only started in week 5 of the 10-week semester which may not have given learners sufficient time to master the skills required to use them optimally for language learning.

R. Darmi (✉)
Department of English, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, Serdang, Malaysia
e-mail: ramiza@upm.edu.my

P. Albion
School of Teacher Education and Early Childhood, Faculty of Business, Education, Law and Arts, University of Southern Queensland, Toowoomba, Australia
e-mail: Peter.Albion@usq.edu.au

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15.1 Introduction

The minister in the Prime Minister's Department of Malaysia, the honorary Datuk Seri Wahid Omar, reported that 161,000 local graduates aged between 20 and 24 years old from the total of 400,00 were unemployed (Bernama 2015). Further, it was reported that the main factor contributing to the increase of the unemployment rate was the low quality of local graduates. An earlier survey administered to managers and senior managers across various industries in Malaysia reported that 70% of them agreed that the quality of the recent local graduates was only average (JobStreet 2011). Another crucial finding from the survey was that the criteria used by both managers and senior managers when employing recent graduates included good interpersonal communication skills, good command of the English language and the right salary expectation. In Malaysia, it is widely believed among employers that graduates who have a good command of the English language required for success in the business environment are able to reflect their competence in their confidence and proficiency with which they respond when the job interview is conducted in English. In addition, a newspaper reported on a survey conducted in 2011 with 174,464 university undergraduates which found that 24.6% of them were still jobless within the first 6 months after graduation. The two main reasons identified were a lack of language proficiency, particularly in English, and insufficient knowledge and competency in the jobs they applied for (The Star 2013). The media reports affirm that local graduates who demonstrate competence in the English language have an added advantage over less competent students when applying for jobs.

Malaysia is situated in the southeast Asian region and is made up of Peninsular Malaysia and East Malaysia, was once colonised by the British, and achieved its independence on 31 August 1957. During the British administration, English was used as the official language throughout the nation, including for communication among the government sectors. Due to the widespread use of English language as the medium of communication, the British not only established English medium primary and secondary schools but also schools to cater for each of the three ethnic groups, the Malays, Chinese and Indians. The Malays are native to the region, whereas both Chinese and Indian people migrated to Malaya (the name for Malaysia before independence) due to trading activity that happened during that era. Nevertheless, schools were allowed to use the language spoken by each of the ethnic groups as the medium of instruction. Post-independence governments implemented the National Language and National Education Policies for primary and secondary levels of education (Darus 2009) and agreed on *Bahasa Melayu* as the national and official language of the country, whilst English was formally accorded the status of a second language (L2) for Malaysia (Darus 2009; Thirusanku and Melor 2012). The three ethnic groups who had served in the British administration and had been using the English language for communication (Thirusanku and Yunus 2012) generally accepted the decision for the English language as L2.

The importance of the English language is greatly emphasised in the Malaysian education system. First, both *Bahasa Melayu* and the English language have been made compulsory language subjects to be learned in primary and secondary schools from the age of 7 to 17 years old. As a result, Malaysian learners who complete formal education at both levels would have learned the English language for 11 years. The recent plan of education development of Malaysia for 2012–2025 (Ministry of Education 2012) again strongly emphasises literacy in the English language for year 1 to year 3 learners in the primary school plan, supporting the importance of the English language.

One of the conditions to continue to pre-university programmes is that learners must obtain a pass in the English language subject in the national examination administered before the end of the upper secondary level known as the Malaysian Certificate of Education or *Sijil Pelajaran Malaysia* (SPM), which assesses academic subjects learnt in Form Four and Form Five of the upper secondary level. The next condition is to obtain a band score of Malaysian University English Test (MUET). It is a criterion-referenced test and the results are on a 6-band scale. The lowest score is band 1 and the highest score is band 6. Each band reflects the individual learner's English language proficiency level. MUET measures four language skills: reading (45%), writing (25%), listening (15%) and speaking (15%). The achieved score is used as a benchmark to determine the number of English language courses the learners must enrol whilst studying at the undergraduate level.

In recent years, there has been an increasing interest in mobile learning in the areas of education in general and in the field of L2 learning specifically (Reinders and Cho 2012). It is predicted that personal and portable mobile technologies can have a positive impact on learning when learning can take place outside of the classroom and in the learner's environment (Naismith et al. 2004). The survey report on mobile phone users in Malaysia in 2014 revealed that the largest group of users were in the age group 20–24 (18.8%) followed by users in the age group 25–29 years old (16.3%) (Malaysian Communications and Multimedia Commission 2015). The statistics reflect the increased ownership of mobile phones among Malaysians, signifying the adoption of these technologies as a necessary, rather than a luxury item. Undergraduate learners in higher-education institutions (HEIs) in Malaysia are mostly in the age range of 20–30; therefore, the central issue for educators has been on mobile learning including the use of mobile phones in L2 learning contexts.

15.2 Review of the Literature

The aim of this study was to explore the integration of mobile phones in the English language learning classroom with the purpose of assessing the impact of using mobile phones on oral interaction skills among Malaysian undergraduate learners. This section reviews past studies on oral interaction skills and mobile learning.

15.2.1 Oral Interaction Skills

Oral interaction refers to spoken interaction in which the skills involve reciprocal activities of listening and speaking that are considered to be difficult for non-native learners (Chen 2011). The difficulty is due to the need to understand a message that is not uttered in the mother tongue. As a result, learners find both skills difficult because they need to understand the spoken statements and at the same time formulate a response with attempts to use the correct structure that the learners have been taught (Kern 1995). In addition, L2 and foreign language learners find it challenging to interact in the English language as they encounter various linguistic problems that handicap and hamper their attempts to interact (Zhang 2009).

The common circumstance in non-English speaking countries is a lack of authentic target language environments for L2 learners to develop their interaction skills, creating an imbalance in classroom participation. Instead of being the avenue for learners to practise interacting in the target language whilst developing their proficiency and confidence in using the language, English teachers teach the target language as outlined in the school syllabus to prepare the learners for assessments (Puteh-Behak et al. 2015). There is no difference in learning the English language from other academic subjects at schools, and learners are made aware of the importance of obtaining a pass in the English language examination. As a result, the teaching approaches make the learners become less active, restricting them from interacting in the target language and consequently affecting their fluency in the English language.

Limited opportunities to use the English language in conversation contributes to low confidence levels in L2 learners about communicating in the target language (Barlow et al. 2014; Boonkit 2010; Chen 2011; Zhang 2009) The learners avoid making mistakes when interacting in the target language, thus creating inactive English language learning classrooms due to limited participation from the learners. Other factors reported are negative experiences and perceptions of the learners towards their teachers and the language content, as well as the learning and teaching process (Kumaran 2010; Samat 2010; Yang et al. 2012). It is believed that L2 or foreign language learners experience language anxiety which according to Horwitz et al. (1986) is a situation-specific type of anxiety responsible for negative emotional reactions during language learning. Furthermore, researchers on L2 acquisition agree that language anxiety inhibits the learning and/or production of an L2 (Horwitz 2010).

Malaysian learners vary on the academic status and social life of the family. For example, those who study at schools located in urban areas are more prepared to use the English language even outside the classroom than those who study in rural areas. Though they are often reminded about the importance of the language in HEIs and later for careers, the English language seems to be a foreign language to learners who study in the rural areas as the language is not widely spoken. This is in contrast to the learning approach by their counterparts in urban areas who easily gain benefits from social interaction.

For oral interaction to be effective, L2 learners need to develop their ability to use the target language appropriately in social interactions and beyond the classroom walls. Competency in oral interaction skills demonstrates the extent of knowledge or the amount of acquired grammar and vocabulary, all of which lead to the construction of sentences that learners need to produce and adapt to the circumstances (Khamkhien 2011). One of the initiatives an English language teacher introduced was preparing a flow chart to assist her L2 learners (Kumaran 2010). The flow chart contained ideas on what to say using the target language. The study found that the learners who had the best language competence agreed on the use of the flow chart in guiding them to speak but the learners who were less comfortable with the language structures experienced problems performing the activity. Nevertheless, the learners enjoyed, felt comfortable and were confident working with peers without worrying about making mistakes when they had to role play. Similarly, the use of drama activities for teaching increased the involvement of both undergraduate and postgraduate learners, and they showed greater interaction among themselves and improvement in their oral skills by the end of the semester (Gill 2013). The use of drama scenarios encouraged speaking opportunities, and as the learners engaged in cooperative learning with other group members, this boosted their confidence level to speak in the target language. Not only did they demonstrate better fluency in the target language but they also showed greater willingness to interact in the language during the communicative-drama activities than in earlier sessions without the drama lessons.

With the advancement of technology, computer-mediated communication (CMC) offers opportunities for teachers to construct activities in order to help different types of learners to develop oral skills (Blake 2009; Chen 2011; Ko 2012; Abu Bakar et al. 2013; Yang et al. 2012). Synchronous CMC was introduced to Taiwanese learners who were learning French to acquire oral interaction skills. The finding from this study was that students considered it useful in structuring conversation contexts, formulating thoughts and reflecting on French linguistic features (Ko 2012). In addition, synchronous CMC was found to benefit intermediate level English proficiency learners in developing their oral fluency and the use of CMC in learning environments contributed to the improvement of fluency in the target language (Blake 2009). Similarly, an asynchronous online discussion forum was found to benefit low proficiency English language learners as they could develop both audio and video recordings of their discussions and then listen to the recorded discussions (Nadzrah et al. 2013). The learners viewed such a learning environment as a platform for them to practise speaking in English and develop their self-confidence to interact in the target language. Low-intermediate-level Taiwanese college learners had problems with English pronunciation and agreed that online and interactive exercises which provided immediate feedback on their performance were effective at enhancing their oral interaction skills (Chen 2011). In addition, practice is also necessary for the development of fluency in the target language. Online discussions facilitated by English teaching assistants who act as models for the foreign language learners to imitate offered them opportunities to practise in the target language discussion, which further improved the confidence levels of students (Yang et al. 2012).

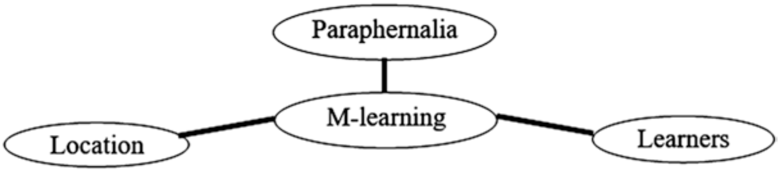

Fig. 15.1 Diagram of mobile learning through paraphernalia, location and learners (Embi and Panah 2010) (Reprinted with permission)

15.2.2 Mobile Learning

In recent years, interest has increased in mobile learning in the areas of education in general and in the field of L2 learning specifically (Reinders and Cho 2012). Since mobile learning has emerged as a new trend in learning, studies have been initiated on opportunities to support mobile learning as an extension to 'learning that occurs in or outside of a classroom or formal education setting, is not fixed to a particular time or place, and is supported by the use of a mobile device' (UNESCO 2012).

There are multiple definitions of mobile learning given by researchers in mobile learning. Sharples et al. (2007) define mobile learning as a process of seeking knowledge through conversations across multiple contexts among people and personal interactive technologies. Brown (2005) labels mobile learning as an extension of eLearning and accomplishing the learning using small and portable devices. According to Ally (2009), 'mobile learning through the use of wireless mobile technology allows anyone to access information and learning materials from anywhere and at anytime' (p. 1). The concept of mobile learning encourages learners to take control of what they need to learn, access the learning materials and related information independently and fosters learner autonomy. Figure 15.1 illustrates the essential elements for mobile learning that include the tools or technology (paraphernalia), the spatial dimension (location) and the participants (learners). Mobile learning takes place when learners use any technology to learn anywhere at any time necessary. In the classroom, research has witnessed the result of mobile learning when the learners become active rather than passive and voluntarily engage in the learning process (Embi and Panah 2010).

Past research studies have looked at learners' perceptions and their acceptance towards mobile learning. At the initial stage of the introduction of mobile learning, these assessments are crucial to language teachers and others considering the use of mobile learning for teaching (Corbeil and Valdes-Corbeil 2007; Keller 2011) because they provide information from the perspectives of learners about incorporating mobile technology as an additional learning medium (Abas et al. 2009). There are a range of mobile devices to choose from which are appropriate for various learning purposes, but they are only tools to enhance the learning process (Hussin et al. 2012). The choice of a particular mobile technology is not as important as making the learning experience compelling and encouraging effective interaction and engagement using the technology (Hussin et al. 2012; Wagner 2005).

In the context of Malaysian HEIs, a number of studies on the readiness of learners towards the implementation of mobile learning have been conducted. This includes studies with on-campus learners and distance learners. Undergraduate and postgraduate learners from two public universities in Malaysia revealed that 100% of the learners owned a mobile phone (Hussin et al. 2012). The basic functions they use on their mobile phones include 3G service (68%), multimedia messages (88%) and internet access (76%) which further confirmed that the mobile phones owned by the learners met the basic requirements for them to engage in mobile learning. Learners indicated their familiarity with the basic skills of using mobile phones including emailing, downloading files and reading online. Seventy-five percent of the learners realised the benefits of mobile learning and about 50% of them indicated their readiness to allocate extra costs to spend on mobile learning, including a rise in phone bills at that time but other learners were not ready to accept the expense. In general, undergraduate and postgraduate learners were willing to engage in mobile learning but were not always able or willing to accommodate additional financial costs.

A preliminary study on mobile learning using a survey analysed 713 complete questionnaires from year 2 to final year undergraduate learners of Universiti Malaysia Sabah, East Malaysia (Choon-Keong et al. 2013). The results indicated 60% of the learners owned either a tablet or smartphone with Wi-Fi access capability. In addition, 86% of the learners viewed mobile learning as beneficial and useful for managing time, 86% agreed that mobile learning was conducive to learning, 43% perceived motivation in learning, 86% commented on improving learners' productivity, 84% would complete assignments faster and 87% said it was helpful learning the course. The learners considered that mobile learning would improve their productivity as it allows for retrieval of extra information through links given by course lecturers or through the help of online search engines such as Google. This was further affirmed by an interview respondent that mobile learning had facilitated her learning, enabling her to work quickly and more productively. In addition, mobile learning helped her to stay connected with friends at a distance besides making her learning meaningful through discussions.

A survey was administered to 6000 undergraduate adult distance learners between 31 and 35 years old who were studying at 31 learning centres of the Open University Malaysia (Abas et al. 2009). A total of 2837 completed questionnaires were received and analysed. The findings revealed 99% owned a mobile phone and the majority used a prepaid service. In addition, 66% expressed their willingness to purchase a new mobile device since they realised the benefits of mobile learning, 43% agreed that mobile learning would assist them better in managing their time, 43% were interested in learning using a mobile device and 50% believed that mobile learning offers flexibility in learning.

A study compared the implementation of mobile learning on 69 undergraduate learners from science and social science disciplines using a questionnaire designed by Hussin et al. (2012) which has 45 items ($\alpha = 0.76$) (Arif et al. 2013). The online surveys contained three domains of readiness, namely, basic physical readiness (e.g. mobile-telephone properties), skill readiness (e.g. ability to make use of mobile devices) and psychological readiness (e.g. understand the idea of integrating learning and the use of handheld devices). The findings showed a significant difference on physical readiness between science and social science learners. The science learners showed greater readiness for mobile learning than those learners from the social science discipline, suggesting that learners from the science discipline were more eager to explore new mobile technologies than their social science counterparts. In regard to skill readiness, learners from the science discipline have greater ability to make full use of mobile devices (such as smartphones), to access the Internet and reading materials compared to learners from the social science discipline. However, there was no significant difference between the two disciplines on psychological readiness, suggesting that the learners were already prepared for, and have accepted the existence of, the technology. The study concluded that Malaysian learners at the HEIs have mobile language learning readiness and are open to accepting the use of technology for teaching and learning.

Previous studies that have researched the use of mobile phones to improve different language skills included an exploration of reading skills (Bahrani 2011; Chang and Hsu 2011; Tsutsui et al. 2012) and listening skills (Stockwell 2013; Yamada et al. 2011) but none for writing skills. Other past studies focused on English for specific purposes, for instance, English for tourism (Hsu 2012), idioms (Hayati et al. 2013), grammar (Gabarre and Gabarre 2010) and prepositions (Begum 2011).

Two studies investigated the use of the video recording feature on mobile phones by Japanese advanced English language learners (Gromik 2009). Both studies required individual learners to produce video productions from week 4 to week 13 of the course. After the production, they presented and discussed the videos with the teacher and peers in the class and were given time to revise the production. For the first study, the length of the task was between 15 and 30 s and the aim was to assess the feasibility and suitability of the learning approach for the language class. The majority of the students agreed on the benefits even though some had reservations about the implementation such as expressing their opinion in the target language. For the second study, the task included a 30-s production every week based on a topic assigned by the teacher. The analysis of the video performances indicated an increase in the number of words the learners spoke in one monologue, 46% improvement on word production and 37% increase on words uttered per second. Interviews with the learners after completion of the exercise indicated that participants were positive about the use of the mobile phones to support learning anytime anywhere and considered learning using a mobile phone to be an interesting and innovative concept.

Subsequently, Gromik and Anderson (2010) carried out an action research study to identify the feasibility of integrating mobile phones to enhance language learning. The 14-week research project engaged second-year Japanese undergraduate learners who have studied the English language for 7 years. The learners had autonomy over the design of their content and video production without receiving assistance with grammatical or linguistics features during the production of the videos from the teacher. The learners used mobile phones to produce videos from the second to the final week of the semester over three stages. The videos were examined in terms of length and the number of lines and words uttered. For analysis purposes, video productions submitted for these three stages – 2, 5 and 7 – by 50 learners were selected. The teacher collected the first set of videos at stage 2 which were then transcribed and the speeches were coded. The results revealed an average speaking time of 20.7 s, the average speech line produced was 4 and the average word count per dialogue was 36.2 words. The final set of videos were collected, transcribed and coded at stage 5. The results revealed average speaking time was 21.3 s, average speech lines produced was 4.2 lines and average word count per dialogue was 36.3 words. Results from both stages had not shown any major improvement on the videos produced. To ascertain that learners had benefitted from the mobile phone-based learning activity, 16 learners were invited to deliver an impromptu speech on their opinion of the course with no time limit at stage 7. The impromptu speech did not allow the learners to write their speech which may have affected their speech production. The results revealed average speaking time was 27.1 s, average speech line produced was 5.06 and average and average word count 43.44 words. In general, the study discovered that the task was within the technological reach of the learners. The learners had access to electronic devices allowing them the opportunity to practise speaking, thinking and improving their linguistic performance in the target language. They were also able to review, evaluate and improve any aspects of their communicative performance before selecting and sending their best video performance to the evaluator. The research demonstrated that practice empowered the learners to improve their speaking ability.

The past studies discussed in the section on integrating mobile phones in speaking call for further research specifically to enhance oral communication skills to aid L2 or foreign language learners. In the Malaysian context, the most dominant users of mobile phones are in the age range of 20–30 years old, and past studies on mobile learning readiness demonstrate student acceptance of mobile learning. As a result, the integration of mobile learning has become a central issue for educators to investigate including in the L2 learning context.

15.3 Research Design

The research design of the study used quantitative methods. Data was collected via an online survey questionnaire using the Qualtrics online tool. The study used an experimental design aiming to investigate the effect of using mobile phones on oral interaction. Two groups are labelled as treatment and no treatment where the former is exposed to the use of mobile phones and the latter was not, to provide a baseline for comparison.

Table 15.1 English language proficiency of participants

MUET result	Language user descriptor	Treatment group	No treatment group
Band 4	Competent user	4	0
Band 3	Modest user	31	6
Band 2	Limited user	13	20
Band 1	Extremely limited user	2	0
Total		50	26

15.3.1 Research Context

The study took place at a public HEI in Malaysia which is also one of the five designated research universities. All five research universities have the dual mission of leading research and providing an educational hub. Malaysia currently has a total of 20 public HEIs. The HEI where the study took place offers a preparatory science programme as well as undergraduate and postgraduate programmes.

15.3.2 Research Participants

The population of the study was L2 learners of an oral interaction course offered in semester 1, 2012–2013 session. The oral interaction course is listed as one of the university courses that are compulsory for Malaysian learners who achieved Malaysian University English Test (MUET) bands 4 and below. The researcher was assigned two groups of learners who had enrolled in the course and embarked on the data collection after obtaining the ethical clearance from the relevant authorities. The first group was made up of 21 males and 29 females, and the second group was made up of 13 males and 13 females. The details of the English language proficiency of the learners are represented in Table 15.1.

15.3.3 Instruments

The main instrument used in the study was a survey questionnaire presented using the Qualtrics online tool. The questionnaire has three main sections. The first section sought background characteristics, level of education and English language proficiency based on national examinations. In addition, the data discussed in the study is based on the third section of the questionnaire which explores the learners' uses and readiness to use a mobile phone. The pretest survey questionnaire was available online once the semester commenced for 4 weeks and the post-test after the semester ended on week 14.

Another instrument used for the study included the course assessment results of the English oral interaction course. The results of the assessments discussed in the study are pair conversation role play and group mock interviews which demonstrated the performance of the learners from both groups. The role play was assessed in week 8 and the mock interview was assessed in week 11. Results of the assessments are used to compare the treatment group before and after integrating the mobile phones and between the treatment and no treatment groups.

The learners from the former group were introduced to the use of mobile phones on week 3 after the semester commenced and used the technology for class activities for 10 weeks. Participants underwent initial training on the use of mobile phone for the purposes of the study to familiarise students with the technical and physical aspects of the mobile phones to achieve the research purpose. Participants were encouraged to use the mobile phones to record individual, pair or class practices during the course of learning.

15.3.4 Data Analysis

The primary researcher adopted the 'description of performance level: oral interaction' as described by Paltridge (1992) as the basis for assessing oral performance. The placement test had been administered for a total of 18 years in both its local context (New Zealand) and an international context (Japan). This established the reliability of the placement test. Prior to the evaluation, the main author briefed her colleague about the oral interaction descriptor (Paltridge 1992). The colleague was the teacher-participant for the study whose task was to do member checking on both course assessments.

For the purpose of the current study, the researcher referred and identified the equivalent level of MUET band achieved by the learners to the descriptors set for the oral interaction descriptor (Paltridge 1992). The course assessments administered in this study were graded according to the descriptor set for English for academic purpose placement testing.

15.4 Results and Discussions

The study investigated the research question about the effects of integrating mobile phones with the aim of enhancing the oral interaction skills of Malaysian undergraduate learners. The use of mobile phones during the English oral interaction course took place with learners in the treatment group.

The participants were introduced to, and trained to use, the built-in features on the mobile phones, specifically using the audio/video recording features to record and review their oral interaction practices. For the first assessment, the task assigned to the learners was role play in a pair or trio. An example of the situation is as given in Table 15.2.

Table 15.2 Example of assessment task given to students for the first assessment

Situation 4
Speaker A
One of your friends missed the first lecture for the day. You meet him/her later. Ask him/her what happened in the morning. Maintain the conversation through follow-up questions
Speaker B
On your way to class from Taman Sri Serdang, you stopped to assist an accident victim. As a result, you missed the first class for the day. Your friend asks you what happened. Explain to him/her

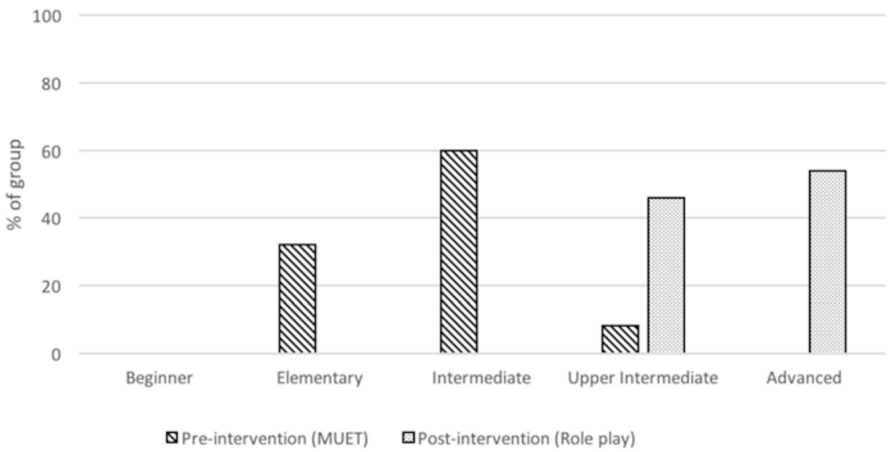

Fig. 15.2 Changes in English language levels of treatment group measured using role play

With reference to the assessment task above, the pair of learners was given the task for 30 min to prepare and practise the dialogue whilst applying the conversation skills taught. Similar to other classroom tasks, the learners were encouraged to record the practice using the mobile phones then review it for improvement. The researcher did not contribute any ideas during the practice. After 30 min the pair was called to perform for assessment.

At the initial stage of the study, the learners from the treatment group were categorised into three English language proficiency levels, namely, elementary (32%), intermediate (60%) and upper intermediate (8%). The assessment was performed in week 8 of the semester and the analysis revealed that they showed progress on their proficiency levels. The learners have progressed to upper intermediate (46%) and advanced (54%), as indicated in Fig. 15.2.

As for the no treatment group, at the beginning of the semester, the learners were categorised into three English language proficiency levels, namely, beginner (3.8%), elementary (88.5%) and intermediate (7.7%). As shown in Fig. 15.3, at the end of the semester, they progressed to upper intermediate level (46.2%) and advanced level (53.8%). These similar results with the treatment group were assumed to be associated with having regular face-to-face practices with their peers. At the same time, learners from both the treatment and no treatment groups were not restricted

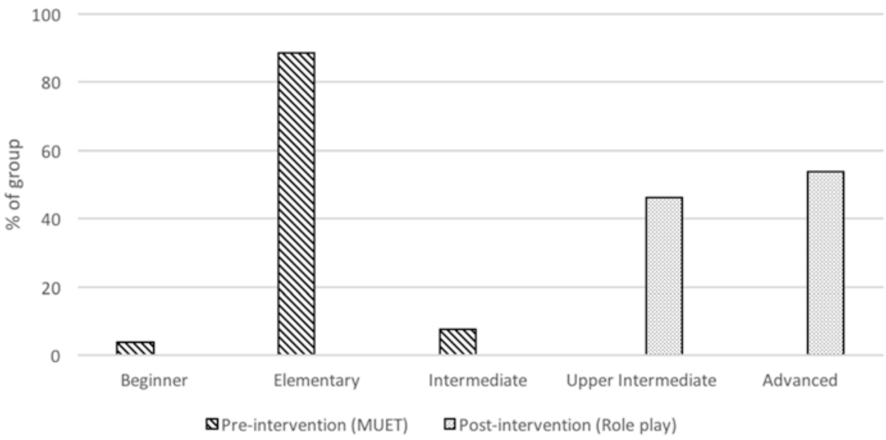

Fig. 15.3 Changes in English language levels of no treatment group measured using role play

Table 15.3 Example of assessment task given to students for the first assessment

Mock interview
You are interested in a temporary job (part time or full time) during the long semester break. Select a job advertisement that you are interested in (the job advertisement selected should contain some job description and required qualifications). Based on the chosen advertisement you are to:
(a) Make a list of attributes/skills that are relevant to the job
(b) Write five possible relevant interview questions the interviewee may be asked for the selected position
(c) Write appropriate responses to each question in (b)
(d) Write three questions an interviewee may ask at the job interview
(e) Write appropriate responses to each question in (d)

from accessing the supplementary materials uploaded by the researcher on the learning management system (LMS) of the university.

The second task was assessing a mock interview. The learners were provided with instruction on interview skills which included best approaches to conducting interviews, common questions asked in interviews and professional skills to demonstrate during interviews. On week 11, the class was formed into groups of four learners for the assessment. Two of them were appointed as interviewers and two other learners were interviewees. The assessment from each group lasted for 20 min. An example of the interview task is shown in Table 15.3.

The group of learners received the mock interview task in the first class during the week. The assessment took place 2 days after the first class. Students were also required to apply the interview skills taught in class. As students would complete the task outside class hours, they were provided with similar videos to watch to assist them in preparing for the completion of the task. Students from the treatment group were encouraged to record the mock interview using the mobile phones and then review it together with the group members for improvement. The researcher

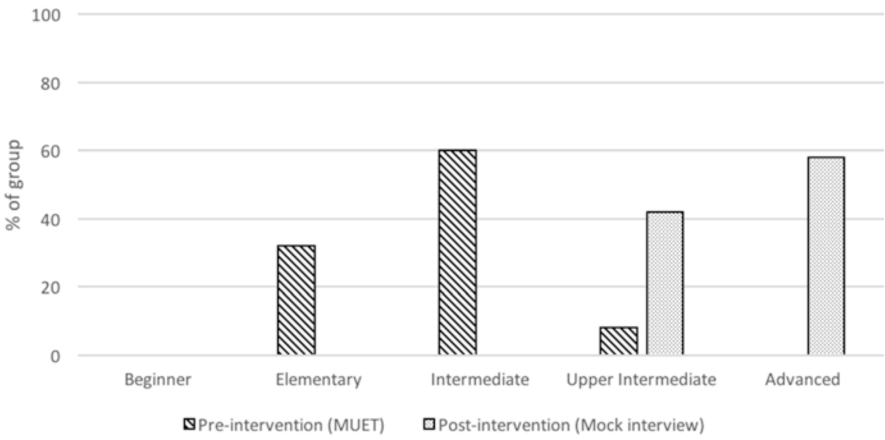

Fig. 15.4 Changes in English language levels of treatment group measured using mock interview

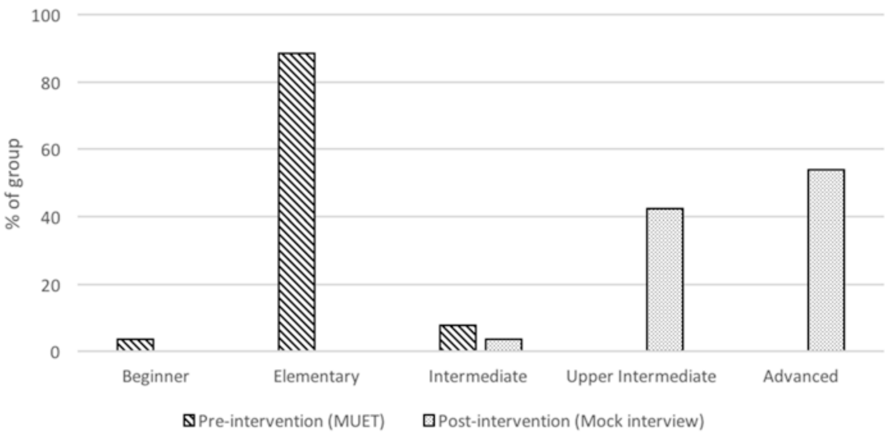

Fig. 15.5 Changes in English language levels of no treatment group measured using mock interview

did not provide additional material or suggestions to support the role play component of the task. After 30 min the pair was called to perform the mock interview and was formally evaluated.

For the treatment group at the beginning of the semester, the English language proficiency levels of the learners were elementary (32%), intermediate (60%) and upper Intermediate (8%). They progressed to upper intermediate (42%) and advanced (58%) (See Fig. 15.4). Data collected at the beginning of the semester for the no treatment group categorised the learners as beginner (3.8%), elementary (88.5%) and intermediate (7.7%). They progressed to intermediate (3.8%), upper intermediate (42.3%) and advanced (53.8%) based on the results of the mock interview assessment (see Fig. 15.5).

The analyses of both the role play and mock interview assessments demonstrated an improvement in English language proficiency for both the treatment and no treatment groups. However, the results of the treatment group cannot be attributed to the use of mobile phones only. This may be explained by the fact that the learners in the treatment group technically started exploring their mobile phones on week 3 and did not have sufficiently extended exposure time to the skills of using mobile phones for that use to have significantly influenced their learning. They may not have felt comfortable with the use of the mobile phones to do the oral interaction practices. On the other hand, the no treatment group may have applied alternative approaches to practise prior to both assessments such as practice face to face with the group members.

To conclude the study, the results of both assessments must be interpreted with caution because learners from the treatment group have not had sufficiently extended exposure time to the skills related to the use of the mobile phones during the course of study. Therefore, this study has not been able to demonstrate the positive outcome of augmenting mobile phones to enhance production in oral interaction. For future research, it is suggested to introduce the use of audio/video features as early as possible after first meeting with the learners. Consequently, learners should be offered the opportunity to practice using the features of the mobile phones until they feel comfortable. In addition, learners should be encouraged to share recording of tasks using mobile phones as to get insights into their use of these devices during the completion of the tasks.

15.5 Conclusion

Learning is an active process and according to constructivist theory, learners actually learn when they construct knowledge, think and learn through experience. In addition, collaborative learning promotes social interaction. Mobile learning is a new pedagogical approach within the Malaysian educational context and additional time is required to develop strategies to use these technologies effectively in the course of learning. Past studies indicate that mobile technologies are readily accepted as potential tools to support learning and teaching. The mobile learning approach requires three basic elements, namely, the learner, technology and location. As extended support to learn English language is recommended, the study introduced the use of mobile phones to L2 learners studying at HEI in Malaysia. Every learner owned at least a mobile phone: thus, the technology was relevant to be used as a tool to enhance oral production. The most important factor to introduce any technology is convenience to use; thus, possessing own phone indicated that the learners psychologically accept it. Finally, the use of mobile phones allowed the learners to practise the skills beyond the classroom context.

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Chapter 16
Mobile Learning Student-Generated Activities from Students' Perspectives: Malaysian Context

Shamsul Arrieya Ariffin

Abstract Malaysia is a country in the Asia-Pacific Region with its own unique characteristics when it comes to education, particularly in terms of mobile learning in the local universities. This work contributes to the literature pertaining to mobile learning student-generated activities. One reason for certain issues is the lack of local content and the urging of the Malaysian government for educational content development. The aim of this study is to research the possibilities of mobile learning in assisting students to generate content for the study of local culture. This study is largely qualitative and derives its findings from data collected through focus group discussions with students after they experienced some activities involving mobile devices, such as mobile phones. Data were analysed via thematic analysis. The results indicate the benefits of student-generated activities, such as students being capable of using mobile devices to generate multimedia content for their assignments for Local Cultural Studies. Students also understand the subjects better and provide better quality assignments. Thus, this paper indicates the prospects of the application of mobile learning student-generated activities to other subjects in the Asia-Pacific Region associated with the Malay culture.

S.A. Ariffin (✉)
Faculty of Art, Computing and Creative Industry, Sultan Idris Education University (UPSI), Tanjung Malim, Perak, Malaysia
e-mail: shamsul@fskik.upsi.edu.my

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16.1 The Influence of the Malaysian Context on Mobile Learning for Student-Generated Activities

Mobile learning is fairly new in the Malaysian context, having been influenced by the policy of the Malaysian government. The lack of local content in Malaysia has made it difficult to access educational mobile learning resources (Ariffin et al. 2012). Mobile learning is also extendable to all subjects, including Local Cultural Studies (LCS) in the context of Malaysian universities.

16.1.1 Malaysian Government Policy

In Malaysia, it is compulsory for digital local content development producers to comply with the rules and guidelines in developing multimedia content. To support local content, the 'Malaysian Communications and Multimedia Commission' (MCMC) or 'Suruhianjaya Komunikasi and Multimedia Malaysia' (SKMM) was created. The department accountable for setting best practices and guidelines for content development is called the Malaysian Communications and Multimedia Content Code department (SKMM 2012). These guidelines and regulations apply to all parties involved in content development, including those from the Malaysian universities.

In addition, the National Cultural Policy influences local culture via the local content development, such as through the use of Bahasa Malaysia and Islamic practices. For instance, the policy focuses on the significance of Malay culture as the indigenous or dominant culture. The policy also encompasses the Islamic religion, which has an important role in shaping the nation, and elements from other cultures that may be suitable for adoption as part of the national culture (Mastor et al. 2000).

The need to be able to access local content from mobile devices has been addressed by many parties in Malaysia, including government ministers. The former Malaysian Minister of Energy, Water, and Communications, Tun Dr Lim Keng Yaik, has urged content providers to take a more serious attitude towards producing more local content (Lim 2005). Likewise, Ishak and Firdaus (2010) have pointed out the need for more local content producers in order to address the lack of availability of local content.

The Malaysian Multimedia Development Corporation (MDeC) has sponsored programmes, such as the Integrated Content Development Programme, specialising in mobile local content development (Ishak and Firdaus 2010). This project for mobile local content development involves a partnership between industry and the universities in Malaysia. Moreover, the Malaysian government has implemented the Mobile Content Challenge competition for institutions of higher learning in Malaysia (Abas et al. 2009; Malaysia Digital Economy Corporation 2012). This competition was established in 2007 and generated much interest among students pursuing careers in ICT.

16.1.2 Lack of Local Content and the Issue of National Identity

Ariffin et al. (2012) have argued that despite the availability of some Malay content for mobile devices in Malaysia (Islamic content, literature, Jawi, and games), there is a serious lack of mobile content applications for the Malay culture. The number of mobile content applications produced by local developers is lower than the content applications from overseas, especially the USA. In addition, the value of the national identity is lacking in most mobile content in Malaysia due to a heavy focus on foreign languages, such as English.

Additionally, interviews with mobile experts in the industry by Ariffin et al. (2012) have identified a number of issues for local content development, including limited local content developers, particularly for mobile learning content. A lack of interest from the mobile developers, likely due to a lower return in terms of profit to develop local content, means that enabling local students to create content is a good prospect to support local content development.

16.1.3 Ownership of Mobile Phones by Malaysian Students

The fact that nearly all students in Malaysian universities own a mobile phone indicates the potential for sustainable mobile learning (Hussin et al. 2012). Their report highlights the percentage of students' mobile phones that have multimedia functions, such as the ability to read and open video files at 84%, while audio file capabilities are at 87%, and photos/graphics are nearly universal at 96%. The study concluded that the majority of the students already have the basic requirements to engage in mobile learning and is optimistic concerning the potential for mobile learning in Malaysian universities. Consequently, students can use their mobile phones for generating multimedia content, for example, developing video content for their assignments for LCS subjects. Students are able to perform many useful activities using their own mobile phones (Prensky 2005) including student-generated multimedia content (Dyson 2012; Dyson et al. 2008), which may add meaningful value to their learning through the use of the mobile devices (Pettit and Kukulska-Hulme 2007). This indicates the prospects for such activities, as the devices are already available for the purpose of mobile learning.

16.1.4 Definition of Mobile Learning for This Study

As reported by Hussin et al. (2012) and Song et al. (2013), mobile phones are widely owned by Malaysian university students. However, other suitable devices may support mobile learning activities in the process of generating local content, for example, cameras to take photos and laptops for video editing. This study has defined mobile learning as the use of mobile technology and devices, particularly students' own mobile phones, to facilitate learning. Therefore, they have the potential for mobile learning. In this study, the blended use with mobile devices, such as the use of cameras and laptops that are also owned by students, is possible.

16.2 Current Situation for Mobile Learning Student-Generated Activities

There is limited research on mobile learning, especially for LCS in Malaysia. During this largely qualitative study, which was conducted in 2012, there was very limited information for mobile learning in LCS. However, according to the limited sources of information, Malaysian ministers discussed the lack of local content and development for mobile phones (Bernama 2010; Lim 2005). For example, one minister, Rais Yatim, stressed in Bernama (2010): 'Telecommunication companies (telcos) should also give priority to content on culture and the development of human civilisation'. He added that the challenges are that the telecommunication companies have ignored cultural content to pursue profit. For example, certain aspects of culture, especially local language, face challenges despite the advent of communication technologies.

According to So (2012), a report was published by UNESCO concerning the lack of mobile content for mobile learning in Asian countries, including Malaysia. However, he did not specifically address LCS. Subjects, such as LCS, may appear boring and students lack any interest in learning such subjects, and, hence, there is a low uptake by students. Although the suggestion to improve LCS through mobile learning is fairly new in the Malaysian context, bringing mobile learning into LCS certainly helps the students in their learning activities through the use of their own mobile devices multimedia functions of videos, audios, and photography.

On the other hand, there are limited guidelines for assessing the impact of sustainable mobile learning, particularly at the university level. Murphy and Farley (2012) proposed a framework for evaluating the sustainability and impact of mobile learning in universities, which may be extended to the Malaysian university context for assessing the sustainability and impact of mobile learning, for example, from the pedagogical, technical, and organisational aspects, and particularly in respect to the student-generated activities.

16.2.1 Malaysian Universities

Mobile learning in Malaysian universities is fairly new. In Malaysia, tertiary or higher education is the responsibility of the Ministry of Higher Education (MOHE). At the tertiary level of education, universities offer courses leading to the award of certificates, diplomas, first degrees, and higher degrees in academic and professional fields. Typically, the course duration for a bachelor degree programme is 3 to 4 years. Courses are provided by both the public and private education sectors. Eighteen public universities are funded by the government. In Malaysian public universities, there are faculties that teach Malay culture, such as in the fields of art and design, performance and music, and humanities and history. Students take these subjects as major subjects or elective subjects. The use of mobile devices has the potential to enhance the learning in these subjects, including LCS.

16.2.2 Lack of Local Cultural Studies Research

While many mobile learning contexts deal with science and technology subjects, there is a lack of research in learning local culture. Additionally, humanity-related subjects, such as the study of local culture, are limited in the Malaysian context due to a lack of interest from students (Ariffin and Dyson 2012). Such subjects are not as popular as Engineering and Science subjects and are typified by a low uptake and uncertain future. For convenience, the term Local Cultural Studies (LCS) is given to Humanities subjects related to the teaching and learning of Malay culture, such as Local History, Local Culture and National Heritage, Malay Wood Craft, Malay Drums, Cooking, Batik Textile, Ceramics, and Local Theatre and Drama. The use of mobile learning in LCS can foster an improvement in the subjects for the students, as using mobile devices will assist them to successfully complete their assignments by improving students' understanding of certain subjects, further contributing to advancing performance and inspiring students' engagement with the subjects. Similarly, it is important to understand the impact of information technologies on students (Myers and Avison 2002), especially that of the human factors impacting mobile learning (Kukulska-Hulme et al. 2009).

Students benefit from learning local culture utilising mobile applications on their mobile devices. A study by Diah et al. (2011) demonstrated that students at preschool are interested in learning Jawi by means of 'Assisted Jawi-writing' (AJaW) software for children using a small tablet device. The study reported that students using such methods are able to practise writing Jawi and better understand the learning content of the application. Shiratuddin and Zaibon (2010) noted the appeal of using local characters for multicultural ethnic groups in Malaysia including the Malay, Chinese, and Indian populations in terms of mobile game applications. This application of mobile learning was aligned with the '1Malaysia' concept to enhance the sharing of multicultural Malaysian values. These local characters were represented via visuals and pictures embedded in the mobile games. They tested the games on primary school students who responded positively, as the games with local characters were easy to learn and play. Learning the Iban language was improved by the use of a mobile application by Bujang and Riaz (2012) known as M-Jako. This mobile application was developed to motivate and inspire primary school students in learning local cultural, such as the local Iban language, which is one of the main indigenous languages in Sarawak Malaysia. Their study found that students at the primary level were motivated to learn using the mobile application using mobile devices because of the attractiveness of the local cultural visuals and pictures embedded in the application. Meanwhile, at the university level, students are more advanced compared to primary students as users of mobile applications. They are capable of, and skilful in, the use of mobile devices, such as mobile phones for mobile learning to generate content (Dyson 2012). Therefore, mobile devices have the same prospects for being applied in the universities in Malaysia for the students to become involved with student-generated content activities for LCS.

There has been little focus on the contribution of mobile learning in terms of the Malay culture at the university level, and how it assists academics and students in teaching and learning about local culture. Diah et al. (2011) and Bujang and Riaz (2012) focused on the pre-school, primary, and secondary school levels. Likewise, the 1Malaysia studies by Zaibon and Shiratuddin (2010), although culturally focused, dealt with intercultural issues rather than the Malay culture itself. The limited number of studies of mobile learning and local culture for student-generated content activities in universities in the Malaysian context indicates a lack of research in this area.

16.2.3 Prospect of a Pedagogical Approach

A student-centred approach benefits students ‘learning by doing’ through mobile learning student-generated activities. For example, students may use mobile devices, such as mobile phones, to create multimedia content for LCS. Likewise, the adaptation of experiential learning (Kolb 1984) through the use of mobile devices for mobile learning (Lai et al. 2007; Naismith et al. 2004) has been demonstrated during student-generated activities (Lai et al. 2007). The studies by Pouezevara and Khan (2007) and Valk et al. (2010) have shown that teachers also affirm the benefits of student-generated activities in other developing countries. Thus, this approach is considered applicable in the Malaysian context for mobile learning student-generated activities to empower students to generate local content in the study of local culture.

16.2.4 Student-Generated Content

Student-generated content focuses on users as producers of their own content. This approach is highly experiential and constructivist (Dyson et al. 2008; Kolb 1984; Naismith et al. 2004). Moreover, in the context of student-generated content, focus is placed on the student discovery of knowledge through the use of mobile devices, such as mobile phones, notebooks, tablets, and digital and video cameras to capture the data. The aim of the student-centred approach to experiential learning in student-generated mobile learning is not to replace the teacher; rather, it is to empower the learners to take charge and make decisions more actively in their learning activities. In fact, teachers become facilitators of students' efforts, meaning that students play a more active role in ensuring that they will benefit from the learning. Teachers thus play a significant role in initiating and monitoring activities in mobile learning. This is commensurate with the change of attitude towards learners being more proactive in their use of emergent technologies, as learning changes transitions from traditional 'chalk and talk' to a digital form of learning.

Student-generated mobile learning content also applies to LCS. In other regions, the study of Chinese culture by local Taiwanese primary school students involved the generation of photo content (Shih et al. 2012). Students utilised smartphones to appreciate Chinese folk poems. In this type of activity, they were requested to record their experiences using text and taking photos and then match them with the Chinese poems. The usage of the mobile phones had a positive effect on learning. Taiwanese students reported being engaged and motivated when using mobile phones with student-generated content activities in learning Chinese culture. However, students are more advanced in the use of mobile devices at Malaysian universities, which is beneficial in creating their own multimedia content, such as in LCS subjects. For instance, they developed video content using mobile devices (Dyson 2012). Due to the limited studies concerning student-generated content in LCS, this study aims to discover the potential in Malaysian universities for student-generated content for LCS, specifically in the context of the Malay culture.

16.3 The Approach to Mobile Learning Student-Generated Activities

This study focuses on qualitative methods through the implementation of mobile learning embedded in LCS subjects to enhance learning with a special focus on student-generated local content. Focus group discussions were conducted with students. The data were further managed using NVivo software. Consequently, the data were analysed using thematic analysis to generate themes from the student-generated content activities.

16.3.1 Research Question

The aim and the research question for student-generated activities are critical aspects of this study as it is crucial to understand the importance of local content for LCS. Ishak and Firdaus (2010) proposed that content creators develop further local digital mobile content, owing to its lack of obtainability in Malaysia. Hence, this study aims to address the lack of local content for mobile learning by considering students' experiences in creating mobile content during mobile learning activities. Thus, the main question is 'How can mobile learning assist students in generating content for the study of local culture?'

16.3.2 Student Focus Group Discussions

Focus group discussions that involve groups of students are a suitable qualitative approach for this study (Barbour 2007). Malaysian students are more active in group discussions than other types of interview, such as when interviewed individually. Focus groups of student discussions with LCS students were conducted after the students had undertaken mobile learning activities. The researcher recommended the use of mobile devices, such as mobile phones that the students already owned, to the focus group to assist them in doing their assignments. In the activities for their LCS assignments, the students used mobile devices in generating multimedia content, such as photos, audios, and videos. One of the purposes of these students' multimedia-generated content is to support their reporting for LCS. Table 16.1 contains examples of student-generated multimedia content including its outcomes.

The focus groups of students who participated were studying the following LCS subjects – Local Culture and National Heritage, Education Action Research, History, Cooking, Theatre and Drama, and Management. Additionally, these students are Bachelor of Education students who are going to become teachers at secondary schools.

The semi-structured questions were largely developed based upon mobile learning literature, for example, the student-generated activities in experiential learning, as demonstrated by Dyson et al. (2008). The following provides further details and a summary of the semi-structured questions:

- What type of cultural content has your class used to produce assignments or projects using mobile devices?
- How did you experience the process of student-generated content in using mobile devices?
- What are the advantages of student-generated content for your learning?
- What are the challenges and issues you may have for student-generated content, especially in your studies?
- How did you overcome the challenges, if any, in your student-generated content activities?

Table 16.1 Summary of themes for student-generated activities

	Themes	Sub themes	Examples of activities
1	What students use mobile devices for	Video, photo, and audio	 Malay traditional cooking demonstrations video
			 Students performing ablution 'Wudhu' video

(continued)

Table 16.1 (continued)

	Themes	Sub themes	Examples of activities
2	Outcomes	Development of new multimedia skills	 Students work collaboratively using mobile devices for their assignments
		Empowering students	
		Lifelong learning	
		Bring your own device (BYOD)	
		Improved learning outcomes	 Students use their own mobile devices (BYOD)

Table 16.2 Examples of LCS assignments in using multimedia-generated content

	LCS subjects	LCS assignments	Outcome from student-generated multimedia content
1	Cooking	Royal Perak cuisines	Cooking video
2	National local culture and heritage	Malay palaces architecture	Local palace guardian interview audios and palaces photos and videos
3	Management	Local Malay traders at local Malaysian market	Audio of interviews with local traders and local market photos and videos
4	Drama and theatre	Local theatre event promotion	Theatre promotion video, photos
5	History	Local archaeological site	Archaeological photos, interview audios, and videos
6	Education action research	Local mosque	Video for performing ablutions (wudhu) before praying

16.3.3 Thematic Analysis

The researcher's methodology in this study for examining the interviews and focus group discussion data was through thematic analysis. Thematic analysis is a fairly straightforward approach to qualitative analysis (Braun and Clarke 2006). The themes were derived after subjecting the data to the thematic analysis process. Generating themes requires a process, which comprises coding, integrating the coding into groups of themes, and, if necessary, the themes are reorganised (Saldaña 2009). The researcher managed and organised the data through the use of NVivo software.

16.4 The Findings from Student-Generated Multimedia Activities

Themes have been developed following the thematic analysis for the data from the student focus group discussion after the students experienced student-generated multimedia activities. The main themes generated include what the students use the mobile devices for (*students accomplishing assignments using mobile devices*) and the outcomes (*achieving better learning outcomes*). The focus groups demonstrated the involvement of participants with mobile learning, such as classroom activities and outdoor fieldwork activities. The students reported that they engaged in self-exploratory learning using mobile devices. In addition, they worked collaboratively with friends in performing their assignments. It is worth noting that these activities involved a mixed use of mobile devices, such as mobile phones, cameras to take photos, and laptops for video editing.

In this activity, mobile learning has been utilised as a complement to enrich existing learning. Thus, this section describes the contributions of mobile learning in achieving student-generated activities, particularly in the creation of multimedia content. Students were divided into groups according to the subjects, topics, and activities to complete their assignments, as illustrated in Table 16.2, which provides examples of assignments and outcomes regarding student-generated content for LCS. The students also worked collaboratively to produce multimedia content. Some students used mobile devices in developing the multimedia content for these LCS activities. Others, who already knew how to use the mobile devices, assisted their friends in producing the student-generated content for LCS assignments.

16.4.1 Accomplishing Assignments Using Mobile Devices

The mobile devices used by the students had multimedia functions to generate content, such as video, audio, and photography. Students reported using mobile devices in a self-exploratory learning approach to complete their assignment. This section shows the benefits students accrue by accomplishing assignments in the student-generated activities through the use of mobile devices to generate multimedia content.

16.4.1.1 Video

Students produced video content for their assignments using their own mobile devices. Students from the Management group reported that they benefited from using mobile phones to record a video at a local trading market for their assignment. Students of the Local Culture and National Heritage subject reported using video recordings for their previous assignment at a local palace in Malaysia. Meanwhile, students from the Local Theatre and Drama subject gained experience in video production through the promotion of a local theatre and drama concert project via their mobile devices. Likewise, Education Action Research students used the video function to record their Islamic prayer assignment. Students from the Cooking class benefited from the use of the video recording function to record the process of food preparation for certain royal dishes of the State of Perak. These findings reveal that students benefited in accomplishing their assignments with the creation of digital video content using mobile devices. Consequently, students stated that they have better comprehension in learning the subjects via student-generated multimedia content activities. Some examples of comments from the students include the following:

> We used recording while doing our assignment at the Jaha Kelantan palace. Our activity was video recorded.

> I am involving myself in the theatre production of ‘Mayat’, also known as ‘The Corpse’. As an assistant manager, I recorded many videos for my report. Throughout this theatre production, I have been using a Samsung mobile phone.

We record how to perform the early Morning Prayer for Islam 'Subuh' using the video recorder on the mobile phone.

It helps with my understanding of the topic more clearly, I can access the information quickly, the activity can be recorded and to be reused as future reference too.

The benefits of this video are that we can repeat and revise what we have recorded many times. It will enable us to remember and learn how to cook the local dishes.

After we completed the cooking of 'Cucur Badak' we went back home and learned the steps of 'Cucur Badak', which is a much better process. We transformed our understanding of the cooking from our video recording into our report assignments.

16.4.1.2 Photos

Students took photos using mobile devices to accomplish their assignments for various subjects. For instance, Management students stated that they benefited from using mobile devices to take photos for their assignment relating to local small traders in Malaysia. In addition, the focus groups benefited from using photos in their Local Culture and National Heritage assignment on Malay palaces. Students from the History class reported that they used the photographic functions to take photos of archaeological sites at 'Gunung Senyum' for their assignment. This indicates the benefits of photography using mobile devices for accomplishing assignments. Consequently, these activities improved the students' understanding in learning LCS from the sequences of photos taken for student-generated multimedia content. For instance, they photographed the archaeological cultural sites and artefacts, reorganised the photos according to their assignment requirement, were able to analyse and present the historical evidence stories, and included the photos in their report for LCS subjects. Comments from students include:

We used a Sony Ericsson mobile phone to take photos and recordings in the process of completing our assignment.

My experience in using a mobile phone to do the assignment includes capturing photos and providing the photographs in my report appendix.

I can upload photos that I had taken from 'Gunung Senyum' archaeological sites that are important for my History subject. I can share the information with friends about my subject of History. This is important because these student-generated activities can further enhance our perspective of the subject.

16.4.1.3 Audio

The students indicated that they used the audio function from mobile devices to generate digital audio content. For example, students accomplished their assignment for the Local Culture and National Heritage class via the use of audio recordings using mobile devices for student-generated activities. They also used the audio recording functions on their phones for recording audios, such as interviews with local cultural experts from the local museums for their assignments. Likewise, Management students stated that they benefited from using mobile devices to record audio interviews at a local trading market for their assignment. Meanwhile, students from the Cooking class reported that they used the audio function to record their own voices when preparing local food. Similarly, these findings show that Local Culture and National Heritage students benefited from a better understanding of the subjects via audio recording, which improved their understanding and knowledge of LCS for example:

> For me, using a mobile phone was very helpful in doing my assignment. I used it to record interviews with the museum officer to obtain some information regarding the local palace.
>
> I learned something that I didn't understand before on Local Culture and National Heritage from these activities.

16.4.2 Achieving Better Learning Outcomes

The students reported a better understanding in learning the subjects from the student-generated activities. They were more motivated and worked collaboratively. This approach leads to a better quality of assignment compared to the traditional approach of sitting passively listening to their teachers inside the classroom, commonly known as the 'chalk and talk' method. Their teachers awarded good marks when evaluating the assignments. This is because of the excellent performance of the students in describing the process in their LCS assignments. In addition, students are able to revise the digital multimedia content they developed during student-generated activities thus producing better assignments. Furthermore, their teachers praised the students' collaborative efforts in using mobile devices to generate digital local content for the assignments. In this activity, the students related feedback, such as, 'Thank you for teaching us to use mobile phones in the correct way for learning'.

Lifelong Learning The participants reported that they gained lifelong learning skills, such as self-confidence, communication skills, and organisational and management skills, as a result of the student-generated content activities. In addition, students from the Cooking class advised that they had also extended their knowledge of the creation of a video to other subjects, for example, 'This knowledge of video creation can be applied to other subjects'.

Work Collaboratively The students reported that they were working collaboratively, as well as self-exploring by themselves using mobile devices in student-generated local content. Students of the Local Culture and National Heritage subject said that they better understood the subject after experiencing student-generated content learning activities. Meanwhile, the focus group for the History group reported that they received positive feedback from their academics for their assignments with the digital photos taken using mobile devices at the historical site of 'Gunung Senyum'. This feedback motivated them to better learn the LCS subject and demonstrated their better understanding in learning the subject. Additionally, students from Education Action Research reported that they had better comprehension of their subject as a result of student-generated learning activities. Thus, these findings demonstrate that students improved their understanding of the LCS subjects by participating in student-generated activities. Some of the perspectives from the students include:

> I learned something that I didn't understand before about Local Culture and National Heritage from these activities.

> I know and better understand the History of the local culture, for example, the Neolithic and Mesolithic community via mobile learning activities. It has enhanced and supported my learning, and contributed in interpreting the cultural aspects of History that are applicable to my study.

> Prior to the mobile learning activity it was very difficult for me to understand this subject of Education Action Research. For example, recently my friend sent an MMS of student-generated activities. I can see the process of doing the activity in learning step-by-step. I now have a better understanding.

> We now have a better understanding of the step-by-step process of cooking from the video.

16.4.3 Development of New Multimedia Skills

Mobile learning has contributed to the development of new skills for the students, such as the ability to record and create their own videos using mobile devices. Some students reported that they were capable of generating their own local content using mobile devices. Additionally, this digital content was transferred to laptops for further editing using software, such as Microsoft Movie Maker, to produce digital video content. These findings demonstrate that the participants gained video creation skills, which will continuously assist the students in using mobile devices to help in future tasks as well as other educational subjects.

The participants gained video skills by using mobile devices with the student-generated content activities in the classroom. Students studying Cooking reported an increase in multimedia skills in collaborating to produce a video. They gained multimedia skills through self-exploration to develop video content for their assignment on the Royal Foods of Perak. The focus group from Management also learned how to use video editing software for their assignment, while students of the Education Action Research subject reported that they gained skills in creating digital videos for their subjects. Therefore, these findings demonstrate that the students benefited in developing new multimedia skills through the creation of digital videos. Some examples from the students' comments include the following:

> We learned this activity by ourselves by using our own mobile phones to video record in the Cooking class. We know our mobile phones are not up-to-date but we managed it okay. Most of our friends use Nokia mobile phones. In our assignment, we created a video using Movie Maker software. It was difficult to learn by ourselves but we managed to use the

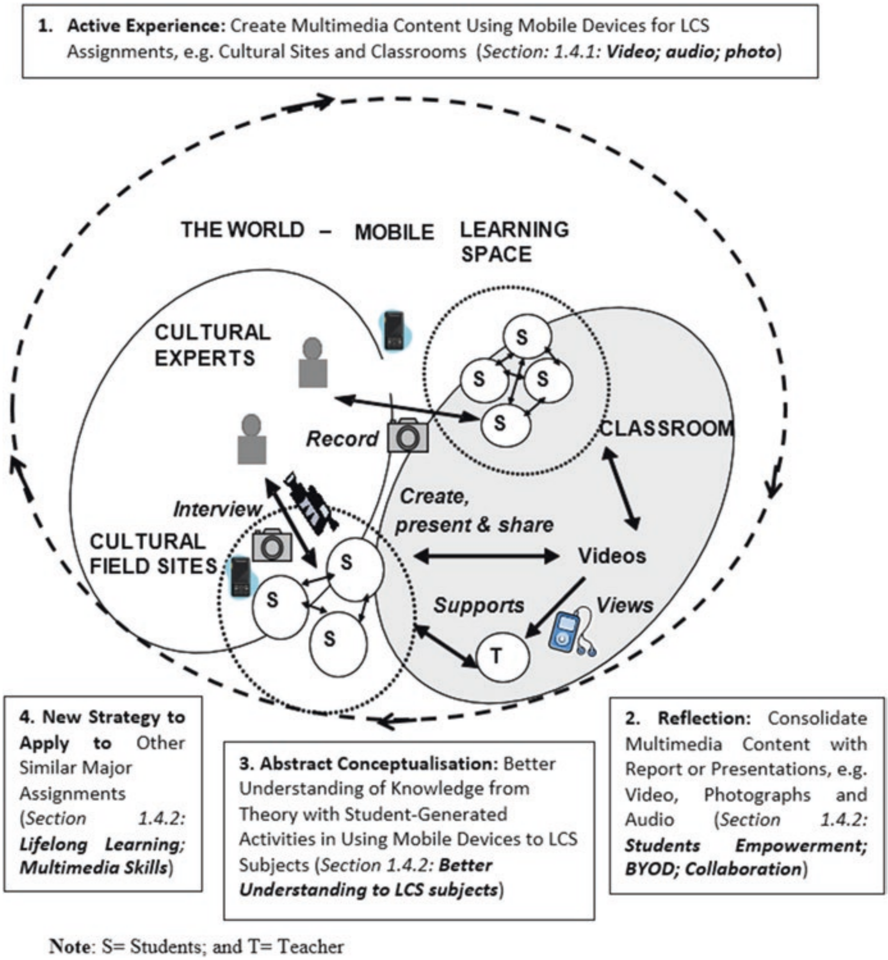

Fig. 16.1 Student-generated activities for LCS

software to produce the video. We learned how to edit and integrate the audio, song, videos and photos we had taken earlier from mobile phones, using this multimedia software. Now we know how to edit and integrate photos, audio and videos, and can apply our new skills to other subjects. Prior to this we had no knowledge of multimedia production.

Our approach is more towards telling a story; for example, describing the Islamic history of 'Bilal' using mobile phones for video recording. We recorded and edited the words and video, and integrated the digital content together. We edited using 'Movie Maker' software. We used our own mobile phones for the video recording. Later we integrated all the digital content and edited the final video using Movie Maker software.

16.5 The Reflections After Mobile Learning Student-Generated Activities

Following the student-generated activities, participants became more aware of the benefits that mobile learning offers. Students reported being very active, collaborating and participating in student-generated activities. Their greater awareness of the various types of mobile learning, such as accessing and sharing learning resources, has been demonstrated by this study. Likewise, it addresses the reduction in the challenge of the lack of local content that was highlighted earlier in the literature by Ariffin et al. (2012).

These student-generated activities as displayed in Fig. 16.1 are from the experience of students in mobile learning as it aligns with the themes generated during the findings. From Fig. 16.1, student-generated mobile learning activities have overcome the lack of local content in the study of local culture. First, the active learning experience was activated under teacher supervision in which students used their own mobile devices, such as mobile phones, to develop multimedia content. The students then reflected on their work for their particular assignments. They integrated these multimedia elements in their presentations for their assignments. The students reported having a better understanding of their subjects as a result of the student-generated activities. Finally, they were able to apply their technical knowledge to create multimedia presentations for other subjects or future work.

The impact of student-generated activities indicates that the participants became more aware of the benefits that mobile learning offers. The teachers observed that their students reported as being very active, collaborative, and participative in the student-generated activities. Their greater awareness of the variety of mobile learning types, including student-generated multimedia content for LCS in the Malaysian context, has been demonstrated by this study. In addition, their teachers also became more aware of other types of mobile learning, such as student-generated multimedia content activities in developing video content, and are now more open to the usage of mobile devices in their classroom for student-generated activities for LCS. Furthermore, students gained a better understanding of the LCS subjects. They revised their digital content and understood the process relating particularly to their subjects. Consequently, these student-generated skills are applicable to other subjects with similar activities.

16.5.1 Empowering Students to Undertake Activities for Student-Generated Content

This study demonstrates that student-generated mobile learning activities positively benefit LCS subjects through the creation of multimedia local content. In addition, students were empowered to complete their assignments with mobile devices through student-generated activities. These student-generated mobile learning activities are aligned with the studies demonstrating 'learning by doing'. For example, students empowered themselves in completing their assignments using mobile devices, developing new multimedia skills in the creation of videos, and achieving better learning outcomes for the LCS subjects.

This study is comparable with that of Dyson et al. (2008) concerning student-generated activities in 2007, which involved students creating a video for the subject 'Introduction to Information Systems' in an Australian university. Meanwhile, this research added to the Malaysian context for student-generated activities involving students creating a video for LCS subjects, thereby allowing local Malaysian students to experience the LCS subjects by creating multimedia content using their own mobile devices.

16.5.2 Overcoming Challenges

Students reported that they managed to overcome challenges by collaborating with their friends, particularly in solving technical difficulties during mobile learning student-generated activities, such as the lack of wireless access, the low RAM size space of the mobile devices, and the drainage of battery power of the mobile devices. Meanwhile, student collaboration and peer assistance enhanced their use of a blend of mobile devices to support their learning activities in the creation of multimedia content (Litchfield et al. 2010). In addition, this study has affirmed that using their own mobile devices benefited the students in the creation of the multimedia content for LCS assignments. These mobile devices are portable, and the students carry them throughout the activities of student-generated multimedia content for LCS. Accessing mobile devices for student-generated content activities is more convenient than using a computer or laptop. Additionally, the student participants in this research need not be connected via wireless to access the Internet all the time since the capturing and editing of multimedia content can be done in the offline mode. They transfer files during non-peak hours, such as very early in the morning. Thus, this study has demonstrated the benefits of student-generated activities in solving challenges using the various pragmatic practices in this research.

Figure 16.2 is a sample snapshot of a video resulting from student-generated activities. For instance, students were assigned by their teacher to develop a video for the traditional Malay food assignment. They worked collaboratively in a small group and self-exploratory manner using their own mobile devices. This demonstrates that developing learning content for local traditional Malay food indicates a more sophisticated approach using mobile phones compared to previous approaches that relied solely on printed out reports.

	Video Generated Using Mobile Devices	Note
1		Cooking class students developed a video of a Traditional Malay recipe. The first is a video recipe of Sambal Tumis Ikan Bilis (Anchovies in Chilli Paste).
2		Cooking class students developed a second video of a Traditional Malay recipe. This is a video recipe of Gulai Lemak Labu (Pumpkin Cooked with Coconut Milk).
3		Cooking class students developed a third video of a Traditional Malay recipe. This is a video recipe of Rendang Paru (Beef Lung Rendang).

Fig. 16.2 Student-generated video for local food recipes

16.5.3 More Open and Showing More Interest in Mobile Learning After Student-Generated Activities

Academics were reported being more open towards the use of mobile devices in their subjects in assisting their students' activities, particularly after being exposed to student-generated content activities after witnessing the good performance of their students in creating quality multimedia content for their students' assignments. They encouraged their students to use the multimedia functions of the mobile phones, such as the video recording, audio recording, and photography functions. This experience is aligned with the studies of Pouezevara and Khan (2007) and Valk et al. (2010) in Bangladesh who reported that teachers were more appreciative of the use of mobile phones after student-generated activities. They changed their attitude and had more interest in using mobile phones for learning after experiencing the mobile learning activities. However, the study of Valk et al. (2010) mainly focused on the usage of SMS with limited information concerning the creation of video content, as has been demonstrated by the students in this study on local culture in Malaysia. Hence, current academics are more open compared to previous academics concerning the use of mobile phones for classroom and fieldwork activities.

16.5.4 Quality of Learning and Better Understanding of the Subjects

From their involvement in creating multimedia assignments using mobile devices, students reported that they had a better understanding of the subjects with a better quality of learning via the video development. For example, from their activities in creating a video, they better understood the process they had undertaken, such as the step-by-step instructions to learn how to cook traditional Malay food. All the academics acknowledged that their students' performance had improved due to their understanding of the subjects from these activities. This reflects the better quality of multimedia content as the source of information provided by their students from student-generated content activities. Thus, this activity demonstrates a better understanding of the subjects by the students, due to the quality of learning they gained from the student-generated content.

16.5.5 Affordances of Mobile Devices

Students benefited from the convenience of using mobile devices, particularly for student-generated activities. Portability due to the lightness of the mobile devices and saving of time by avoiding travelling to their house in order to collect other devices are some of other benefits, as students can carry the devices anywhere including to the cultural sites and museums. Hence, this study demonstrates some of the affordances of using mobile devices for student-generated activities for LCS studies.

16.5.6 Lifelong Learning

Students have the prospect of using the multimedia skills they gained in these LCS activities for other subjects as well as in the future for their own students when they themselves are teaching in schools. This is a long-lasting and sustainable approach

Table 16.3 Summary of the association of student-generated activities for LCS in Malaysia with mobile learning evaluation framework of Murphy and Farley (2012)

	Mobile learning considerations	Implication towards sustainability of mobile learning in LCS in Malaysia
1	Pedagogical (student perspective)	Students are empowered to experience student-generated activities in creating multimedia content
2	Pedagogical (context and learning objectives)	Students have a better understanding of the subjects by developing multimedia content
3	Technical (technological context)	Students develop multimedia content which is transferable from and to another platform
4	Organisational (sector context)	BYOD helps the university to save the cost of buying extra mobile devices for student-generated activities

to learning as an impact of these student-generated activities. Thus, this means that student-generated activities have the potential to contribute to lifelong learning practice that is also applicable to other subjects.

16.5.7 Students Own Mobile Devices

In this research, students used their own mobile devices, which helped in learning activities when conducting their assignments, particularly for LCS. Additionally, they enhanced their education by bringing their own device, as they did not need to purchase extra expensive devices. Similarly, their university did not need to purchase extra mobile devices for the students. This means that the use of student-provided devices allows for a sustainable cost-effective approach to mobile learning for student-generated activities.

16.6 Implications of the Study

Table 16.3 shows the implications of this research in Malaysia for LCS on student-generated activities towards the sustainability of mobile learning in LCS within the mobile learning evaluation framework of Murphy and Farley (2012). From the pedagogical viewpoint, the students are empowered to take activities as they learned from experience from developing the multimedia content for LCS assignments. This benefits them in understanding the LCS subjects as they gained experience in describing the LCS content in a series of processes. From the technical perspective, the students also benefit from developing multimedia content, which is transferable from one platform to another. From the organisational context, this benefits the universities in the long run in terms of the cost of mobile devices, as the students owned their own devices (BYOD) for student-generated multimedia content. Thus, the university need not purchase mobile devices for students.

16.7 Conclusion

This study exhibits a holistic understanding of users' perspectives from student-generated mobile learning content activities, as one way to remedy the lack of local content for LCS studies. In addition, the impact of mobile learning was established through the findings and themes developed for student-generated activities. This is possibly the first time this approach has been demonstrated in the Malaysian context in learning local culture. Certainly, it is an innovation in LCS for the Malaysian university context. Likewise, more sophisticated use of mobile devices that includes the development of video for student-generated multimedia content as compared to the main previous use of communicating by using SMS. This indicates a greater awareness of the utilisation of mobile devices for student-generated LCS activities in Malaysian universities where students are content producers compared to using apps where the students are only end users and do not produce their own multimedia content. This indicates a deeper learning and higher order of thinking skills developed for student-generated mobile learning activities (Dyson 2012). Consequently, students are able to identify and analyse the information they collect from the student-generated multimedia activities and develop the multimedia content for LCS rather than just interacting with the mobile applications. This study demonstrates that students are capable of producing multimedia content collaboratively with minimal supervision from academics, thereby promoting a better quality of learning content and understanding of the subjects in the Malaysian university context for LCS studies.

This study highlights further possibilities, such as students becoming content producers in future assignments with similar activities in LCS or non-LCS subjects. Importantly, these capabilities reduce the challenge of a lack of local content in Malaysia, which addresses the Malaysian ministers' suggestions and complies with the SKMM content guidelines and National Cultural Policy. Students at one of the universities have experienced and acquired the skills for mobile learning student-generated activities, which are transferrable for use in other subjects or when they graduate and teach their own school students. Embedding the mobile learning student-generated activities in LCS subjects encourages mobile learning student-generated content development while reducing the challenges arising from the lack of local content.

As demonstrated, this study is aligned with a mobile learning evaluation framework, which includes the implications associated with a sustainable approach in pedagogy where students are empowered to develop mobile content for LCS. In addition, the university did not need to buy additional mobile devices as students use their own devices. Students are able to develop and transfer the multimedia content as their assignment using a common platform. Hence, this provides a sustainable environment for LCS in mobile learning in a Malaysian university. Similarly, student-generated multimedia content has the prospect of being transferable to other subject areas in developing local content for learning LCS, particularly in other Asia-Pacific countries, such as Indonesia, Brunei, Cambodia, Vietnam, Thailand, Singapore or the Philippines, or anywhere that Malay cultural practices exist.

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Chapter 17
Personalising Mobile Learning Spaces in Higher Education: A Case Study of a Malaysian Student with Learning Difficulties

Helena Song

Abstract This research study reports on a single case study that seeks to explore how a student with learning difficulties uses "everyday" technology to cope with the demands of higher education. A qualitative case study approach was taken, utilising an in-depth interview as the main data. Data collected was analysed using a thematic approach from which three distinct themes emerged: (1) choice of technology, (2) ease of use/compatibility with technology, and (3) learning strategies. The findings appear to indicate that relationship between the student and her technologies is one that is intimate and personal. Social media technologies, though not designed as learning technologies, were appropriated for academic purposes. These personal social media technologies, particularly Facebook and YouTube, appear to be playing a significant role in the everyday life of the student participant, where there is a blurring of academic and social spaces, formal and informal learning.

H. Song (✉)
Faculty of Creative Multimedia, Multimedia University, Cyberjaya, Selangor, Malaysia
e-mail: helena.song@mmu.edu.my

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17.1 Introduction

The transition from secondary school to post-secondary education can be a daunting experience for any student. The academic and social demands in a higher education setting are significantly more complex compared to the highly structured secondary school environment. Adapting to the college or university environment might be more challenging for disabled students[1] due to their cognitive challenges, executive functioning limitations and social stigmatisation. Hence, disabled students are at high risk of lagging behind their non-disabled peers (DaDeppo 2009), and dropout rates are also notably higher for this cohort (Newman et al. 2011). Past research identifies various reasons for this disparity, particularly in the area of physical, cognitive, and affective challenges. Among others, assistive technology (AT) is often employed to support and assist disabled students in colleges and universities. AT can be defined as "any item, piece of equipment or product system whether acquired commercially off the shelf, modified or customised, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities (U.S. Congress 1997)". More often than not, AT which includes devices, as well as services, is required for disabled students to be successful learners.

17.2 The Evolving Term: "Assistive Technology"

The term AT has evolved since it was first conceived. AT is commonly rigidly defined as a very specific type of technology related to a specific type of disability. The term "Universal Design for Learning (UDL)" shifted the focus to provide more encompassing and inclusive products and services for all students including disabled students. UDL is a "concept or philosophy for designing and delivering products and services that are usable by people with the widest range of functional capabilities and that include products and services that are directly usable (without requiring assistive technology) and products and services that are made usable with assistive technology" (Beard et al. 2011, p. 8). The guiding principles of Universal Design provide a framework that promotes and accommodates the needs of a diverse group of learners instead of focusing on the individual disabilities of each student. UDL demands a more inclusive, accessible and enabling ecosystem within the education environment for all students, including disabled students.

[1] This article adopts the term "disabled students" rather than "students with disabilities". The term "students with disabilities" implies that the students' impairment or condition causes them to be "disabled" (and consequently that it is their responsibility to overcome it), whereas "disabled student" implies that the person is disabled not necessarily by their condition or impairment, but by, in this case, the higher education environment and its inability or reluctance to cater effectively for that person (and consequently that higher education institutions must effect change to remove that disability).

Examples of such technologies which enable UDL are mobile technologies and other emerging mobile media applications. "Everyday" mobile technologies, such as smartphones, tablet computers, mp3 players and eReaders, are positively impacting the lives of disabled students. These mobile technologies had been found to be extremely versatile and easy to use with universally designed capabilities. For example, the simplicity of being able to enlarge text on a touch screen mobile device with one swipe of the fingers is extremely helpful for many users, particularly students with visual and perceptual challenges. Other examples including the ability and the ease of use (with a click of a button) of such devices to capture images and record audio can be beneficial to students who have issues and challenges with reading text. While smartphones and tablets do not fall under the category of the traditional assistive technology, these technologies can be both empowering and enabling to a wide spectrum of students. Therefore, assistive technologies, in the widest sense of the term, should include those that fall into the general and emerging technology domain (Draffan 2009).

17.3 Focus of the Study

Smart mobile devices are becoming more accessible, affordable and widely used. The rapid growth in the smartphone industry in the last few years is changing the landscape of how people and society as a whole communicate, learn and play. Malaysians were found to be among the most prolific users when it comes to smartphones, spending an average of 6.4 h a week accessing the internet through their devices (ASEAN-UP 2016). A recent survey of 194 first year students from a Malaysian higher education institution reveals that most students owned a mobile phone: 80% of them are smart devices (Song et al. 2013). While 19% of the students owned a tablet computer, almost half of the students (48%) had access to one for use. These statistics bear out that being mobile and connected is very much part of being a university student in this part of the world. A comparison was also made with a survey conducted with a similar cohort from the year 2008 in terms of ownership. The researchers found that although the age and gender profiles were similar to the present cohort, the levels of ownership of mobile technologies and other ICTs had changed drastically over the 5-year period (Song et al. 2013). For example, PDAs were present in the 2008 survey (Yuen et al. 2008), but had since disappeared, while tablets such as iPad have appeared over the same period (See Table 17.1).

In a separate survey, it was found that 92% of 452 disabled people owned or used mobile devices of which 53% are smartphones (Rehabilitation Engineering Research Center for Wireless Technologies 2013). This survey also revealed that the disabled population behaves similarly to the general population with regard to mobile wireless Internet use. Even though the results of this survey cannot be generalised to Malaysia, it does give a suggestion that mobile devices are very much a part of the lives of disabled people, probably including disabled university students.

Table 17.1 A comparison of the percentage of higher education students' ownership of technology between 2008 and 2013

	2008	2013
PDA	2.6%	0%
Tablet computer	0	19
E-book reader	0	4
Desktop computer	48.5	31
Laptop	25.5	92
MP3 player	41.1	43
Smartphone	0	80.5
Feature phone	100	43

Source: Yuen et al. (2008) and Song et al. (2013)

The proliferation of and increased access to these highly personalised mobile devices may well lead to increased connectivity, collaboration, communication and having access to readily available digital resources (Walker and Logan 2009). This inevitably changes the teaching and learning process within higher education. Additionally, it creates a fertile ground for personal learning spaces. Personal online learning spaces have their genesis in Web 2.0 technology. The onus is on the learners and how they organise, manage, collaborate, create and share learning resources online. Most importantly, these learning spaces are seen as an accessible and enabling learning platform for disabled students (JISC 2016).

There is no doubt that AT, in a more traditional definition, has an important role to play in the lives of disabled students in higher education. However, though AT is seen as a special solution to a specific problem encountered by the disabled students, using them may attract unwanted attention as well as exacerbating the stigma of disability. Research has shown that there is a reluctance to connect with AT when it draws attention to the disabled student (Seale et al. 2008a). By way of contrast, "everyday" technologies were found to be widely accepted, and digitally mediated social networks are seen as levelling the playing field for these students (Barden 2014). These general technologies are becoming more pervasive and ubiquitous in the educational and social landscape of disabled students. Therefore, research that focuses on the affordances brought forth by off-the-shelf emerging general technologies such as mobile devices and their services and Web 2.0 technology, such as social networking sites, video sharing sites, blogs and wikis, is warranted. This research study reports on a single case pilot study that seeks to explore the experiences of a disabled student in utilising her mobile and portable devices and Web 2.0 technology in higher education. Specifically, the aim of this chapter is to share the experiences of how a student with learning difficulties uses "everyday" technology to fulfil the requirements of her academic courses.

17.3.1 Previous Research on Disabled Students and Technology

Technology for disabled students is often deemed as "the great equalizer" (Wyer 2001, p. 1) and a central tool for fostering inclusion and participation in higher education (Barile et al. 2012). Hence, providing access and training to develop technical skills became the main emphasis and concern when it came to technology used by disabled students. It is not surprising then that previous research on the use of technology by disabled students in higher education tends to focus on accessibility and technical (hardware and software) issues (Abbott 2007; Barile et al. 2012; Fichten et al. 2009; Steyaert 2005). Though providing access to technology is imperative for promoting wider participation and inclusion, it is not sufficient to ensure meaningful participation and beneficial interactions among the disabled students. Seale (2006) cautioned against the common notion that having access to technology equates to having access to online resources and tangible support for learning activities: It might not be necessarily so. One might have access to technology but still gain little from interactions with technology. Social-cultural examples reveal evidence of exclusion among disabled students including the rejection of the use of assistive technology and training and other technologies for fear of being looked upon as not being "normal" or self-sufficient (Goode 2007). In addition, substantial time is needed when dealing with issues related to their disability leaving them less time to explore new technologies and work online compared to their non-disabled counterparts (Wald et al. 2009). In fact, social media exacerbated the impact of some students' disabilities when encountering the social experience of disability for the first time, especially for those students with unseen impairments (Lewthwaite 2011). Finally, the perceived stigmatism of receiving special accommodations with certain technologies due to their disability also deterred disabled students from fully benefiting from AT (Seale 2013).

Other authors such as Selwyn and Facer (2007, p. 12) also pointed out the need "to move beyond a conventional understanding of the 'digital divide' as a simple case of 'technology haves' and 'technology have-nots' and begin to address the area of digital inclusion in more nuanced terms". This complexity of conceptualising digital inclusion is further compounded because the convergence of various new media platforms, such as smartphones and other portable devices, has given rise to multimodal technology access and use. There is a blurring of boundaries between social and learning spaces and formal and informal learning (as well as the concepts of disruption and flipped classroom) that permeate the learning landscape of higher education. Several groups of researchers have attempted to widen and extend previous research that merely focuses on accessibility and technical issues. Among the wider issues addressed are exploring the personal experiences of technology used by disabled students – focusing on voice and participation (Seale et al. 2008b; Wald et al. 2009); relooking at digital inclusion in terms of resources and choices (Seale et al. 2010; Selwyn 2006; Selwyn and Facer 2007) and understanding the relationships between disabled students, the technologies they use and their universities through a digital cultural and social capital lens (Lewthwaite 2011; Seale 2013).

In response to this lack of research on issues other than technological access, Seale et al. (2008b) undertook a study to explore the eLearning experiences of disabled students in higher education. Using participatory methods, the researchers collected personal narratives and voices of disabled students on their use of technology particularly in relation to eLearning experiences. Participatory design methods are common in disability studies, which focus on working or doing research with participants, rather than solely researching about participants. However, this method is still relatively new to research studies on eLearning, where more traditional methods such as interviews, questionnaire surveys and focus groups are employed. The researchers found several issues unique to disable students in their eLearning experiences (Wald et al. 2009). They found that disabled students, compared to typical students, had to learn to use new assistive technologies at the start of their university studies. Substantial time was also needed in dealing with issues related to their disability, leaving them with less time to explore and work online compared to their non-disabled counterparts. Another pertinent issue was disabled students had to be more flexible and agile in their use of technologies. Wald et al. (2009) found that disabled students had to find ways to personalise their use of technologies for learning without training or guidance. For example, one student described:

> I felt that having access to a "computer" available for me to use all the time would enable me to keep a note of what I need to say or do when it came to my mind as I have short term memory problems ... Having a smartphone basically allows me to carry a mobile phone, personal organiser, and laptop and mp3 player all in my pocket! I can access information or do work anytime I please! I've even sat in nightclubs writing essays! – having the ability to sync the phone means all my information is up to date with the records on my computer. If I have something I need to be doing or attending my phone will alert me ... Obviously like you do on a normal mobile phone, I play with the backgrounds and ring tones. At the moment I have scatman as my ring tone! I have some voice commands set but they're often difficult to use in noisy places. I can change the font size easily and this can often be useful if I'm tired. (Disabled student cited in Wald et al. 2009, p. 359)

This study is one of the most comprehensive accounts of the uses of learning technology by disabled students in higher education produced so far. It will be interesting to see if this relationship has changed or evolved since this study was completed in 2008. As was revealed in the previous section, the levels of ownership of mobile technologies and other ICTs had changed drastically over the years. There is also a widespread availability of faster network speed and connectivity as well as low-priced mobile devices. Compounded with the increased usage of social media technology by university students (Corrin et al. 2010), further studies on how disabled students are utilising current and emerging technologies for academic purposes is warranted.

17.4 Methodology

Yin (2014, p. 19) suggested that one of the most important applications of a case study methodology is when "you want to understand a real-world case and assume that such an understanding is likely to involve important contextual conditions pertinent to your case." Given that this study focuses on a complex, detailed understanding of social experiences and interactions within a real-life context, a case study approach was employed for this inquiry. The complexity of this study is evident because of the nature and characteristics of the participant involved. Additionally, this study deals with the use of technology that is prevalent within the higher education context and which is constantly evolving at a tremendous speed. This study helps to uncover what Stake (1981, p. 47) highlighted: That case studies could illuminate the social-cultural experience under study, where "previously unknown relationships and variables can be expected to emerge from case studies to a rethinking of the phenomenon being studied". Therefore, this case study focused on exploring and understanding human experiences and the relationship between mobile technologies, Web 2.0 technology and a student with learning difficulties within a Malaysian higher education environment. Specifically, this study seeks to explore a disabled student's understanding, perceptions and personal experiences with mobile technologies and Web 2.0 technology and its impact on her learning experiences in higher education.

17.5 Data Collection, Research Process and Procedure

This research study utilises an in-depth interview as the main source of data. In-depth interviews allow the researcher "to find out what is in and on someone else's mind" as well as "enter into the other person's perspective" (Patton 2002, p. 341). The main purpose of interviews is also to gain knowledge about people's experiences and behaviours as well as their perceptions of the world in which they live (Kvale 1996). In this study specifically, an in-depth interview was conducted to gain knowledge on the disabled student's personal experiences with technology as well as her perception and views on her relationship with that technology within the higher education institution at which she was studying. Simons (2010) suggested that in-depth interviews allow for active engagement and flexibility to adjust and shift the focus to emerging issues as well as digging deeper into certain issues, responses or topics during the interview. In addition, in-depth interviews can facilitate the uncovering of feelings and events that cannot be obtained using observations alone. As Simons (2010) insightfully puts it: "In interview, people often reveal more than can be detected or reliably be assumed from observing a situation" (p. 43).

An in-depth face-to-face interview was carried out with a final year undergraduate student diagnosed with learning difficulties. Convenience sampling, also known as availability sampling, was utilised for this case study as the university had no formal records of disabled students. This participant was selected because she identified herself as having specific learning difficulties, was available and was willing to participate in the study. While acknowledging the question of researcher bias in the selection of participants, the reality of the matter here is that there are no formal policies or requirements within the university for any student to disclose their disabilities; hence, there are no records of these students. In addition, this case study is collecting exploratory data in a still emerging field of research in Malaysia. On these grounds, the data collected can still contribute and add new knowledge to the better understanding of how disabled students use technology in higher education. The student's disability was made known to the author via an email. This student emailed all lecturers of the subjects in which she was enrolled that semester, detailing the struggles she was experiencing due to being dyslexic and having attention deficit hyperactivity disorder (ADHD). At first, she was reluctant to disclose her condition but taking the advice of her psychologist, she decided to inform the lecturers involved so that they could understand her situation. Seizing this opportunity, an email was sent to her requesting if she was open to an interview with the author. Her response was immediate and positive. She was also given the assurance repeatedly that should she decide not to participant in this study, she would not be penalised in any way in relation to her studies.

The interview location was suggested by the participant. The rights of being a research participant were explained to the student. Permission and consent were sought and given before the interview started. She was also briefed that the interview would be recorded and that she could withdraw from the interview at any time. The student was encouraged to converse in the language that she was most comfortable with. The interview was conducted in a conversational manner in a private room. Semi-structured questions were used as a guide throughout the interview. General questions about her background were asked first, after which questions specifically relating to her experiences with technology used for learning in her studies. Some examples of the interview questions include "What technology do you use for academic purposes? Give some examples of how you use these technologies in your courses, classes and assignments", and "Why do you use these technologies?"

17.6 Data Analysis Approach

Data collected from the interview was analysed using a thematic approach. Thematic analysis is widely used and a common form of data analysis method in qualitative research. Braun and Clark (2006, p. 79) define thematic analysis as a qualitative analytic method of "identifying, analysing and reporting patterns (themes) within data. It minimally organises and describes your data set in (rich) detail. However, frequently it goes further than this, and interprets various aspects of the research topic". Specifically, this study takes on an inductive and semantic approach to thematic analysis by searching across the dataset (interview data) to identify patterns of meaning. The interview data, both verbal and non-verbal including explicit emotions shown during the interview were transcribed verbatim by the author. Some researchers assert that the process of transcription is a fundamental phase of an interpretive qualitative data analysis (Bird 2005). Therefore, the transcription process was conducted by the author personally. Then, the interview transcript was repeatedly read, reviewed, compared and analysed to uncover meanings, patterns and themes. After several cycles of moving back and forward between the transcribed interview data and the initial coding and categories, several distinct themes emerged.

17.6.1 *Iris Ib's Story: A Disabled Student's Experiences of Mobile Technology and Web 2.0 (Participant Profile)*

Iris Ib (a pseudonym chosen by the student participant) is 23 years old, studying in her third and final year of a bachelor's degree in creative multimedia. Iris Ib was diagnosed first with dyslexia when she was 7 years old by a paediatric doctor, then later with ADHD. She repeatedly expressed that she lacked self-confidence, kept to herself most of the time, and that she lacked social skills. Even with an intelligence quotient (IQ) score above average with the recent IQ test taken 6 months prior to the interview, she was struggling with her studies, having to repeat her foundation level twice as well as other several degree subjects. With her current cumulative grade point average (CGPA) of 2.0, Iris lamented about her low grades, yet was still harbouring dreams of furthering her studies to master's degree or doctoral level. Only two of her friends knew that she was dyslexic and had ADHD. Iris reported that her parents and siblings were supportive and encouraging.

Iris Ib seemed keen to share her experiences. She expressed her willingness and openness to share about herself and her experiences in the hope that it would help others similar to her. She communicated in a mix of both Malay and English throughout the interview. The atmosphere was relaxed, and Iris Ib was seen to be calm and untroubled through the whole interview. In this chapter, the interview data will be quoted verbatim with English translation for the parts spoken in the Malay language.

17.7 Findings and Discussion

Several distinct themes emerged from the interview dataset. These are (1) choice of technology, (2) ease of use/compatibility with technology and (3) learning strategies.

17.7.1 Choice of Technology

From the interview, it would seem that the Iris Ib's choice of technology gravitated towards and revolved around popular and generic social technologies. She owned an iPhone, an iPad, a laptop as well as a desktop computer. Throughout the interview, it was very evident that she relied on her mobile devices and social media technologies for the majority of her academic and social activities. Among the technologies mentioned were Facebook, Facebook Messenger, YouTube, Google, Gmail, WhatsApp, Twitter, Tumblr, Pinterest, Instagram, as well as various mobile applications such as WebTV and online news. All these technologies were adopted without training and through trial and error. Significantly, the university's learning management system was not mentioned at all throughout the interview.

Some of the comments related to this theme are:

"Facebook! Yes! Every day! "

"I baca itu tweet, I reply jugak itu tweet, reply, baca semua tu, I active dalam Facebook …Facebook dengan Twitter"

(*I read tweets, I also reply to tweets, I read all those. I am active on Facebook… Facebook and Twitter*.)

"I Google…all the time."

"YouTube-lah especially tutorial, I selalu."

(*YouTube especially tutorials, I always use that!*)

"I am more comfortable melalui device...I guna untuk discuss dengan kawan, kita buat group kat whatsapp."

(*I am more comfortable using devices…I use them to discuss with friends. We create groups on WhatsApp*.)

"….dulu I ada pinterest, I suka tengok design-lah…I follow yang ada design."

(*…I used to have Pinterest. I liked to look at design…I will follow one that is on design.*)

"Hari tu kan, pasal MH370, I follow everyday tentang news tu" (Astro Awani App on her mobile device)

(*That day, on MH370, I followed that everyday on the news.*)

"Website yang ada pronunciation kan, I dulu kan ada problem dengan pronunciation, so bila I enter dia punya word, they akan pronounce..."

(*There's a website that provides pronunciation. I used to have problems with pronunciation, so when I enter a word, it will pronounce…*)

"sebab I kan tak bagus English, so I download-lah, macam Johnny Grammar app.."

(*Because I am not good in English, I download apps like Johnny Grammar…*)

"Macam kawan I kan, dia active, dia ada Tumblr, dia photographer kan, I suka tengok dia punya kerja, art work."

(*For example, I have a friend who is a photographer, she is active in Tumblr. I like to see her work, art work*.)

"Untuk belajar ada…macam I follow, kan, I rasa Media Art twitter adakan…I follow-ah"

(*For learning, for example I follow; there is Media Art twitter, right? I follow that*)

There might be several reasons to her preference for popular and generic technologies. There is an unspoken high expectation for students to be independent and self-sufficient. These ideas contribute to a pervasive culture of higher education that has a crucial influence on the digital decisions made by disabled students (Goode 2007). Disabled students might reject the use of assistive technology and training and other technologies for fear of being looked upon as not being "normal" and self-sufficient. A study revealed that the sense of perceived stigmatism of getting special accommodation to certain technologies due to their disability also deterred them from fully benefiting from it (Seale 2013).

Time is an influential factor for disabled students. Substantial time is needed in dealing with issues related to their disability leaving them less time to explore and work online compared to their non-disabled counterparts. Some researchers found that some disabled students, unlike typical students, had to learn new assistive technologies at the start of their university studies (Seale et al. 2008b; Wald et al. 2009). Learning a new assistive technology can be equally time-consuming, if not more. Disabled students might not be able to fully benefit from it or make meaningful use of it due to lack of skill in operating these new assistive devices. This is on top of having to navigate unfamiliar online spaces to interact and obtain online learning and administrative resources provided by their lecturers and the university.

17.7.2 Ease of Use/Compatibility with Technology

In the interview, Iris Ib often expressed her preference for managing academic activities via her mobile device and other internet technologies. It is apparent that she is comfortable in using technology as part of her everyday activities including academic activities.

"Kalau saya, I prefer guna mobile. I don't talk much in person in group."

(*For me, I prefer to use mobile. I don't talk much in person in a group*.)

"Tak tahu, kalau untuk I, I rasa ni, ia banyak membantu…technology nie banyak membantu....I memang tak boleh survive kalau tak ada."

(*I don't know, for me, I feel that it helps a lot…technology helps a lot…I really cannot survive without it.*)

"Kalau untuk I, memang selesa, I prefer I rasa I better belajar daripada online dengan mobile."

(*As for me, I am comfortable, I prefer, I feel that I can learn better online with mobile*.)

"With the lecturers i prefer through email, SMS not face to face. Same goes to friends.. unless kawan rapat i okay. I tak boleh kawan ramai atau group.. I tak pandai social.. Tak tahu nak communicate...so i choose to use social media for interaction with lecturer or even friends."

(*With the lecturers, I prefer to communicate through email or SMS, not face-to-face. Same goes for friends…unless they are a close friend, I am okay. I cannot make lots of friends or a group. I am not good at socialising. I don't know how to communicate...so I choose to use social media for interaction with lecturers or even friends*.)

I semua through internet...I tak-kan face-to-face, second choice

(*I do everything through the internet…I won't use face-to-face; that's a second choice.*)

17.7.3 Learning Strategies

One other theme that emerged was how Iris Ib developed some learning strategies to cope with her disability. She acknowledged her condition and recognised the weaknesses that came with her disability. She leveraged generic and everyday technologies to compensate for issues related to her disabilities.

Some comments included:

> "Kalau untuk belajar, macam Internet Application, untuk scripting in Flash…I guna YouTube sebab I tak faham dalam kelas apa mereka cakap…banyak kat MMU nie I belajar guna youtube, guna internet, tak nie sangat tu dari lecturer sebab I tak faham mereka cakap apa"
>
> (*If for learning, such as internet applications, for scripting in Flash…I use YouTube because I cannot understand what they are talking about in class…most of the time at university. I learn through YouTube, through the internet. I can't learn much from lecturers because I do not understand what they say*.)
>
> "Tak faham. I tahu my condition-lah, sebab I tak boleh focus, tu bila I balik I kena refer YouTube-lah, kan…mana ada yang record masa lecture, saya perlu guna youtube balik-lah. Kan you ada kasi youtube link kat facebook group tu…tu I banyak guna."
>
> (*I don't understand. I know my condition. Because I cannot focus, when I go back, I need to refer to YouTube. There is no recording of the lecture, so I need to use YouTube repeatedly. Remember you gave the YouTube link at the Facebook group?…that I use a lot.*)

Social media technologies, though not primarily designed as learning technologies, were appropriated for academic purposes. These personal social media technologies, particularly Facebook and YouTube, appear to have played a significant role in the everyday life of this student. This has led to a blurring of academic and social spaces, as well as formal and informal learning. This finding concurs with several earlier studies that reveal the widespread use of social media for learning (Corrin et al. 2010; Lampe et al. 2011; Mazwan and Usluel 2010). Most importantly, a study on dyslexic students and Facebook usage for learning found that dyslexic students were highly motivated to learn while using Facebook (Barden 2014). This study's finding is interesting in that though dyslexic students often identified issues and difficulties pertaining to text and literacy, Facebook, which is still predominantly text-based, didn't seem to hinder these students from actively participating in it. This particular finding is similar to what this chapter's case study found. For example, when asked if she used social networking sites such as Facebook, the response was a resounding "yes". She exclaimed: "Yes, every day! Even in class!" One possible reason could be because of Facebook's status as a popular, everyday rather than assistive technology. The student saw it as levelling the playing field rather than further alienating them from other typical students and the university community at large (Barden 2014). This finding also confirms the association between disabled students' adoption and acceptance of technology and their perception of whether the particular technology exacerbates their disabilities (Lewthwaite 2011).

Other emerging mobile media technologies such as WhatsApp were also found to support academic related activities such as organising group work and group discussion. For the student participant, this technology has provided an alternative support for her in communicating with other students in her course. It acted as a bridge to negate issues and problems related to her disabilities. For example, she mentioned:

> "I memang jenis lambat nak respond, I susah nak faham, even in Malay, macam lambat sikit… err…hmm…I difficult to put my thought in words" (*I am one of those who is slow in response, I find it hard to understand, even in Malay, kind of like a bit slow…err…hmm…I find it difficult to put my thoughts in words*).

She continued:

> "..untuk discuss dengan kawan, kita buat group kat WhatsApp… I am more comfortable melalui device… I prefer guna mobile. I don't talk much in person in group. Lepas discussion I ask one of the group mate to explain balik. Satu mereka cakap terlalu cepat, satu lagi I tak boleh concentrate. Sebab dalam group, banyak cakap, I tak boleh.."
>
> *(..to discuss with friends, we set up group in WhatsApp…I am more comfortable communicating through the device…I prefer using mobile. I don't talk much in person in a group. After the discussion, I ask one of the group mates to explain it back to me. For one, they talk too fast, another is that I cannot concentrate. Because in a group, there is lots of talking, I cannot…)*

Additionally, she added that she was connected most of the time via her mobile phone. One reason being that she was able to get notifications: She claimed that:

> "…usually on my phone, setiap hari sebab I dapat notification dari gmail. Sebab laptop dengan desktop, dia tak ada notification"
>
> *(…usually on my phone, everyday because I get notifications from Gmail, because laptops and desktops do not have notifications).*

YouTube, a video-sharing site, is another Web 2.0 social technology that she frequently uses to counter the challenges related to her disabilities. One main reason for using YouTube is because of the ability to replay the video many times. She expressed:

> "…because I can replay banyak kali, boleh repeat balik…I tahu my condition-lah, sebab I tak boleh focus, tu bila I balik I kena refer YouTube-lah, kan… Kan you ada kasi YouTube link kat Facebook group tu…tu I banyak guna I tak boleh baca lama sangat, kalau lebih 2 minute, I tengok macam semua letter jumble up, jumping around, so macam mana I nak focus…in class, my mind keep wandering around, macam I tak boleh focus sebenarnya"
>
> *(…because I can replay many times, can repeat back…I know my condition, because I cannot focus, so when I go back, I have to refer to YouTube…Like you gave use the YouTube link at the Facebook group…that I use very often. I cannot read too long, if it's more than 2 minutes, I see all the letters jumble up, jumping around, so how do I focus…in class, my mind keep wandering around, I cannot focus, truthfully).*

17.8 Implications for Learning

Researchers Manago et al. (2012) observed the impact of social media technologies on students' university experience as well as their well-being was largely positive. Another group of researchers (Yu et al. 2010) found that online social networking boosted self-esteem and greater contentment with university life. Weaving social media technologies into academic activities formally might provide some form of antidote to the common psychological stress that disabled students usually face during their university life. The transition into university is a daunting experience. Compounded with the extra burden of having to deal with issues related to their disabilities, disabled students are prone to experiencing mental health issues and tend to be seen as social misfits. This is evident with this student participant. For example, she lamented that:

> "I pun selalu still buat treatment, pergi jumpa…I pergi dekat hospital, psychiatrist kat situ. I ambil medicine-lah untuk ADHD, sebab I hyperactive, I tak boleh focus less than 2 minutes. I pergi dari Foundation lagi, I stress belajar, I pergi-lah…"
>
> *(I still always go for treatment. I see…I go to the hospital to see the psychiatrist over there. I take the medicine for ADHD because I am hyperactive. I cannot focus for more than 2 minutes. I've been going since Foundation year. I go because I am stressed due to my studies…)*
>
> "I ada seorang kawan, I cakap kat dia I ada ADHD, Dyslexia, tu kawan kedua I bagi tahu, …dia senyap-ja, lepas tu dia tahu saya ada ambil Concerta, sebab I letak dalam Instagram I ada ambil Concerta, dia cakap kenapa ambil benda macam nie, I cakap nie life saver, I cakap, kalau I tak ambil memang satu hari tu, I tak boleh focus kat kerja, macam mana nak submit assignment, macam mana nak belajar, I cakap. Dia cakap dah mind set I buat macam tu, dia cakap, sepatutnya tak perlu pun benda macam nie. I bukan yang buat benda macam tu, I cakap, I dapat nie since born, dia cakap macam dyslexia, ADHD, dia cakap macam benda tu tak wujud-lah, dia cakap…entah-lah"
>
> *(I have a friend; I told her that I have ADHD, dyslexia. That is the second friend that I told…she was quiet. When she knew that I am taking Concerta, because I put it up on Instagram that I am taking Concerta, she asked me why I am taking stuff like this. I told her it's my life saver, if I don't take it, the whole day I won't be able to focus doing work. How to submit assignments, how to study, I said. She said it just a matter of mindset on my side. The fact is, I don't need stuff like that. I said I am not making this up. I got it since I was born. She speaks as though dsylexia, ADHD do not exist…I don't know.)*
>
> "Sebab I rasa macam, sebelum nie I ada bagi tahu kawan, dia macam tak tahu apa saya cakap…apatu, dia cakap, tak pernah dengar. Apa dyslexia? Tak pernah dengar pun, I senyap-je-lah"
>
> *(Because I feel before this, I told a friend, she does not seem to understand what I said… what is that, she asked, never heard of it. What is Dyslexia? Never heard of it before. I just kept quiet).*

However, evidence from research that studied the networked experiences of disabled students in higher education revealed that this relationship is not straightforward but is laden with complex and diverse experiences (Lewthwaite 2011). Caution has been urged against uncritically assuming that positive experiences are always the outcome when using social media technologies. Lewthwaite (2011, p. ii) found that while social network experiences create opportunities to "mobilise new ways of being, building social capital and mitigating impairment", others experience the same network as "punitive and disabling". For some disabled students, it supports a "normal" status, while some students with invisible impairments encounter the social experience of disability for the first time. Hence, the influencing factors that determine the beneficial and meaningful use of technology among disabled students in higher education would be complex, multiple and diverse. Selwyn (2004) summed up this contention plainly:

> …we should see that once an individual has gained suitable conditions of access to different technologies, a lack of meaningful use of them is not necessarily due to technological factors (such as a lack of physical access, skills or operational abilities), or even psychological factors (such as a 'reticence' or anxiety about using technology), as is generally claimed by technologists. Instead, as a range of studies have shown, individuals' engagement with ICTs is based around a complex mixture of social, psychological, economic and, above all, pragmatic reasons" (p. 349)

17.9 Conclusion

The purpose of this case study was to explore the relationship and experiences of a disabled student's use of technology for learning and other academic activities. The initial findings and reflection of this study suggest that mobile technologies together with Web 2.0 technologies, particularly social media including video-sharing sites, could play a pivotal role in the lives of disabled university students for academic activities. It could also level the playing educational field for disabled students and create opportunities for social inclusion within the university community. Despite its exploratory nature, as well as a single convenience sampling case study, this study offers initial insights into the complex relationship disabled students have with their technology, particularly those used and appropriated for academic activities. These limitations can be addressed in future research to provide more definite evidence for this growing field of research particularly in the Asia-Pacific region such as Malaysia.

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Chapter 18
Teachers' Use of Facebook Motivating Vietnamese Students to Improve Their English Language Learning

Henriette van Rensburg and Triet La Thanh

Abstract At the Ho Chi Minh University of Foreign Languages – Information Technology (HUFLIT) in Vietnam – students must enrol in eight intensive compulsory English courses (two credits, equal to 30 h per course) as required by their program. The National Language Project (2012–2020) uses the Common European Framework of Reference (CEFR) as a framework of reference and also requires all English second language teachers in Vietnam to reach an English level proficiency of B2 as indicated by the CEFR for primary and lower secondary school teachers and CEFR C1 for upper secondary, high school teachers. As part of the National Language Project, blended learning was introduced to modernising language teaching, but unfortunately, the learning outcomes were not as positive as expected. The researchers introduced a social networking site, Facebook, for language learning in an effort to improve learning motivation through mobile learning. This study is underpinned by Malcolm Knowles' (The adult learner: a neglected species, 3rd ed. Gulf Publishing, Houston, 1984) principles of andragogy as the science of adult learning. During the course, the researcher observed and examined participants'

H. van Rensburg (✉)
School of Linguistics, Adult and Specialist Education, University of Southern Queensland, Toowoomba, Australia
e-mail: Henriette.vanRensburg@usq.edu.au

T. La Thanh
Department of Foreign Languages, University of Foreign Languages – Information Technology, Ho Chi Minh City, Vietnam
e-mail: lth.triet@huflit.edu.vn

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learning participation and attitude using data collected by both qualitative and quantitative methods. This case study demonstrated that learning connections made through mobile learning and virtual learning environments could have a positive effect on learning outcomes and also increase students' motivation as well as a sense of community.

18.1 Background and Research Context

Ho Chi Minh University of Foreign Languages – Information Technology (HUFLIT), established in 1994 (HUFLIT 2008) – was the first private university in Ho Chi Minh City, in the south of Vietnam, formed on the basis of former Saigon Foreign Languages and Information Technology School which was established in 1992. Similar to other universities in Vietnam, HUFLIT's main objective is to assist students with obtaining tertiary qualifications, gain knowledge associated with a specialised field, and develop good practical and professional skills that meet the needs of the global market. The academic curriculum at HUFLIT is suitable for the Vietnamese foreign language requirements and comparable to the curriculum of other universities in Asia. The university offers Master and Bachelor programs in Foreign Languages (English and Chinese), Information Technology, Oriental Languages and Cultures (Japanese, Korean, Chinese), International Business Administration, Tourism and Hospitality, International Relations, and Accounting (Finance) (HUFLIT 2010). One of the prominent aspects of HUFLIT in comparison to other universities in Vietnam is that all HUFLIT students must take intensive compulsory English courses as part of any major program. Students have to undertake at least 16 credits, which is equivalent to 240 periods of learning (50 min per period) for general and academic English in the first four semesters of their program.

18.2 Overview of Education in Vietnam

The Vietnamese people have inherited a high admiration for learning. Originally this occurred under Confucianism, which consists of two essential principles: the necessity of correct behaviour and the importance of loyalty and obedience, "education was essential for admission to the mandarinate, the ruling class of scholar-officials" (Kelley 2006, p. 314). In Confucian education, the message was strengthened by rites and ceremonies, and there was no mention of any spiritual dimension but focused on the observance of traditional rituals (Te 1989). Later, "under French rule, (even though Vietnamese were excluded from the colonial power elite), education was a requisite for employment in the colonial civil service and for other white-collar, high-status" positions (p. 320). Kelley (2006) further stated that in a "geographically divided Vietnam, education continued to be a channel for social mobility in both the North and the South" (Kelley 2006, p. 321).

Since 1986, Vietnam has stepped into the phase of a Socialist-oriented market economy, intended to make education more applicable to the nation's economic and social needs (Kelley 2006). These reforms combined theories with practical applications and emphasised the training of skilled workers, technicians, and managers. The government also focused on the demand to develop the country's scientific and technological levels of achievement (Socialist Republic of Vietnam 2008). Their aim was to make it equivalent to international levels in order to assist Vietnam in expanding its technical collaboration with foreign countries in general and socialist countries in particular. In this period of international integration and economic development, Vietnam education has been both directly and indirectly affected in various ways by changes in the economic and social infrastructure. With a heritage from the Vietnam War, Vietnam adopted a new trend from Western education, moving from dependent to independent learners (Van 2007). Regarding learning and teaching, Vietnam has not yet made learners and teachers aware of the advantages of integrating information technology into education (Van 2007). Blended learning, "the integration of a combination of face-to-face and online learning in order to enhance the classroom experience and extend learning through the innovative use of information and communications technology and to enhance student engagement and learning through online activities to the course curriculum, and improve effectiveness and efficiencies by reducing lecture time" (University of Calgary 2008, p. 1), has not yet been applied effectively in Vietnam, especially in the field of English language teaching.

18.3 Statement of the Problem

In the Vietnam higher education context in general, and at HUFLIT in particular, the government is implementing the National Foreign Languages Project 2012–2020. The aim of this program has been to improve Vietnamese university students' foreign languages capacity and enhance students' learning and working outcome as a compensation for the 'foreign languages gap' in high school programs for some years. In addition, many Vietnam schools from primary to higher education have incorporated technology into classrooms following the National Language Project 2012–2020 and modernising the language teaching and learning process (Socialist Republic of Vietnam 2008).

The general target of the National Language Project is to thoroughly renovate the tasks of teaching and learning foreign languages within the national education system and to implement a new program in teaching and learning foreign languages at all school levels and degrees. The aim is to achieve vivid progress on professional skills and language competency for human resources by the year 2015, especially in some prioritised sectors (Socialist Republic of Vietnam 2008). By 2020, the government aims that most Vietnamese students who graduate from vocational schools, colleges and universities will have the capacity to use a foreign language independently. This will enable them to be confident in speaking foreign languages and able to study and work in an integrated and multicultural environment. Vietnamese people will benefit from being bilingual, serving the cause of industrialisation and modernisation for the country. Besides, this National Language Project also aims to require all English language teachers in Vietnam to reach an English proficiency level of the Common European Framework of Reference (CEFR) B2 for primary and lower secondary school teachers and CEFR C1 for upper secondary, high school teachers. The CEFR (Council of Europe 2014) defines foreign language proficiency at six levels: A1 and A2, B1 and B2 and C1 and C2. It also defines three 'plus' levels (A2+, B1+, B2+). Based on empirical research and widespread consultation, this scheme makes it possible to compare tests and examinations across languages and national boundaries (Council of Europe 2014).

The CEFR is a framework of reference (Council of Europe 2014) that was designed;

> …to provide a transparent, coherent and comprehensive basis for the elaboration of language syllabuses and curriculum guidelines, the design of teaching and learning materials, and the assessment of foreign language proficiency. It is used in Europe but also in other continents and is now available in 40 languages. (Council of Europe, para. 1)

In order for the Vietnamese teachers to achieve the goals as described above, many teachers are required to undergo training to improving their English language proficiency as well as updating and improving their skills in communicative and learner-centred teaching methodology.

Based on Vietnam's current education context and social factors, there is an option of 'blended learning' (Bonk 2004), a learning process which involves the combination of traditional teaching and learning, with hard copy textbooks, and online learning resources, as well as the use of e-resources such as online workbooks. This is one of the most popular learning and teaching models and was proposed to be integrated into language education in Vietnam. However, a case study at Ho Chi Minh University of Foreign Languages and Information Technology has demonstrated that the foreign language learning outcomes were not as high as expected. Online learning with online or digital workbooks appears not to function well at HUFLIT. From 2011 to 2013, the department of Foreign Languages implemented two online learning programs. The first system was Net Languages, an online language-learning course by Net Languages, an online platform for different types of learners, such as individual students, corporate clients, educational institutions of all kinds and government departments around the world (HUFLIT 2008). The second system was English Discoveries Online, a fully customisable, interactive end-to-end solution that catered for specific client needs. This system was an online learning product developed by the US English Testing Service which was intended to provide educators with effective and user-friendly tools to maximise learning outcomes (HUFLIT 2008). However, according to an internal survey within the Department of Foreign Languages, there were mostly negative responses from students regarding the use of these two online learning programs, and the department has since ceased using the two programs. By observing the student's behaviour and using survey data collected by the department, the researcher has recognised that the teaching and learning methodology was not the main problem but the students' attitudes towards the new form of learning, computer-assisted language learning (CALL). From this reality, there is a hypothesis which assumes that the outcome of foreign language teaching and the learning process would appear to depend on students' attitudes and their motivation towards learning (Palmer 2007).

18.3.1 Review of Teachers' Viewpoint Towards Social Networking Sites

In their studies, many researchers have focused on teachers' attitudes towards the use of social networking sites in the practice of English language teaching. One theory, the *Technology Acceptance Model* initially proposed by Davis (1989) suggests that a learner's attitude in using social media is determined by two aspects: the ease of use of the technology and usefulness. These aspects are considered to be affected by external changing factors such as education policies regarding social media, pressure from parents and students, teacher media training and opinions from colleagues (Cox 2003). Another theory is the *Theory of Planned Behaviour*, which states that an individual's behaviour is determined by an intention which, in turn, is influenced by three main aspects: subjective norm, attitude and behavioural control (Ajzen 1991). In this current study, the Theory *of Planned Behaviour* was applied to the instructors' use of social media. Attitude refers to how teachers view the value of the technology, the manner in which it affects their role in the classroom, the students' learning and motivation and the teachers' influence in the school (Cox 2003).

Other studies have provided evidence of the manner in which teachers' attitudes play an important role in influencing their tendency to be in favour of, or against, using any form of technology in the classroom, with a positive attitude to learning integration (Kreijn et al. 2012). Applying the principles of the *Theory of Planned Behaviour* as the basis of their study, researchers conducted a survey of approximately 1200 teachers in the Dutch language to investigate their usage of digital learning materials. The researcher recognised that teachers' attitude was one of the elements with the strongest effect which could predict their intention to use any digitalised materials in the students' learning process. Additionally, some findings revealed that teachers' positive attitude correlated with teachers' self-efficacy, previous usage of social media and, to some extent, colleagues' usage of social media. The researchers also argued that successful experiences in technology integration from colleagues would have a positive impact on teachers' attitude and their usage of the technology (Kreijn et al. 2012).

Another observation of teachers' attitudes towards social media was mentioned in studies by Ajjan and Hartshorne (2008). Using the *Theory of Planned Behaviour* as the framework of this study, the researchers surveyed over 100 university faculty members at a large south-eastern university in the United States to summarise their awareness of the benefits and intentions towards the use of social media. In this specific survey, the researchers concluded that the benefits were that social media improved student-faculty interaction, enhanced student writing and ultimately boosted writing outcomes. An analysis of the data in this survey also showed that attitude was a contributing factor with a significant outcome in affecting the faculty's intention to use social media in teaching, while behavioural control and subjective norms were factors which slightly influenced the faculty's intention to use social media.

Further studies in the South-east Asian context of education focused on educators' attitudes towards society in general and social media in particular. These studies showed that governments, through policies in education, have demonstrated that expertise in social media should be one of the focus points of education to prepare a globally competitive future generation (Cox 2003). The research also claimed that some national schemes focusing on social media integration in education have been develop to support eLearning.

A recent study by Borg (2006) focussed on teachers, whose influence over student learning was considerable. It was obvious that teachers are vital contributors and decision-makers who play a critical role in determining activities in classrooms. Therefore, an understanding of teachers' mental state and well-being is necessary to have an insight into the nature of instructional practices and professional development, as well as to support policy makers to be more sensitive to the key roles that teachers play in educational innovation (Borg 2006). Teachers' familiarity with various types of social media is considered as the foundation for the analysis of their attitudes towards using social media in teaching.

This research focussed on teachers' attitudes to the usefulness of social media, ranging from specific to the more general aspects of social media: social media usefulness in teaching foreign languages and the aspects of wider professional development areas and finally to the more general area of educational use of social media for higher education. In addition, the relationships between the attitude towards social media and details of the participants such as tenure, gender, age, employment, and education level were also probed in order to observe the potential correlations.

18.3.2 Students' Attitude Towards Social Networking Sites

Various research studies focus on learners' attitude to social networking sites around the world. Eren (2012) studied students' attitudes towards the use of a social networking site, Facebook, in language classrooms. There were 50 undergraduates who were enrolled in a 1-year compulsory English preparatory class in Turkey. Research findings showed that students have passive, positive attitudes towards the use of Facebook activities as a supplementary medium to classroom instruction.

However, the data in this research also revealed that traditional classroom-based language learning is still the backbone of foreign language teaching and learning in general.

A quantitative study carried out by Kabilan et al. (2010), which involved 300 college students in Malaysia, analysed the students' uses of Facebook as an online environment for foreign languages teaching and learning. This research also examined students' confidence, motivation and attitude towards English language learning through the Facebook platform. The findings briefly demonstrated that the students acknowledged the prominent role of Facebook as a cyber learning environment to support their language learning.

A pilot study by Chen and Jones (2007) investigated the needs of distance language learners and the importance of online two-way interaction in distance-based language learning. The researchers stated that cyber learning systems were positively received by distance learners, who considered it to be an interactive and communicative environment. Findings showed that learners perceived their learning as more relevant, and learning isolation was decreased. Similarly, Tilfarlioglu (2011) pointed out in his case study that the advent of web technologies have remarkably changed the way people use the Web for foreign language learning in particular, as well as in education in general.

Ajjan and Hartshorne (2008) claimed that using social networks in class teaching improved the student's course and learning satisfaction. Students viewed networks such as Facebook as purely social and used these networks informally for learning purposes. Furthermore, Silius et al. (2011) believed that students showed a desire for using social networks in their learning. They felt that the implementation of social networks would enhance their learning outcomes.

Finally, Akbari et al. (2012) examined students' expectations towards the use of social networking sites for language learning. Their findings stated that there was a substantial difference between students' attitudes before and after the learning process. Before learning, most students considered Facebook to be an informally useful tool, because, through it, they could interact and share knowledge. After learning with Facebook as a platform, most students said that Facebook has the potential for being used as an efficient learning tool. In other words, the study reinforces the idea that students' had positive attitudes towards the usefulness of social networking sites in the learning and teaching environment.

18.3.3 Facebook and Social Networking Sites in Vietnam

This small-scale study attempts to explore the benefits of using a social networking site, specifically Facebook, in English language learning at HUFLIT. The following section provides a brief overview of the practice of using social networking sites in Vietnam. Since early 2010, there has been a thriving popularity of social networking sites in Vietnam, with more than 30 million monthly active users in the country, and 27 million users are accessing the social network on their mobile devices. Each

Vietnamese user spends an average of 2 h and 30 min on Facebook every day, mostly connecting with friends and visiting Facebook pages (Tuoitre News 2015a). Facebook has begun to have a voice in social and politics-related issues. It is now more common for Vietnamese Internet users to express their opinions, objections or protests on social networks, and sometimes end up seeing the changes they have demanded really put in place. This can be evidenced by several recent headline-grabbing issues, which indicates that authorities are apparently listening to what their citizens discuss on Facebook and that social media currently have a certain say in Vietnam, which has been unfairly alleged to block social networks (Tuoitre News 2015b). Tuoitre News (2015b) further claimed that in spite of both the official and unofficial restriction from the government, a growing number of citizens are actively using online networks to express their views on social and political issues.

Vietnamese people still have access to both domestic social platforms such as Zing.vn or Go.vn, and foreign social platforms such as Twitter and Facebook. Access to social networks is against the government's so-called 'security policy', which restricts the citizens, especially the younger citizens, from freedom of speech and the press (Palatino 2015). Internet restrictions in Vietnam "primarily targets topics with the potential to threaten the Vietnam Communist Party's political power, including political dissent, human rights and democracy" (Aquino 2015, p. 2). In order to connect to Facebook using a web browser, Vietnamese users need a proxy tool in order to bypass a firewall. Approximately 60% of all Internet users in Vietnam are using Virtual Private Networks or proxy servers to access restricted content (Tuoitre News 2015a). This is often not convenient because the slow connection speed also acts as a barrier. Besides computers, smartphones, phones with central processing units and operation systems, are becoming more and more popular to end-users. These devices are now more affordable and social networking sites such as Facebook or Twitter are more accessible through their installed applications. Due to these applications, Facebook is now more available and more reachable to the general Vietnamese users. Most Vietnamese students frequently use Facebook for language learning in an effort to improve learning motivation, which directly promotes language learning outcomes (Le 2007). Students' attitudes and motivation have frequently been considered as one of the greatest contributing factors for learning success within computer-enhanced language learning environments (Brandl 2002).

18.3.4 Theoretical Framework

This study is based on the principles of Malcolm Knowles's Adult Learning Theory, (also labelled as andragogy), and the following assumptions where an adult learner, according to Knowles (1984) and Pullagurla (2014):

- Becomes a self-directed learner, and needs to be involved in the curriculum. Adult learners should be vigorously involved in the learning process by making choices related to their learning objectives. As such, adult learners also steer their learning goals with the direction and support of their teachers. As an educator, it is imperative to facilitate the process of goal-setting. Students need to be given the autonomy to assume responsibility for their own choices. When it comes to assignments, they also need to be active in making decisions and in contributing to the process;

- Has a wealth of life experience that provides a platform for learning activities. This implies that teachers encourage learners to draw on their past experiences with their existing knowledge-base and activities. Learners are supported with ways to bring to their present placement, past knowledge, opinions, and experiences. Teachers need to be knowledgeable in how to help students in using and applying relevant past knowledge and experiences. In addition, teachers must know how to narrate the totality of learners' experiences to the present learning experiences;
- Is interested in learning that has relevance to their life. The inspiration to learn is increased when the relevance of the topic to real-life situations is obvious, particularly in relation to the specific apprehensions of the learner. Learning is assisted when appropriate ways of implementing theoretical knowledge in real life situations are made explicit;
- Focuses on problem centred learning. It is of high importance to obtain relevant and suitable knowledge. "Adult learning is characterised as goal-oriented, and intended learning outcomes should be clearly identified. Once the learning goals have been identified, it is now imminent to align the learning activities such that these objectives are fulfilled within a certain period of time. This approach is a great way to maximise a students' learning experience" (Pullagurla 2014, p. 1); and
- Motivation to learn is internal (Knowles 1984; Pullagurla 2014). Adults are usually motivated to learn if they can relate the assigned tasks to their own learning goals. "If it is clear that the activities they are engaged into, directly contribute to achieving their personal learning objectives, then they will be inspired and motivated to engage in projects and successfully complete them" (Pullagurla 2014, p. 1).

Knowles (as cited in van Rensburg et al. 2014, p. 203) indicated that "in accordance with adult learning theory, a less didactic approach should be utilised; one that promotes an emphasis on equality between teacher and learner".

The research question that underpins this study is: Will students' learning motivation improve through engaged learning activities within the online platform, Facebook, a social networking site?

18.4 Participants

In this study, the teacher was also the primary researcher and is specifically qualified, trained and experienced in computer-assisted language learning. There were 22 students in an Intermediate Reading class, equal to a B1, Pre-intermediate level of the Common European Framework. Most of the students had access to the internet through an internet support policy from government-owned telecommunication companies. The Facebook application was installed on iPhones, Microsoft Lumia phones, and Android phones by the manufacturers as a default application.

Facebook is a United States based social networking site, with the following main functions:

- Timeline: Your Facebook Timeline details all of your personal activities on Facebook. It is called a timeline because it can include information, memories, and milestones in your life.
- Status updates: A status update is anything that you decide to share with your Facebook friends. Through a status update, you can communicate your current activity or location, post a link, mention or “tag” friends whom you want to include in a conversation, and share photos, live videos and thoughts.
- Fans: Facebook users may join a page because they have a particular interest in the topic or a connection with the brand/product.
- Like: The ‘like’ button can be found on every piece of Facebook content: status updates, photos, comments, brand, timelines, applications (apps), and even advertisements.
- Comments: Respond to a post written by the page or by another fan with the ‘write a Comment’ box.
- Shares: A person or page can share content from another post on his or her own page by using the ‘share’ function. Options are: share now, write a post, send in Messenger or copy link.

In the Vietnamese culture, there is usually a close relationship outside the classroom between students and teachers. Beside the role of a teacher or instructor, the primary researcher also worked as a student academic supervisor, whose role was to supervise students’ learning and help them to deal with non-academic issues. This role required the teachers to have frequent communication with the students. Therefore, the primary researcher used Facebook mainly for communication purposes with students in his role as an academic supervisor, where Facebook was considered to be an unofficial channel. During the use of this tool for communication, the primary researcher recognised the potential of it as a supplementary tool for learning.

18.5 Methods

During the course, the researcher observed and examined data about participants’ learning participation and attitude collected using both qualitative and quantitative methods. In addition to formal class time, participants also added the researcher’s Facebook account, followed the instructions on the Facebook page, engaged in daily activities and completed daily assigned exercises. Before implementing this learning channel to the learning process, the researcher informed the students that the Facebook social networking site was going to be applied as a supplementary learning tool for learning in the Intermediate Reading course during this specific semester. This teaching and learning process was also officially approved by the Department of Foreign Languages at HUFLIT. Students in the project were required to regularly complete compulsory exercises which were posted by the teacher on his Facebook page. All 22 students in this class had smartphones with free internet and Wi-Fi connection and also access to the computers at the HUFLIT laboratories. Students could use their smartphones to connect to the free internet for various learning purposes, for example completing learning tasks activities, such as searching for words or ideas on the internet or group work activities. Students could also use their personal computers and/or mobile devices. Optional exercises were regularly posted by the teacher. These were learning-related posts, such as word quizzes, extra exercises, reading texts, music, video, and even book reviews which were not always directly relevant to students' foreign language learning. However, based on their Facebook personal profiles, these were of interest to the students and included topics about fashion, music, movies, travel, leisure, sports, technology, or meaningful life lessons. Students who preferred, could share or add some comments in English to the teacher's posts. Through this reading course, the researcher observed and examined the participants' learning participation and attitude by collecting both qualitative (open-ended) and quantitative data (closed-end questions, technical counting of comments, peer reviews, and other interactive activities).

The researcher first applied a qualitative method by interviewing the participants in order to investigate their attitudes towards cyber-based learning powered by a social networking site Facebook. Second, a quantitative approach was followed when the researcher counted the times the students replied to the teacher's posts, to their peers' comments and/or posts.

18.6 Research Outcomes

Besides the compulsory exercises which the participants were required to complete, they were also engaged in responding to the teacher's additional optional posts and peers' comments. Figures 18.1 and 18.2 illustrate the data collected from the observation. The first figure indicates the percentage of students' responses to the teacher's posted exercises. The teacher posted daily compulsory exercises and frequently posted optional tasks (two or three times per week). More than 95% of the students responded to the compulsory exercises. Students replied to the tasks after seeing the teacher's post (the researcher just counted the responses, but the exact time of the responses was not recorded). Approximately 60% of the students in the study responded to the optional tasks, while just over 30% of the participants replied to their friends' comments.

Figure 18.1 indicates that compulsory exercises attracted the highest rate of responses (The vertical axis represent the percentage of students' responses). The researcher believed that the compulsory exercises received the highest response rate

Fig. 18.1 Students' responses to the compulsory exercises

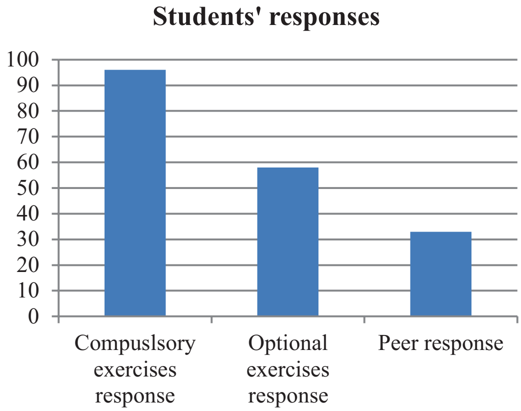
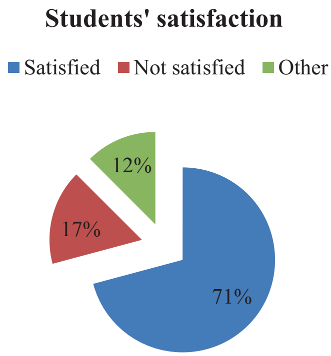


Fig. 18.2 Students' satisfaction



due to students' intrinsic motivation to finish these exercises. Students were motivated to complete the tasks which formed an integral part of the reading course, and it directly contributed to their final grade. In any learning context which significantly focuses on the testing and result, the learning and teaching regulations are key factors which will certainly enhance students' extrinsic learning motivation regardless of their learning attitudes.

Nearly 60% of the participants engaged in the optional exercises. There were two noticeable themes received from the participants' responses, which were 'because it is optional' and 'it is not really interesting'. This reflected a basic notion that intrinsic and extrinsic motivation always plays a crucial role in any learning context. In this study, students' learning activities were only completed when they were aware of the importance of their learning, as well as the relevance of the completion. It seemed that there was a link between students' beliefs, which increased their motivation, and also influenced their learning behaviour.

Finally, approximately 30% of participants responded to their peer's comments. As observed, most of these responses were shown with 'emoticons (ideograms or smileys used in electronic messages) or 'like' to show 'attention', 'agreeing' or 'disagreeing'. In terms of contributive learning, the researcher did not regard these nonverbal responses as valuable learning feedback in this study. These emoticons were more related to students' emotions and feelings than their actual thinking. The researcher believed that the peers' responses were based on the content of the posts and students' attitudes towards their peers.

Figure 18.2 showed the students' satisfaction on completion of the course. Over 70% of the participants were satisfied with digital learning on mobile devices. Participants commented that completing the electronic exercises was more convenient than paper-based versions; they could complete these tasks at the college, before or after class time, and even with the support from their classmates. Seventeen percent felt uncomfortable with digital learning on mobile devices, and 12% had other opinions. These participants stated that they were not familiar with this type of learning, and typing directly on their mobiles for responding to exercises was time-consuming, and it affected their concentration. The participants indicated that they preferred 'live' posts, responses and shares from the teacher in this new cyber learning platform. A number of students thought that, although they really liked this mode of learning, they did not want their comments or answers to appear publicly. According to the interview data (some students were randomly and informally interviewed and were asked general questions regarding their experiences with mobile learning during the course, their opinions about learning difficulties and benefits that they perceived through this mode of learning), some participants also revealed that they should learn from their teachers, not their classmates. This reflected a traditional trend in the Vietnam education in general, where the teachers usually play a central role in the learning and teaching process with specific authority, which is established in a traditional teaching method of "lecturing" and the knowledge is expected to be poured into, and fill students' 'empty minds' (Mehdinezhad 2011).

18.7 Discussion and Conclusion

In the research context, the language learning outcomes demonstrated that the use of social networking sites is expected to partly increase students' language learning outcome through their active participation and positive attitude to supplementary learning activities during the formal course. A cyber learning usage within the learning context may encourage peer feedback on assignments. Through thoughtful reflections on course content, students may openly communicate with each other and develop strong relationships with peers, as mentioned by Arnold and Paulus (2010).

The data analyses also indicated that students who used social networking sites as supplementary learning environments felt emotionally more connected with their classmates and teacher than students who did not participate in social internet learning platforms as indicated by Jackson (2011). A cyber learning space which is based on social networking sites provides students with a learning platform not only for group and individualised learning, but also flexible contact with the teacher outside the classroom (Mazman and Usluel 2010). In addition, by forming group or collaborative learning with interaction, social networking sites can align the classroom diversity through building a shared learning space where learners can easily collaborate with others.

This study also echoed the findings of Heafner and Friedman (2008) where they demonstrated that learning connections made through a virtual learning environment could have a positive effect on learning outcomes. Students' participation in social networking sites may also generate an interactive learning environment by providing students with opportunities for discussions and collaboration with their classmates. The result also demonstrated that using social networking sites as a teaching environment, a teacher not only stimulates students with engaging topics but also develops a stronger sense of collaboration amongst students (Top 2012).

The results indicated that there was an increasing sense of community amongst the students and the teacher outside the classroom. Through personalised Facebook accounts which include avatars and personal information such as interests and hobbies, it seems that Facebook users, in general, are more considerate towards each other. In this study, the sense of community and understanding between people increased remarkably. Along with the previous offline relationship, online learning within a social networking site partly improved information sharing and openness, which indirectly enhanced learning outcomes.

The social networking sites focus heavily on building online communities, bound together with common interests or activities. In the field of education, social networking sites encourage students to engage with each other and to express and share their creativity. Social media is also one good way for students to gain knowledge which can be from outside their classroom activities. With so many social media sites and platforms, they can share and discuss many things related to their need of particular knowledge with others practically.

Active engagement in social networking can create a better English communicative environment for students. They do not have to physically visit an English speaking country; they can just connect to the internet and interact with people from English speaking countries. According to Wang (2013), effective, interactive and interesting English lessons can make the learning more enjoyable. Social networking sites offer the users many free applications that can benefit English language learning. The learners can easily install the apps on their devices and simply click to open these at a convenient time. Facebook, Twitter or Tumblr may also help to enhance learning collaboration, as well as the interaction between learners and teachers. These platforms provide users with features such as posting, commenting, or sharing links which may help to promote the learning and teaching process.

The most important feature of the social networking site is the ability to give and receive feedback. Any content that you post instantly starts receiving comments, likes, reviews, opinions, and additional information on that topic (Picardo 2011). By doing this, it can create discussions, sharing ideas and other communicative skills which use English as the language in the discussion.

Social networking can encourage students to upload images or videos related to the courses. Some teachers even ask their students to upload their draft assignments onto these cyber spaces, where they provide feedback to the students in order to improve their work. It can be a very valuable process activity where learning and teaching can run smoothly without the barriers of place and time.

In conclusion, implementing supplementary language learning on a social networking site in this case study demonstrated that engaging learning activities within a social networking site provided students with a collaborative environment for learning. This directly increased students' motivation, as well as a great sense of community. Mobile learning supported by a platform such as Facebook improved the learning experience, which enhanced the learning and teaching outcomes.

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Part IV
North and South-West Asia

Chapter 19
Mobile Learning Implementation in University Environments: Implications on Practice for University Leadership Stakeholders

Umera Imtinan

Abstract In higher education environments in the Asia-Pacific particularly in South Asian region, mobile learning introduction and implementation are associated with certain challenges in order to harness its true benefits and potential. This research aims at investigating the feasibility of a potential introduction of mobile learning into Pakistani university environments. The expectations of students and senior university leadership stakeholders on key policy-making roles were investigated during this exploratory case study research. From three of the Pakistani mainstream universities, students and teachers participated in focus groups and discussion sessions, and leadership stakeholders were invited for individual interviews. The findings of the research indicate that there are several implications for practice by university leadership stakeholders if mobile learning is to be included in mainstream education in university environments in South Asian region. Findings of the research show that universities might need to adapt the paradigm shift in pedagogies from traditional face-to-face learning to mobile learning, resulting in updating certain key factors in university teaching and learning environments such as changing teaching philosophies and modifying learning resources. Further, mobile learning initiatives would require universities to modify several policies regarding students' attendance, use of mobile devices in university premises and classrooms and adjusting teachers' workload. The findings

U. Imtinan (✉)
School of Information Systems, Curtin University, Perth, Australia
e-mail: umera_imtinan@yahoo.com

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of the research could be generalised for the university environments in other South Asian countries such as India, Afghanistan, Bangladesh, Sri Lanka, Nepal and Bhutan due to similar sociocultural environments in those countries.

19.1 Introduction and Background

19.1.1 Definitional Perspectives

As eLearning constitutes a substantial part of the educational Information and Communication Technologies (ICTs) in modern higher education environments, it has already become popular among the teaching and learning communities around the world (Anderson 2008; Parsons 2011). eLearning offers flexibility and interactivity to learners and educators beyond the limits of time and space. The adoption of eLearning by education providers around the world has revolutionised the education industry in recent decades. The popularity of eLearning extends to mobile learning as it not only inherits flexibility and interactivity from eLearning but offers portability, connectivity, context sensitivity and collaboration. Mobile learning is a step forward from eLearning as it provides a higher degree of flexibility in learning (Chao and Chen 2009; Low 2007; Peters 2009). Connecting to the inception of mobile learning a decade ago, Traxler (2005) argues that mobile learning is more spontaneous, portable, informal, bite-sized and interactive which makes it distinct from traditional face-to-face learning and eLearning. Mobile learning research is needed to investigate how its unique attributes could contribute to the teaching and learning environments for different educational levels and settings.

Brown et al. (2008, p. 1) consider mobile learning as a window of opportunity for learning environments as it 'invite(s) the learning field to think "out of the box" and take an evidence-based approach to exploring these capabilities'. Furthermore, Oliver and Goerke (2008) argue that future university graduates can keep pace with technological advancements only if universities encourage them to be advanced digital learners by providing learning options on mobile devices and using social networking forums for learning. By making learning content available on mobile devices, students and teachers can have flexible learning options while on the move. Students can download lecture slides, listen to podcasts, participate in class wikis and project blogs using their mobile devices (Akhshabi et al. 2011; Copley 2007; Lan and Sie 2010). The range of learning activities that can be undertaken by students irrespective of time and location gives mobile learning a huge potential for teaching and learning environments in the future.

19.1.2 Current State of Mobile Learning in South Asian Region

Around South Asian region, the prevalence of sophisticated and user-friendly mobile devices with hundreds of thousands of compatible apps and faster access technologies (such as 3Gs and 4Gs) have already made a substantial impact on several industries such as banking, finance, travel planning, tourism, healthcare, social networking and entertainment (Farid et al. 2015; Kumar et al. 2010; UNESCO 2013). However, to date, education providers have been reluctant to use mobile technologies in formal teaching and learning environments in South Asian region, and, thus, the education industry is far behind in adopting the mobile technologies and reaping the potential benefits on a larger scale in spite of rapidly increasing mobile phone users and availability of inexpensive and affordable smartphones in Pakistan, India, Bangladesh and other countries in this region (Adkins 2015). Although many universities around the world have started embracing mobile devices as an important and cutting-edge part of the educational ICTs, only a few in South Asian region could start making research in the context of allowing mobile devices in formal university ICTs (Brown et al. 2008; Hooft 2013; Imtinan 2014; Keengwe and Bhargava 2013; Keskin and Metcalf 2011). It is important to note that there are multiple mobile learning research projects in Pakistan, India, Afghanistan, Sri Lanka, Bangladesh, Nepal and Bhutan that have demonstrated positive results with respect to learning objectives, learner's performance, motivation and effective use of learning resources beyond the limits of time and space (Anjum 2013; Isman et al. 2015; Kim et al. 2012; Saif 2013). The state of education and literacy rate is alarming in some of the South Asian countries, whereas the stats of mobile phone users make a strong argument and case to take advantage of the mobile technology to make an impact on literacy rate, girls' education, teacher training, women empowerment and access of education in remote areas (Acedo 2014; Ibrahim 2015; UNESCO 2013). Furthermore, there is a surge of education technology start-ups in South Asian region funded and supported by foreign aid agencies such as USAID, UKAID, British Council and AusAID; these small businesses are working on innovative learning solutions to solve the problem of education in these countries. Many of these innovative and edtech solutions include use of mobile devices to solve a problem relating to education (Asia 2016).

In the context of current state of mobile learning in South Asian region, this study explores the challenges and implications for practice for the leadership stakeholders and policymakers in university environments in Pakistan in order to introduce and implement mobile learning in Pakistani university environments. The outcomes of this study might also be generalised to stakeholders from other developing countries in the region to implement mobile learning in university teaching and learning environments as well as other higher education institutions.

19.2 Research Method

A number of mobile learning researchers have used the case study approach as the research method and qualitative data collection and analysis techniques for their research projects (Vavoula et al. 2009; Wu et al. 2012). The case study approach has been selected as the research method, and qualitative data has been collected through multiple data collection techniques including focus groups, semi-structured individual interviews and observations (Benbasat et al. 1987; Krueger and Casey 2000; Vavoula et al. 2009). The following subsections highlight the rigour in the data collection and data analysis processes.

19.2.1 Case Studies: Rationale for the Selected Universities

Three universities have been selected for this study based on the ranking data of the Pakistani universities available on the Higher Education Commission Pakistan's website available in 2009 (HEC 2009). The students, teachers and administrative stakeholders from the three universities were the target population for this study. In order to have a balanced representation of a variety of sociocultural backgrounds of the students, teachers and leadership group (the main participants in the study and therefore the immediate beneficiaries), the universities were selected from both the public and the private sectors (HEC 2009). Two universities have been selected from the public sector (named University A and University B for the purposes of this research), and one university represents the private sector (University C) so that people from different social and financial backgrounds are represented in the population sample representation. Sample size includes three focus groups from students, three focus groups from teachers (average seven participants in each focus group) and nine individual interviews from the leadership stakeholders in three universities. This sample size is relatively smaller than that of qualitative studies. However, Crouch and McKenzie (2006) argue that smaller sample sizes are appropriate for qualitative research in the context of exploratory case studies.

19.2.2 Data Collection and Data Analysis

The focus group is a qualitative research technique used to collect data through group interaction where the researcher provides the focus or theme and sometimes plays the role of moderator during the discussion. Focus groups can be used as a primary source of data as well as a complementary data source in a research design using multiple data collection techniques such as interviews and participant observation (Morgan 1997).

Table 19.1 Stages in data analysis for this research

Stage no	Stage name
Stage-1	Choosing data analysis strategies
Stage-2	Choosing data analysis tools
Stage-3	Preparing data
Stage-4	Organising data
Stage-5	Coding data
Stage-6	Identification of themes
Stage-7	Synthesising data
Stage-8	Interpreting data
Stage-9	Writing the results

Adapted from Miles and Huberman (1994) and Yin (2009)

The focus group discussions were a key element of this case study research. Focus groups were planned and conducted during the first phase of data collection. The students and the teachers from the three universities were the main participants in the focus group discussion sessions. One student focus group and one teacher focus group were conducted for each of the three selected universities, comprising of six focus group discussion sessions in total. For each focus group discussion session, 13 participants were invited to participate in the focus group session. The average attendance for students was nine participants for each focus group. The average attendance for the teachers' focus group sessions was ten. Interviews are considered to be the most common and the most important source of data in a case study research design (Miles and Huberman 1994). For this research, interviews are the main source of data. After the focus group discussions with students and teachers, the semi-structured individual interviews were conducted with the additional university stakeholders including administrators, IT managers and instructional designers. Personnel were invited by email to participate and were provided with an information sheet, cover letter and consent form.

The establishment of modes and strategies to be used for data analysis during the design stage is very helpful and makes the researcher mindful of the data analysis process for the field procedures and data collection phase (Benbasat et al. 1987). Yin (2009) has offered several data analysis strategies, techniques and tools to embed in a variety of case study research designs such as using a theoretical framework to guide the analysis and using a pattern-matching technique for coding the data. Miles and Huberman (1994) have proposed similar techniques and strategies for the preparation and organisation of data at this stage. By incorporating all of the important techniques, strategies and stages from the literature suitable for the type of data in this research, a nine-stage data analysis process has been devised for the data analysis of this research in order to ensure the rigour of the data analysis process (see Table 19.1).

QSR NVivo was used to assist with the organisation of the text data from sources (focus group discussion transcripts and individual interview transcripts) to categorise themes, coding and classification of nodes and sources of data, building relationships and associations between nodes and building the various models for a pictorial representation of the data. In addition, Microsoft Excel 2010 and Microsoft Word 2010 have been used to assist in the data analysis for this research. An Urdu language word processing software call InPage Urdu 2009 was used to transcribe initial text from recorded interviews. The preparation of data is an important step in the data analysis. The audio recordings were transcribed in the Urdu text format by using InPage 2009 Urdu text editor. After the Urdu text for all focus groups and individual interviews had been transcribed, the transcriptions were translated into English. The final version of the transcripts' translation was checked, reviewed and verified by a bilingual expert who is a lecturer of English as a second language in a Pakistani university.

To organise data, meaningful codes and titles were assigned to the universities, focus group participants and interviewees for identification and referencing during the analysis. For instance, universities were assigned the codes of University A, University B and University C to ensure anonymity. Similarly, meaningful codes were generated for students' and teachers' focus group participants such as Uni A, Student1, and Uni B, Teacher2. Interviewees were labelled in a similar fashion such as university code followed by the designation of the interviewee, e.g. Uni A, Administrator, or Uni B, IT Manager. These codes were used for the data analysis and for reporting the results.

19.3 Results and Discussion

There were several challenges and implications for practice for university leadership groups in the context of the potential introduction of mobile learning in Pakistani university environments. During interviews, the university leadership stakeholders expressed concerns and perceptions about considering and evaluating certain key factors when planning a mobile learning implementation initiative in Pakistani university environments. The following subsections contain discussions about several challenges and issues, which emerged from the research data that would need to be considered by university leadership stakeholders in order to introduce mobile learning into Pakistani university environments.

19.3.1 Paradigm Shift in Pedagogies

During the discussion of the teacher's role and teaching philosophies in a mobile learning mode, almost all of the participants strongly emphasised that the teacher's role should not be compromised or ignored; however, teachers would need to update their teaching philosophies in order to encourage students to be more independent learners. Some of the senior executives believed that when students learn that they have to be disciplined and responsible, they are learning to be self-regulated, and they learn to look after their own property and the university's property (this could be a mobile device). However, it was strongly recommended by the interviewees that the teacher should control and mediate the learning process in order to regulate learning among different cohorts of students and to enforce certain assessments and deadlines. Some of the administrators commented on updating the teaching philosophy and enforcement in the following words:

> I think it totally depends on how you make the rules and how you manage to enforce the rules in your university learning environment. It is the same for distance learning or face-to-face learning. When you make rules and implement them strictly, students have to switch to regulate themselves to be independent learners. It is the teachers' responsibility to engage the students in learning in such a way that every student should feel a responsibility to submit their assignments on time, and there must be penalties for late submissions. Students tend to follow the teacher even in online or traditional learning mode. If teachers or course leaders know how to run a course and implement certain rules, it is possible to lead students in a certain direction. [Uni B – Administrator]

> Teachers should have control over the learning process even if it is offered through mobile learning or e-learning mode. It is very important because students do not have vision and guidance which a teacher can give them besides learning resources. The teacher knows the breadth and depth of course contents and what is an appropriate level for students to reach. Students are beginners, they do not realise where to go ultimately, and it is the teacher who paves the way for them. [Uni A – Instructional Designer]

In spite of stressing the pivotal role of the teacher, participants did agree that mobile learning might bring about a change in students' attitudes and could encourage students to learn independently of teachers. This is a positive outcome given that, in accordance with traditional views of teaching and learning communities in Pakistani universities, this would have been considered a problem/hindrance. A new school of thought, however, would accept the paradigm shift to allow and empower students to think and learn for themselves.

> Yes, a mobile device is a kind of digital teacher or facilitator and will help students in continuous interaction for their guided learning in the field. [Uni C – Instructional Designer]

> This may vary from course to course and from one program type to another; but generally, it must improve the self-capacity and learning of the students without intervention by the teacher. [Uni A – Administrator]

Chen (2009) argues that self-regulated learning has become a critical success factor for learners in today's blended learning environment where a learner has to interact frequently with learning management systems without the teacher's monitoring. In a mobile learning environment, self-regulated learning can be used to enhance students' performance in university, and a mobile device could play the role of *digital teacher* for students as mentioned by one of the participants of this research. However, the cultivation of self-regulated learning habits in students remains a crucial step and needs further research. Kukulska-Hulme (2012) mentions that teachers' own commitment to informal learning and appropriate training in new technologies could play a key role in bringing about changes in students' attitudes toward learning.

However, some of the participants adhering to the somewhat old school of thought warned that mobile learning might become a mere waste of time and resources if the process of learning was not controlled by the teacher. Participants believed that students would tend to indulge in social networking only and other non-learning activities by using mobile devices and mobile Internet made available to them for the purpose of learning.

> I think teachers should put some restrictions on how students may use it. For example, they should not indulge in social networking and communicating with each other all the time. This may result in time-wasting for both parties. If we allow limited features just focused on learning, then it would be more beneficial. [Uni A – Instructional Designer]

> Mobile is a useful tool for learning but wastage of time should be controlled. Mobile learning may encourage self-study which is very good. However, it should be monitored and guided by teachers. [Uni C – Instructional Designer]

Contrary to the participants' perceptions that students might waste time merely in social networking using their mobile devices, researchers such as Selwyn (2009) and Madge et al. (2009) found that students have been using social networking forums to support their learning in various ways including settling into university life, discussing assessment tasks, providing moral support to fellow students during difficult times in university life, increasing engagement in learning activities and improving their relationship with teaching staff and fellow students. Selwyn (2009) acknowledges that some of the stakeholders in university environments are concerned that students might engage in social activities; however, based on the findings of a study conducted in a UK university about the use of Facebook, he further argues that social networking forums would be assumed to be, and used as, new learning spaces in today's university environments. The concept of social learning might be introduced into Pakistani university environments which will assist senior leadership groups to consider mobile learning as a window of opportunity to open up new learning spaces in university environments.

In the quest to introduce mobile learning in university environments, universities need to acknowledge that there will be a paradigm shift in traditional teaching philosophies and conventional pedagogies currently being practised in universities. Kukulska-Hulme (2010) argues that instead of shifting from teacher-centred to student-centred learning, a balanced participation of teachers and learners might be ideal for a mobile learning environment. Similar findings were revealed by Uzunboylu and Ozdamli (2011) who researched teachers' perceptions about mobile learning in Cyprus; the teachers wanted to switch to learning technologies including mobile learning in order to engage themselves and their students in a constructivist learning fashion. Kukulska-Hulme (2012) recommends that stakeholders in higher education should be open to adapt new technologies and pedagogies in university environments such as social media and informal learning. Therefore, appropriate staff development and training would be required in order to equip teaching staff with hands-on knowledge of new technologies in learning so that they might be able to portray themselves as role models for students in terms of social media and informal learning.

19.3.2 Updating Learning Resources and Content

University administrative stakeholders including IT managers, campus directors and instructional designers were asked about any mobile device usability issues for learning, technical support available to mobile device users, and any training needs associated with the implementation of mobile learning. IT managers and instructional designers stated that there might be usability issues for mobile devices for learning purposes such as a small screen, tiny keypad, short memory and small battery capabilities. However, they argued that a number of usability issues associated with mobile devices such as inappropriate screen resolutions are due to the non-optimisation of learning content for mobile devices. Once the learning resources have been optimised so that they can be accessed and displayed on mobile device interfaces, the number of usability issues would reduce substantially.

> Students access our Information Servers or Learning Management Systems through their mobile devices. However, unfortunately, our applications are not optimised for mobile devices which make it very difficult to use them appropriately. There are major problems of screen resolution or content being too heavy to be downloaded/viewed on a mobile device. [Uni A – IT Manager]

In the literature of mobile learning, a number of researchers have found that mobile device usability issues decreased when the application or prototype was designed specifically for mobile learning purposes. For instance, Hashim et al. (2011) found that a mobile learning tool designed and developed by following usability guidelines proved to be a useful revision tool for higher education students. Similar experiments have been conducted by Fetaji et al. (2011) and Sahilu et al. (2010) that showed a reduced number of reported usability issues of the mobile learning applications and prototypes used in these studies.

However, when discussing the usability issues related to mobile Internet or overall network connectivity, IT managers from Pakistani universities stated that there were minor usability issues related to network connectivity on mobile devices. They stated that mobile device users across the university did not need technical support on a regular basis after their devices had been configured to the network. However, ongoing IT and technical support would be readily available if mobile learning users were to need it in future.

> We have a support department which is responsible for providing support to all network users. Generally, mobile device users contact us when they need to register their device with the network initially. After that, things work quite smoothly. There are some issues with the network sometimes; those are resolved at the back-end normally. Students do not face any problems in this sense. Network configuration is done systematically which makes the process easier for mobile device users as well. We allocate the same username and password which they use in the lab or from campus workstations to connect to the network. [Uni A – IT Manager]

> Initially, mobile users have to register with our department with their student ID and department information. Usually, students and teacher face few difficulties, particularly when they change their mobile device; they have few issues of configuration with university network. We provide support for this kind of issue; however, we do not provide support for the con-

figuration of their personal mobile devices with other networks such as from private telecom providers. For study-related issues, we take 100 % responsibility to provide technical and IT support for their mobile devices. Overall, mobile users across the university do not have many technical support issues. [Uni C – IT Manager]

Further studies also show that experienced mobile users might not face many usability issues as discussed by Kukulska-Hulme (2005) and Koole (2009).

19.3.3 Adding/Allowing Flexibility in University Teaching and Learning Environments

Mobile learning adds flexibility to learning; this is one of the greatest arguments in favour of implementing mobile learning in universities in different parts of the world (Kukulska-Hulme 2009; Schneider et al. 2009). The participants in this research study agreed that mobile learning would add flexibility to the university teaching and learning environments in Pakistan.

My personal opinion is that mobile devices are a good addition in teaching and learning environment provided that they are adequately, ethically and appropriately used. Readily available learning resources on mobile devices would facilitate learning communities in third world countries in general. [Uni C – Administrator]

We will definitely encourage mobile learning to be tested in our university. We do not have any problems with adopting this technology in learning. You can see mobility in every walk of life these days, so why not education? [Uni C – IT Manager]

Instructional designers mentioned that teaching staff can optimise their consultation time with students by allowing them to send their queries online, and they would respond using mobile devices when convenient and in their own time. For students undertaking medical studies, one of the participants suggested that students might not need to merely rely on their memories for all of the medical equipment or medicine names; they would be able to consult eBooks and dictionaries accessible on their mobile devices when needed for a particular diagnosis.

Obviously, it is very beneficial. You have the flexibility to share and access learning resources anywhere and anytime. Traditionally, a teacher is available to students between 8:30am to 4:30pm; a student may consult on things, have discussions or attend lectures during those hours. With the introduction of mobile learning, those students who have missed lectures for some reason can listen to recorded lectures and access learning resources remotely or in their homes. They may be poor attendees but they can be exposed to the knowledge. I think mobile learning offers many benefits. It liberates learners from being location-dependent or time-dependent. They can submit their assignments from home or any other place they are in. They can access information timely and use it when it is needed. They can subscribe to alerts; the information will be shared instantly. With mobile learning, you are connected to learning resources all the time. [Uni A – Instructional Designer]

That would be beneficial for students in terms of diagnosis and prescribing medications for the patients. Students may not need to memorise medication names and dosage requirements. It would be useful to access the information using their mobile devices in order to prescribe correct dosage for a particular patient instead of just relying on the memory. [Uni C – Administrator]

> Yes, it will provide a greater flexibility; they can use it to enhance their scope beyond the limited text provided by books, but again teachers have to continuously interact to filter the contents for students. Time would be saved due to ease of access to the learning resources. Procrastination of students and teachers to do some learning tasks can be decreased by availability of mobile learning option. [Uni C – Instructional Designer]

For medical students and trainees, similar experiences have been recorded by Luanrattana et al. (2010) and Garrett and Jackson (2006) who have shown the benefits of the flexibility of accessing learning resources and collaborating with peers and supervisors using mobile devices.

Despite all the positive comments expressed by the majority of participants, several concerns were also raised regarding the flexibility added by mobile devices to the university learning environments in Pakistan. For instance, in one of the participating universities, a student needs to show an attendance of 80 % or more in order to pass the unit and be allowed to sit for final examinations; administrative stakeholders were concerned that students might not physically turn up for classes if they were offered learning resources via mobile devices. In the literature, Copley (2007) found that the availability of podcasts for students engaged in mobile learning negatively affected their physical attendance at lectures. In Pakistan, this situation may cause mobile learning to conflict with university policies. Hence, universities might need to modify certain policies if they are to embrace mobile learning. Mohamad (2012) mentioned that certain policies needed to be changed in Malaysian schools in order to implement mobile learning and integrate it into the existing learning environments. One of these policies was to allow the use of mobile phones on school premises – something which had been previously banned.

Furthermore, it would be very important to ensure that students were engaged in learning activities even if they accessed learning resources remotely through mobile devices, as it would be unlikely in a typical Pakistani university education system that learning would occur if students were not monitored in some way in mobile learning mode. As mentioned by one of the instructional designers, all of the stakeholders and beneficiaries of mobile learning would need to know that mobile learning would be an additional, but not an alternative, mode of learning in Pakistani university environments.

> Definitely, it can be deployed and it may also be successful but there is a lot of work involved. A number of issues might need to be considered. For example, in mobile learning mode, how you will ensure the attendance of students in a class which is required in our typical learning system? To my understanding, mobile learning may lift time constraint. People can be involved in the learning process at their own convenience. So, in this case, the mobile learning model has to ensure that people do actually engage in learning. Who knows? People might not bother to come online during class time and for other learning activities etc. The mobile learning model must be very strong in this case. These are a few of my concerns; otherwise, mobile learning is very good and it should be included in the university learning environment. [Uni A – IT Manager]

> That is true because it will make many tasks easier than the currently used practices. However, from my previous experience, students are often too busy with other activities to get any benefit from online resources. [Uni B – Instructional Designer]

> Mobile devices should have a healthy share of a university's learning environment because they provide an additional but not alternate source of learning. [Uni C – Instructional Designer]

There is a considerable ongoing debate in mobile learning literature regarding the assessment of the learning process using mobile devices and the evaluation of mobile learning activities (Georgieva et al. 2011; Petrova 2010; Ruchter et al. 2010; Ting 2013). It appears that the concerns raised by participants in this research study are similar to those expressed in the literature.

19.3.4 Training Needs and Technical Support

In respect to the training needs of mobile learning users, many of the stakeholders were of the view that users might not need much training in terms of using mobile devices for learning purposes as many users who possessed such a device had some user experience with that device; therefore, a one-off training session at the start of any mobile learning implementation project would serve the purpose.

> Absolutely, we do provide training to staff and students for general IT matters; therefore, it would be fine to train them for mobile learning. But I can tell you, people are so keen and already experienced mobile users, they may not need to be trained much for the purpose of mobile learning. Everybody is tech-savvy here; only very few people are less involved in IT and use of mobile technologies these days. [Uni C – IT Manager]

> I think they are quite experienced in using those devices, so there will be no concerns about training them to use devices. They already know enough of that. To me, the main and most important point is to have an app which is easy to use and assists students to participate in mobile learning activities. [Uni A – Instructional Designer]

On the other hand, many of the interviewees including IT managers and instructional designers stressed the need for strong technical support during the process of redesigning and developing the learning content to make it suitable for mobile devices. This technical support includes the development of learning apps, games and modification of existing learning management systems in order to effectively respond to requests from mobile learning users and successfully handle the day-to-day IT support issues raised by mobile learning users.

> Currently our courses are not well-designed for mobile learning; we need to prepare proper content that may be used for this purpose. [Uni B – Instructional Designer]

> There is a lot of work to be done in terms of application development. As far as the network is concerned, they may not face many problems. [Uni A – IT Manager]

> The other problem is related to the design and development of mobile learning apps. You have to design those apps, thinking about the content covered in those activities, assessment activities such as assignment and quizzes etc. You have to have a separate interface for students and for teachers. [Uni A – Instructional Designer]

On the question of teachers' need for appropriate training to redesign and redevelop learning content for mobile devices, most of the administrative stakeholders agreed that teachers would not only need extensive and ongoing training but also a strong technical or IT support team to assist them.

> Currently, I will not be able to prepare some of the course contents to be placed online. It will only be possible after the availability of proper resources and training. [Uni B – Instructional Designer]

> Yes, I can design learning material myself but I would need the help of device experts in this process. [Uni C – Instructional Designer]

> The full potential of mobile learning can only be perceived once practically used; however, it will require training and content preparation. The limited use of a mobile phone has already been employed by many teachers on an individual basis. There is a need to employ such strategies on the institutional level and proper policies must be defined. [Uni B – Instructional Designer]

Mobile learning studies do consider this issue of mobile learning content redesign and development in the form of learning activities and the means of converting them into learning applications, podcasts, vodcasts and other forms to be accessible on mobile devices. Researchers have developed and tested the prototype of certain mobile learning applications (Hashim et al. 2011; Sahilu et al. 2010). The Dean of the Engineering Faculty from University B argued that the university would need a dedicated technical support department just to support the mobile learning initiative if it were launched in the future. Therefore, in order to design and develop mobile learning content for university-wide implementation, universities might need to hire expert mobile learning educational designers, programmers and mobile learning application developers. Alternatively, universities might need to negotiate with third-party mobile learning educational designers and application developers. Unfortunately, mobile learning literature does not place much emphasis on teachers' training needs prior to implementing mobile learning, nor have many studies discussed the necessity of roles for educational designers and mobile learning application developers to assist teachers with implementing mobile learning smoothly.

In addition, another important aspect was highlighted by two interviewees who believed that teachers from IT, Computer Science and Engineering backgrounds might already be well versed in IT, and they may not need much technical support to redesign and redevelop learning content for mobile devices. However, teachers who have not embraced the latest IT trends or teachers from non-IT-related disciplines such as Humanities or Islamic Studies might not be able to undertake mobile learning content design and development by themselves at all; they would require extensive training in order to become active and confident users of mobile learning devices. Overall, stakeholders in key leadership roles within the universities were positive about providing teachers with the required training and ongoing technical support to upgrade learning content for mobile devices.

> To launch mobile learning in our university, there would be a need for a proper team or support department working on it at the back end such as they are doing in a virtual university. As you know, course contents need to be created and revised at regular intervals which make it a continuous process. Teachers' concerns are very valid in terms of support and training. There must be a team or support department dedicated to helping teachers if they want to record their lectures or update course contents. [Uni B – Administrator]

> For my course, the level of difficulty would be medium because already it has been done. However, other colleagues who will be doing it for the first time might face more difficulties and would need more help and training to do that. [Uni A – Instructional Designer]

> As for the training aspect, I think teachers in tech disciplines such as IT, computer science and engineering may not need much training as they already know all about it. A once-only orientation training session would suffice for them. However, teachers from non-IT related disciplines or some senior professors who are usually not comfortable with the latest technologies might need comprehensive training at regular intervals. [Uni B – Administrator]

> I think yes, because our university is quite progressive and has a positive attitude to embracing innovations and new technologies in teaching and learning. Therefore, I don't see that there would be any limitation in welcoming and supporting a mobile learning initiative that includes providing support to teachers to create and redesign learning material. [Uni C – Administrator]

One of the IT managers representing University C, however, discussed current efforts in reference to the optimisation of learning resources for multiple platforms. For example, he stated that the university's learning management system has been developed in such a way that it can be accessed through multiple interfaces such as PC, tablets and mobile devices. Therefore, this could be an advantage for mobile device users, and they might not face major issues if mobile learning were introduced in the university.

> Another important point to mention here is that our learning content is already somewhat compatible to be accessed and opened on mobile and tablet devices successfully. All the learning content is in a web-based learning management system that people can access through mobile devices, laptops or desktop PCs. [Uni C – IT Manager]

IT managers and instructional designers from the other two universities also mentioned that there were ongoing efforts in their universities to create and update learning content to make it accessible via mobile devices. For instance, one IT manager mentioned that staff had been hired to assist teachers to record their lectures in audio and video formats. These audios and videos were available for students to download from the university's learning management system. However, at that time it was not compulsory for every teacher to record lectures. Mobile learning literature supports these findings as many studies including Lundin et al. (2010) and Idrus and Ismail (2010) have recommended using education providers' existing ICT infrastructures as well as students' and teachers' own devices as an input and precursor to mobile learning implementation in educational institutions.

19.3.5 Need for Awareness

Besides the positive responses in terms of embracing mobile learning in Pakistani universities, the interviewees were focused on the issue of creating awareness about the use of mobile technologies in teaching and learning environments prior to any attempt to test the mobile learning initiative in Pakistani university environments. A number of stakeholders and potential beneficiaries of mobile learning including teachers, students, university administrators and managers, instructional designers, course leaders, librarians and parents of enrolled students could be considered as targets for an awareness campaign.

> It would be very good to introduce mobile learning in our university. However, the only thing lacking is the exposure of new technologies and their integration on smart devices and the mobile device is one of them. It would be a pretty good idea in terms of students' practical experience with new technologies in education. Students lack this when they join the workforce after their studies; it would certainly help them. Teachers would also certainly look into this along with their theoretical study patterns. [Uni B – IT Manager]

Mobile learning researchers from other developing countries such as Mohamad (2012), Sife et al. (2007), Premadasa et al. (2013), and Sari and Tedjasaputra (2008) also recognised the need for raising awareness of mobile learning in the developing world prior to attempting to provide education using mobile devices. The awareness activities could range from an informative seminar to a practical workshop providing the attendees with a hands-on experience with using their mobile devices for learning activities. Concerned stakeholders might be trained in the ethics and standards pertaining to the use of mobile devices for learning so that abuse of mobile learning opportunities may be prevented.

> The main difficulty is the lack of realisation of mobile learning potential. More seminars and training on this subject can enhance the students' and teachers' awareness. Mobile phone ethics is a big issue. Both students and teachers need extensive training in mobile phone misuse and ethics, norms and values. [Uni B – Instructional Designer]

> At the moment, it seems impossible to offer a complete course in mobile learning mode but it is possible to offer it partially, though. I stress the importance of raising awareness among students and teachers about learning via mobile devices through workshops and seminars on this topic where they might be able to experience hands-on mobile learning by engaging in learning activities during the workshop. [Uni C – IT Manager]

19.3.6 Harnessing the Motivation

University leadership stakeholders noticed that in spite of the low awareness levels about using mobile devices in teaching and learning environments, many of the students and teachers were motivated and excited to be involved in mobile learning initiatives in the university. Discussing the current activities and students' motivation regarding mobile learning, one participant mentioned that students have been watching lectures from highly ranked universities from developed countries in order to gain insight into a topic and acquire more knowledge.

> For example, I have observed some students (who have enabled/purchased larger internet data packages on their mobile devices) watching MIT open courseware material or other learning videos on YouTube during their spare time in university. I think the basic idea of mobile learning is related to distance learning which is not new in Pakistan. The virtual university of Pakistan is already providing education through technology in far-off areas of Pakistan. [Uni B – Administrator]

Oliver and Goerke (2008) found that students from developing countries were more highly motivated to engage in mobile learning compared to their colleagues from a developed country. Barker et al. (2005) discussed motivation as one of the biggest factors determining mobile learning adoption in South Africa.

For the university leadership stakeholders, the motivation for mobile learning among students and teachers was very important to demonstrate readiness for mobile learning in Pakistani university environments. They wanted to harness this motivation by involving the students and teachers in a trial mobile learning implementation in the future.

19.4 Implications on Practice for University Stakeholders: A Mobile Learning Implementation Framework for Universities

This research in Pakistani universities revealed several implications on practice for key stakeholders within the university environment. Based on these findings, a 'mobile learning implementation framework for universities' has been formulated (Table 19.2). In this framework, key implications have been mapped to the levels of the foundation of mobile learning evaluation framework by Murphy and Farley (2012). In addition to the levels or focus areas provided by Murphy and Farley (2012), a few focus areas/levels have been mentioned as outcomes of this research which are findings from the author's PhD research. Furthermore, each implication includes corresponding stakeholders who might be directly or indirectly related to the implementation of that particular implication and recommendations provided in this framework (Imtinan 2014). Universities in Asia-Pacific Region might use this framework to guide the implementation of mobile learning into the university mainstream education.

19.5 Conclusions and Future Research

Mobile learning implementation in university environments is a challenge; particularly in the developing world. Outcomes of this research demonstrate many of the challenges and implications for practice encountered by educators and institutions attempting to introduce and implement mobile learning in Pakistani university environments. These challenges include accepting the fact that mobile learning brings a new pedagogical aspect which takes learning to the personal spaces of the learners. Updating certain policies, redesigning learning content and resources for mobile devices, allowing flexibility in teaching and learning environments and provision of technical support and appropriate training to the staff are key implications for practice for the university administrative stakeholders and leadership group. Future research directions include conducting a pilot study of mobile learning implementation in university environments in order to further investigate the feasibility, challenges and implications for practice.

Table 19.2 A mobile learning implementation framework for universities

Implications for practice	Focus area/level (Adapted from Murphy and Farley 2012)	Concerned stakeholders
Based on the findings of this research, universities might need to consider:		
Adapting the paradigm shift in pedagogies from traditional face-to-face learning to mobile learning	Pedagogical (Learning)	Students, Teachers
	Pedagogical (Teaching)	
Changing teaching philosophies from teacher-controlled learning to students' self-regulated and independent learning using a balanced approach	Pedagogical (Teaching)	Students, Teachers
	Pedagogical (Learning)	Leadership stakeholders
	Technical (Policy)	
Introducing the concept of social learning using social media forums for discussions and enrichment of curriculum by user-generated content	Pedagogical (Teaching)	Students, Teachers
	Pedagogical (Learning)	Leadership stakeholders
	Technical (Policy)	
Modifying/updating learning resources to be suitable for mobile learning mode such as small chunks of information and short-spanned activities instead of longer activities and readings	Technical (Technology)	Leadership stakeholders, IT managers Technical/IT staff
	Technical (Policy)	
Reducing usability issues by optimisation of learning content for certain types of mobile devices	Technical (Technology)	IT managers Technical/IT staff
Providing seamless network connectivity and reliable mobile Internet services for students and teachers to be engaged in mobile learning activities	Technical (Technology)	IT managers Technical/IT staff
Providing mobile learning users with technical support such as device and network configuration and access to learning resources	Technical (Technology)	IT managers Technical/IT staff
Allowing students and teachers use of mobile devices in university premises and classrooms	Technical (Policy)	Leadership stakeholders
	Leadership support	
Change in students' attendance policy to allow them to utilise flexibility of mobile learning	Leadership support	Leadership stakeholders, Students
	Technical (Policy)	
Adjusting teachers' workload to facilitate them to engage in mobile learning activities	Leadership support	Leadership stakeholders
	Technical (Policy)	Teachers

(continued)

Table 19.2 (continued)

Implications for practice	Focus area/level (Adapted from Murphy and Farley 2012)	Concerned stakeholders
Arranging staff development and training workshops to equip teachers' with latest technologies and teaching methodologies	Pedagogical (Teaching)	Leadership stakeholders
	Leadership support	IT managers Technical/IT staff
Developing mobile learning apps and games and allowing students to access university LMS on mobile devices	Technical (Technology) Leadership support	IT managers Technical/IT staff
Hiring education technology experts and instructional designers for mobile-based content design for university courses	Technical (Technology) Leadership support	Leadership stakeholders IT managers Technical/IT staff, Instructional designers
Spreading awareness among students, teaching staff, leadership stakeholders and other stakeholders such as managers, librarians and parents/guardians of students about benefits of mobile learning	Technical (Technology) Leadership support	Students, Teachers Parents/guardians of students Leadership stakeholders Instructional designers

Adapted from Imtinan (2014) and Murphy and Farley (2012)

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Chapter 20
Mobile Voting Tools for Creating a New Educational Design of the Traditional University Lecture in Russia

Titova Svetlana

Abstract Mobile voting tools can enhance learning and teaching experiences in many ways, by providing instant feedback, better diagnosis of learning problems and creating new formats of enquiry-based activities. Mobile voting apps, also known as mobile clickers, which directly introduce dialogue and interactivity between teacher and student, have been used successfully within the context of the university classroom for the last decade. The objective of the international study *Enhancing Technology Awareness and Usage of m-Learning in Russia and Norway* was to evaluate the impact of a mobile voting tool student response system (SRS) on creating a collaborative environment for university lecture courses. As part of a comparative experimental study, this research quantitatively compares student's test scores across two groups (56 students) of Lomonosov Moscow State University (Russia). This data was combined with that from a qualitative attitudinal student survey. Research indicates that an SRS-supported approach influenced important aspects of lecture design such as time management, the mode of material presentation and activity switch patterns. In addition, SRS was also found to impact on learner-teacher interactions, student collaboration and motivation and formats of activities.

T. Svetlana (✉)
Far Eastern Federal University, Vladivostok, Russia
e-mail: Stitova3@gmail.com

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20.1 Introduction

ICT integration into the teaching and learning context is one of the pivotal trends of modernisation of higher education in the Russian Federation. The new national standards of higher education which were introduced in 2011–2013 contain several references to the use of ICT: modern technologies and web resources have to become an integral part of the curriculum; student ICT competence is incorporated into both professional and research competencies and skills; 65% of all classes should be conducted in an interactive learning environment incorporating webinars, slide presentations, roundtable discussions and case studies (Titova 2012).

Higher education institutions and universities do not have to be driven only by imperatives and ICT procurement documents. Institutional strategies should be transformed by building continual research on student practices with technology into the practice of teaching and by creating environments where students and teachers are in ongoing dialogue (Kukulska-Hulme and Jones 2011). When students arrive at the university, they already have certain skills and competencies in a variety of practices related to learning and the use of digital and networked technologies. So educators have, first of all, to meet the expectations of a new generation of young learners who are commonly referred as *the Net Generation* (Tapscott 2009) whose perception of the responsibilities and roles of themselves in relation to lecturers and universities has changed drastically. Teachers who would like to make creative use of new technologies and to support collaborative, learner-oriented environments need to follow a transformational approach alongside digital literacies (Dudeney et al. 2013). This approach has to be viewed as the transformation of education from "a contrived performance, on a stage, to a shared experience of a contingent reality that no-one, lecturer or student, has experienced before" (Traxler 2010, p. 14).

This chapter, supported by both current mobile learning theory and enquiry-based learning theory, focuses on developing a new educational design for the university lecture within a highly collaborative environment.

20.2 Theoretical Framework

20.2.1 Mobile Technologies: The Pedagogical Potential to Transform a Traditional University Lecture Design and to Create a High-Level Collaboration Environment

Recent research demonstrated that language skills can be enhanced through mobile technologies that drastically transformed foreign language learning/teaching experience enhancing learner autonomy (Lammons et al. 2015; Sato et al. 2015); offering immediate diagnosis of learning problems and design of new assessment models (Demouy et al. 2011; Bolona Lopez et al. 2015); creating mobile networking collaboration (Pemberton et al. 2010; Berns et al. 2015), providing instant feedback (Voelkel and Bennett 2013; Arnesen et al. 2013) enabling teachers to create new formats of problem-solving, interactive tasks based on augmented reality, geolocation awareness and video-capture (Clough 2016; Cook 2010; Driver 2012); and providing a more personalised and motivating learning experience (Oberg and Daniels 2013).

Danaher et al. (2009) proposed a mobile learning framework based on three key principles: *engagement, presence and flexibility*. Presence is interpreted as *interaction* which is subdivided into three types: cognitive (student-content interaction), social (peer interaction) and teaching (student-teacher interaction). Kearney et al. (2012) argue that the key constructs of mobile learning pedagogy are *authenticity, collaboration and personalisation*. The authenticity feature provides opportunities for contextualised, participatory and situated learning; the collaboration feature captures the often-reported conversational, connected aspects of mobile learning, while the personalisation feature has strong implications for ownership, agency and autonomous learning. Kearney et al. (2012) distinguished between the two subscales of the collaboration construct – *low-level* and *high-level collaboration* – that are crucial for this research. The high-level collaboration involves deep, dynamic dialogue mediated by a mobile networking environment and learner-generated content creation (Kearney et al. 2012).

Digital technologies enable instructors to create a *high-level collaboration environment* (HLCE) based on an enquiry-based learning approach which inspires students to learn for themselves, bringing a genuine research-like approach to the subject. This interactive, dialogic model of learning is similar to the processes of participation in research (Sambell 2010). The particular emphasis, in this case, is placed on fostering the development of collaborative, informal communities in which students learn by seeing and engaging with other people's approaches. Ubiquitous access to information, mediated by mobile devices, potentially enables a paradigmatic shift in education; it changes the way classes are managed and the instructor's role (Beatty 2004). Kahn and O'Rourke (2005) argue that an enquiry-based learning approach encourages students to actively explore and seek out new evidence for themselves and can help support the development of peer networks and relationships with staff. This approach implies a fundamental change in the philosophy of teaching and learning; mobile devices are particularly applicable as they effectively act as accelerators of the social discourse (DeGani et al. 2010).

Mobile technologies help create an HLCE where learners can communicate with their peers, instructors and other specialists any time; they can produce content, get access to any data available on the net across time and place and share and exchange their own content – now everyone can produce content to learn, and everyone can discuss and share it "anywhere/anytime and just in time, just for them" (Traxler 2010, p. 14). The most efficient and frequently used mobile tools for collaborative in-class activities in language teaching in European colleges and universities are social network tools, moblogs, instant messaging apps and mobile voting systems (Dudeney et al. 2013).

Any kind of collaborative activity is evaluated not just on overall outcomes but on group dynamics (Johnson et al. 2012). More than that, "collaborative activities are best assessed collaboratively: this might include students' self-assessment of their own contributions alongside peer-assessment of other participant's contributions" (Pallof and Pratt 2009, p. 9). Self- and peer assessment which can be formative or summative is not only motivating but it enables students to develop their feedback skills and techniques while interacting with group mates and giving extensive feedback (Dudeney et al. 2013). However, large class sizes make it difficult to offer frequent formative assessments in combination with high-quality, timely feedback without implementing mobile voting systems into the teaching process (Voelkel and Bennett 2013).

To this effect, mobile technologies change the way teachers have access to learning materials, present them, interact in the classroom and outside the classroom, assess and evaluate learners' participation. They liberate learning environments from "the standardised straightjacket of the methodology (how one learns), the content (what one learns), the spaces (where one learns), the time (when one learns), and the social (with whom one learns) of the current educational paradigm" (Cavallo 2012, p. 2).

On this basis, this research has drawn the conclusion that an HLCE created with the help of mobile technologies commonly results in the transformation of four main constituents of any teaching process – *material presentation*, *tasks and activities*, *feedback* and *evaluation and assessment* – as shown in Fig. 20.1 (Titova and Talmo 2014).

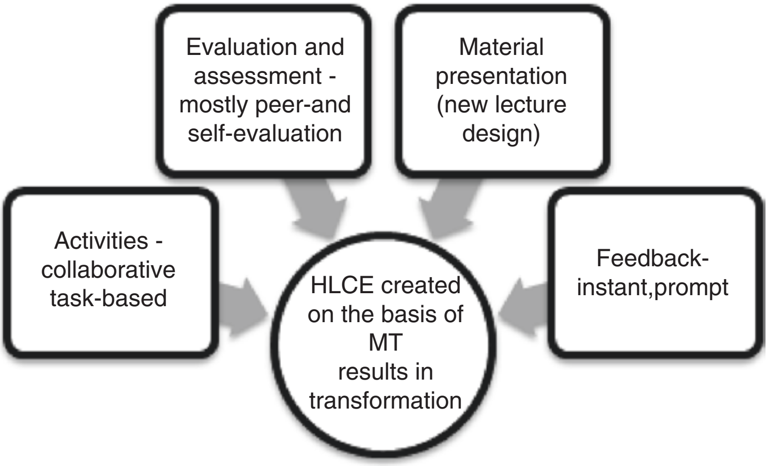

Fig. 20.1 HLCE created on the basis of mobile technologies

20.2.2 Wireless Voting Tools in the Educational Context

Electronic voting systems, also known as audience response systems, or clickers, which directly introduce dialogue and interactivity between teacher and student, have been used successfully within the context of the university classroom for the last decade (Bruff 2009; Dangel and Wang 2008; Fies and Marshall 2006; Rubner 2012). Quite a few mobile voting tools (*Socrative, Poll Everywhere, Xorro-Q, Mentimeter, MbClick, MQlick,* etc.) are currently available. These tools share some common technological characteristics that facilitate material presentation and feedback:

- An audience can interact with the presenter's computer and any interactive display or whiteboard and can respond using whatever mobile device they own. There is no need for additional expensive and bulky devices.
- Presenters can send questions to participants' mobile devices, so they can vote and reply in different formats.
- Questions can be created on the fly or set up beforehand using the session leader's own web page; polling results can be presented in a variety of formats (histograms, pie charts, etc.).
- They can be used in small group training sessions or in a large auditorium of 200 people or more.

Many researchers have analysed the best pedagogical practices for using these tools:

- They allow for anonymous participation and add a game approach to the classroom environment (Martyn 2007).
- They can turn multiple-choice questions – often seen to be as limited as assessment tools – into effective tools for engaging all students during class; students are more invested in participating in discussion and are more likely to have generated some ideas to share in that discussion (Bruff 2009).
- Polling results can be saved to spreadsheet programmes for semester-long analyses that may inform subsequent curriculum development (Hodges 2010).
- Peer evaluation mediated by polling tools provides honest, constructive feedback and promotes more engaged class discussion (Bruff 2010).
- They can promote deep learning when teaching and questioning strategies centre on higher-level thinking skills, increase student engagement providing prompt feedback (Dangel and Wang 2008) and help design formative assessment activities (Rubner 2012).

Mobile voting tools are very challenging; they require instructors to rethink their instruction to leverage their potential advantages (Tarr and Beasley 2012). Teachers may start with just minor changes, but major pedagogical changes may also be introduced. The student response system (SRS) that was piloted in this research is a web-based mobile voting system designed by Sør-Trøndelag University College (Norway) to enable asking multiple-choice questions during teaching sessions in

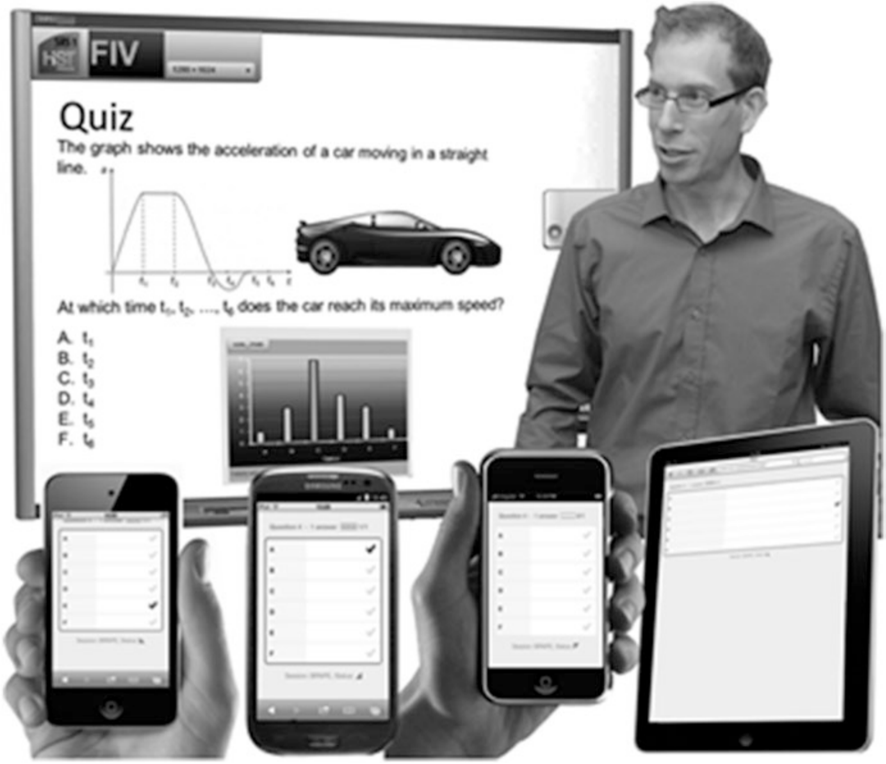

Fig. 20.2 SRS session

classroom or distance learning. Since 2009, it has been used by university and school teachers from 17 different countries. It allows students to respond anonymously to questions asked by teachers in the classroom.

SRS enables instructors to get instant assessment of tests, to evaluate group dynamics, to visualise group results immediately and to conduct feedback with the class by polling their opinion. Automatically generated feedback is followed by post-test activities provided by the lecturer aiming at clarification of common misconceptions. After that students may be given one more attempt to revote on the misconceived question. SRS can be employed successfully both in distance and blended learning (Arnesen et al. 2013). Figure 20.2 demonstrates the SRS session at the lecture.

The technological characteristics and pedagogical potential of SRS are summarised in Table 20.1.

The research, which has been undertaken on the pedagogical impact of SRS at Sør-Trøndelag University College (Norway) since 2009, showed significant improvement especially in student motivation and academic performance when SRS was implemented into language classes (Arnesen et al. 2013). SRS supported tests integrated into courses of science and engineering education departments,

Table 20.1 Technological characteristics and pedagogical potential of SRS

Technological characteristics of SRS	Pedagogical potential
Immediate test assessment and feedback	Immediate diagnosis of teaching problems
	Instant feedback on learning problems in the large auditoriums
	Group dynamics evaluation: the instructor can witness the students' learning progress
	Any aspect of student output is under control and can immediately be drawn attention to
	Increase participation of all students, not just a vocal minority
	Skill practice by means of formative SRS tests
Instant visualisation of the test results	Development of learner motivation
	Encouragement of peer discussions and collaborative post-test activities
	Evaluation of group dynamics
Anonymous submission of test results	Creation of a low-anxiety environment: everybody is involved; shy or reluctant students can feel relaxed and self-confident
	Correction is supportive, done in a form of collaborative activities
"Tag-it" function	Visualisation of learning materials: it enables teachers to ask multiple-choice questions using multimedia material such as photos and videos
	Students' attention is maintained for longer
The teacher interface for SRS forms an invisible "layer" on the top of other windows and applications on your computer	The system is very flexible and handy – no matter what programme is used to ask a question; SRS is just a click away when one wants to run voting sessions
Equipment necessary: one Internet-enabled teacher computer and Internet-enabled student mobile devices (wireless or cable access)	Teaching in technologically limited environments
	No need for bulky costly equipment
	No need for profound tech preparation
Use of student's own devices	No need for technical instructions – familiar devices

encouraged student peer discussions and peer instruction, facilitated learners' engagement and enabled them to become actively involved in discussion improving learner academic performance and research skills (Arnesen 2012; Nielsen 2012).

SRS is perfectly suited to the evaluation of group dynamics. It was primarily used in the research for *formative assessment* or low-stake assessment which serves to give learners feedback on their performance and provides them with a gauge of how close they are to reaching a prespecified learning goal (Sambell and Hubbard 2004). Formative assessment is specifically intended to provide feedback on performance to improve and accelerate learning (Sadler 1998). For the teacher, the design of formative assessment activities is motivated by wanting to increase students'

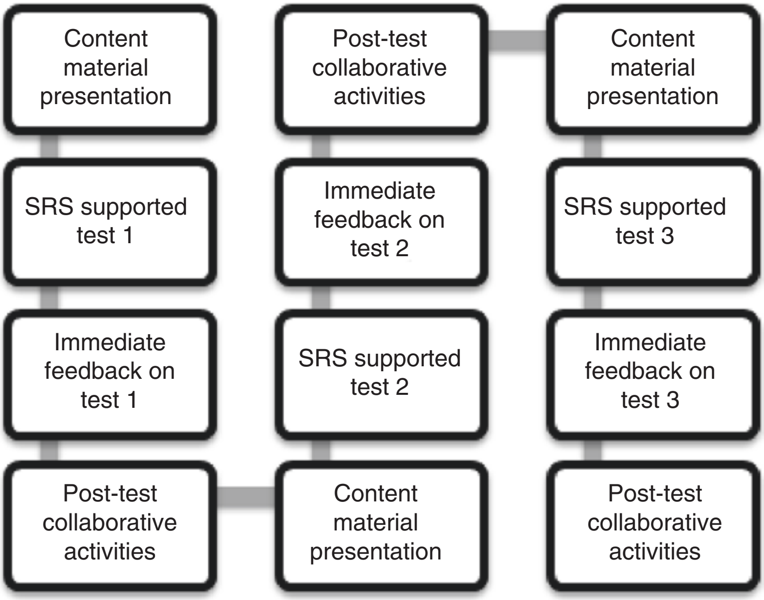

Fig. 20.3 SRS-supported lecture framework

desire to learn, to engage in self-evaluation and self-assessment and to take control of their own learning (Rubner 2012).

SRS provides instructors with an opportunity for quickly determining the level of class understanding at any given point in time, without an extra burden of grading (Hodges 2010). SRS implementation allows for significant feedback pattern changes and material assessment redesign. We offer the following framework of SRS-supported lectures (Fig. 20.3).

HLCE is created by initiating group discussions or brainstorming on the basis of SRS-supported activities aimed to determine the correct answer to the test statement. This kind of formative feedback obtained from peers resembles *'internal feedback'* as defined by Nicol and MacFarlane-Dick (2006), in which feedback is generated in relation to peers' perspectives rather than transmitted by the lecturer. The collaborative post-test activities, as well as instant messaging apps, also help to highlight weak points of material presentation and transform students' approaches to their own learning as a matter of active enquiry and meaning making rather than seeing themselves as passive recipients of their lecturers' knowledge. SRS provides deeper conceptual understanding when used with a peer instruction methodology: "Engaging students in peer discussions can challenge them to generate explanations and convincing arguments for their solution and in this way also facilitate a deeper understanding of scientific phenomena" (Nielsen 2012, p. 45). On the other hand, students need more guidance, more practice at tackling assessment-related activity and more feedback on their learning than is traditionally the case in many university courses (Sambell 2010).

Table 20.2 Time management comparison of the traditional lecture vs SRS-supported lecture

<table>
<tr><th colspan="3"></th><th>Traditional lecture</th><th>SRS supported lecture</th></tr>
<tr><td colspan="3">Material presentation</td><td>80–90 min</td><td>40–50 min presentation</td></tr>
<tr><td rowspan="5">Material assessment and collaboration activities</td><td colspan="2">Weekly tests</td><td>–</td><td>15 min</td></tr>
<tr><td colspan="2">Brainstorming</td><td>–</td><td>0–15 min</td></tr>
<tr><td colspan="2">Brief group discussion</td><td>–</td><td>0–15 min</td></tr>
<tr><td rowspan="2">Low context interaction</td><td rowspan="2">Questions for lecturer</td><td>0–10 min</td><td>0–10 min</td></tr>
<tr><td>Questions (if any) are asked orally after presentation</td><td>Questions (if any) are sent via mobile instant messaging apps (Twitter, SMS, Google Talk) during presentation</td></tr>
</table>

20.2.3 Lecture Design: From a Traditional Lecture to a Flipped Classroom

The task-/enquiry-based learning approach and an SRS implementation are central to the transformation of the lecture design as well as assessment and feedback patterns. SRS-supported lecture design presents three challenges for a lecturer: *first*, the content material under discussion (PowerPoint presentation) has to be re-arranged into certain chunks of five to six slides which are followed by a short SRS-supported test that consists of four to five statements; *second*, at least three SRS-supported tests should be created to provide better diagnosis of learning problems and to highlight weak points of both the content/material and the presentation of that material on the part of a lecturer; *third*, a lecturer has to be ready with some enquiry-based activities to initiate post-test group discussion or brainstorming.

In Table 20.2, time management of the traditional lecture (low-level interaction) and the SRS-supported lecture (high-level interaction) is mapped out and compared.

SRS is likely to become a supportive mobile tool for lecturers who would like to implement flipped classrooms, which are an example of the substitutional and augmentative use of technologies (Tucker 2012), because the traditional content-based presentation is removed from classroom time. Due to the time management pattern of SRS-supported lectures, it is recommended that changes should be made to transform the traditional design and to present the material in the form of outside classroom activities and tasks. For example, students are asked to watch videos or listen to lecture podcasts in their own time so that classroom time is devoted to discussion and collaboration with intensive teacher support. In other words, the challenges of learning a new content delivery system encourage faculty to think outside the box. Mobile voting system SRS could enable lecturers to transform the content of the presentation and turn the traditional lecture into an interactive SRS-supported lecture, then into a flipped classroom that is a valuable model of blended learning aided by open educational resources and then, in the long run, into MOOC lecture (Fig. 20.4).

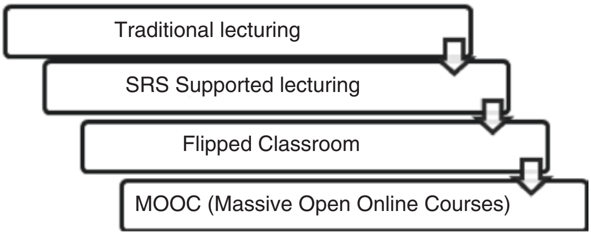

Fig. 20.4 Traditional lecture course transformation on the basis of SRS implementation

20.3 Methodology

20.3.1 Objectives of the Research

A long-term research project *Mobile devices in Language Classroom: theory and practice* was launched in 2011 at the Department of Foreign Languages and Area Studies, Lomonosov Moscow State University. The key objectives of this project are to evaluate learners' and instructors' preparedness to integrate mobile technologies into foreign language classrooms and to work out mobile learning strategies to create collaborative language learning environments. The research results indicated that the pressure for mobile device implementation came from students and that it is necessary to work out a pedagogical framework to guide the implementation of mobile technologies into traditional classrooms to avoid undesirable consequences of their misuse (Titova et al. 2013). The next stage of the project consisted of working out sound pedagogical strategies on how to implement mobile voting tools into traditional lecture courses. One of the main objectives of the international research project *Enhancing Technology Awareness and Usage of m-Learning in Russia and Norway* was to pilot and evaluate the pedagogical impact of *SRS* integration into a traditional university lecture course (Titova and Talmo 2014). So three research questions were proposed:

- What is the pedagogical potential of SRS to create a high-level interactive environment?
- How does an SRS implementation enable lecturers to redesign a traditional university lecture course?
- How does an SRS-supported approach change student learning and academic performance?

The general hypothesis for this research was that the students could enhance their learning following the implementation of an SRS-supported approach.

20.3.2 Participants

The participants of the research were 56 (12 males and 44 female) second-year undergraduate Russian students enrolled at Lomonosov Moscow State University in Russia. Students aged 19–22 were Intercultural Communication Studies Majors who took part in SRS piloting as volunteers during two semesters of the 2012–2013 academic year in the lecture course *Introduction to American Studies*.

The objectives of this course which is facilitated in English are twofold: to help learners to develop, on the one hand, their intercultural skills by gaining a better understanding of contemporary US beliefs, values, traditions, geography, political and economic situation, education and religious and social life and, on the other hand, to develop their language skills (listening, reading, speaking). The language competence of students was B1–B2 according to the Common European Framework of References for Languages (Common European Framework of References for Languages 2001). Written consent was obtained for collection, analysis and publishing of learner data. Students were informed that the survey was anonymous and that they could not be identified by the answers.

20.3.3 Data Collection

Data collection was done in three cycles that took place in the academic year 2012–2013:

- Pre-study evaluation of ICT (mobile) competence of experimental group students and their attitude to mobile learning before SRS implementation (36 students)
- Intervention of SRS-supported tests (three per lecture) as formative assessment tools and redesign of the traditional lecture pattern. Analysis of summative test results data of the control (20 students) and experimental groups (36 students)
- Post-study evaluation of learner experience and attitude (30 students) to SRS-supported lectures

20.4 Reports of Findings and Data Analysis

20.4.1 Cycle 1

The pre-study questionnaire was aimed at evaluating the ICT (mobile) competence of 36 learners in the experimental group. The online questionnaire which consisted of 25 multiple-choice questions was published on *surveymonkey.com*; the participants were sent a link via e-mail. The survey was adapted from the one used for a previous study (Titova et al. 2013) and was comprised of three sections: (1) student mobile technologies skills (ten questions); (2) student experience in using mobile devices and apps for in-class and outside classroom work (ten questions) and (3) their attitude to mobile devices implementation into the language classroom (five questions). The data were subjected to a descriptive statistical analysis that facilitated examination of student mobile competence and their readiness to implement mobile devices into the learning process.

The data analysis of Sect. 20.1 demonstrated that the majority of students were experienced users of mobile devices. Some examples of student mobile technologies skills are detailed in Table 20.3.

Student experience with using mobile devices for in-class and outside classroom work (Sect. 20.2) is summarised in Table 20.4.

Students are likely to use mobile devices and apps on their own in class and outside classroom as an access to reference materials (dictionaries, encyclopaedias), as multimedia material playback (podcasts, videocasts) and as a means of interacting with group mates via Twitter, moblogs and e-mail. Only a few students had experience in using mobile apps designed for learning foreign languages (and mostly for pronunciation skills). During lectures students commonly used their digital devices to make a recording of a lecturer's speech, to take photos of lecture slides or to take lecture notes. Unfortunately, mobile-supported activities were not incorporated into course syllabi, so students never used mobile devices for educational collaboration with peers or for getting instant feedback from instructors.

Answering the questions from Sect. 20.3, 94.4% students said that they would like to use their own mobile devices for class activities, and 94.4% students were not against the bring-your-own-device approach. Answering the question *Where are mobile devices worth applying?* 86.2% gave a positive response, 74% said that they would like to use mobile devices both for classroom-based and autonomous work, 16% only for autonomous work, 7% only in class and 3% nowhere. Choosing some possible ways of mobile technologies implementing, almost 60% said that they would like to use it for academic interaction and material sharing, 52% for educational mobile apps, 42% for the course mobile syllabus apps created by their instructors and 38% for recording and filming presentations and speech production tasks.

Data analysis demonstrated, first, on average, that students were experienced users of mobile devices; second, the students had some previous experience in using mobile devices and apps for in-class and outside classroom work; third, their attitude to mobile devices implementation into the language classroom was very positive.

20.4.2 Cycle 2

Learners of the control group participated in traditional university lecture courses; the second group of learners – the experimental one – participated in lectures supported by SRS. Students of the control and experimental groups during the course

Table 20.3 Examples of students' mobile technologies skills

Statements	Number of students in %
Can download an app	95%
Can record a presentation	90%
Can save and text materials on their device	84%
Can use mobile dictionaries and encyclopaedias	100%
Can share links with group mates	96%
Can search the web via mobile access	98%
Can publish video and audio file online via smartphone	82%
Can write a post in moblog	96%
Can set up a moblog	84%
Can use instant messaging apps	100%

Table 20.4 Student experience in mobile devices use in their learning

		Questions	Number of students in %
Use of mobile devices on their own in class and outside classroom		Every day	78%
		As an access to reference materials (dictionaries, encyclopaedias) outside classroom every day	95%
		As multimedia material playback (podcasts, videocasts)	65%
		As a means of interaction with group mates via Twitter, moblogs	68%
		To make a record of a lecturer's speech	82%
		To take photos of lecture slides	96%
		To take notes of lectures	30%
Use of mobile apps is incorporated into the course syllabus	At seminars	For learning foreign languages for in-class activities	12%
		For group and pair interaction activities or mobile networking activities	0%
	At lectures	For educational collaboration and interaction with peers or instructor	0%
		For getting instant feedback from the instructor	0%

were expected to undertake the same compulsory in-class and outside classroom activities which made up their final course grade. They had to pass three summative tests (two midterms and one final), write an essay and create a group web project. Formative assessment was provided in the form of in-class SRS tests only for the experimental group – usually three tests per lecture. SRS-supported tests were multiple choice (single best answer out of a number of options) or multiple answers

Table 20.5 Test results of the experimental and control groups

	Control group		Experimental group	
	Mean	Standard deviation	Mean	Standard deviation
Midterm 1	64	3.42	62	4.56
Midterm 2	61	5.69	76	7.61
Final test	66	3.02	78	6.56

(several correct choices out of a number of options). A variety of question types were chosen to promote understanding rather than memorisation. The test topics were based on the lecture material. SRS-supported tests were presented in class using PowerPoint. Students responded with their smartphones or tablets. They had access to SRS tests by using Wi-Fi in class.

The learners in both groups were given the same midterm and final tests. These tests were used for summative assessment. According to the methodology of an SRS intervention, we collected the quantitative data on the results of the control and experimental groups. To assess the magnitude of any significant changes following the intervention, effect sizes were calculated according to the methods of mathematical statistics; the effectiveness of the experiment is characterised by the standard deviation (SD) and mean score (MS) for each group. In order to determine the standard deviation of the test results, we derived the arithmetic mean score for each test (Table 20.5).

The mean score of midterm 1 of the control group was a little bit higher (64) than that of the experimental one (62). However, the control group demonstrated a decrease in mean scores of midterm (61), and *average results for both midterm 2 and final test were higher for the experimental group. These differences* can be explained by the fact that midterm 1 took place after four lectures possibly indicating that one-month experience with SRS was not enough for students and the lecturer to become accustomed to a more active format required by SRS. It can also take time for an instructor to learn how to design tests that include good-quality questions (Bruff 2010), and an instructor must be well prepared to ensure that the expected outcomes are achieved.

The likely interpretation of the improvement in academic performance of the experimental group in overall results of midterm 2 (76) and final test (78) is that the results of regular formative SRS-supported tests based on the lecture and required reading materials helped the instructor determine what difficulties students had with different areas of their course and to what extent. It was also helpful in designing better quality questions and feedback to improve their understanding and knowledge of the subject. The increase in the overall exam results was encouraging but not conclusive to show that only SRS tests were beneficial. One more reason for better academic performance is that students of the experimental group were actively involved in post-test activities based on active learning theory (Rubner 2012). However, it could also be due to the lecture design transformation – division of the lecture material into chunks or flips and activity switch framework (Tucker 2012).

Table 20.6 Results and mean scores of the post-study questionnaire

	Strongly disagree	Disagree	Agree	Strongly agree	Mean score
New lecture design prepared me well for SRS tests	0	3	20	7	3.0
SRS tests helped me understand the topic in focus	1	2	19	8	3.5
SRS tests helped me get ready for midterms and final a lot	0	6	15	9	3.1
SRS tests and post-test activities made me read a lot at home	0	2	8	20	3.6
SRS tests were frustrating, they complicated my learning a lot	7	21	2	0	1.9
Instant feedback was very supportive and encouraging for my learning	0	1	15	14	3.5
Activity switching kept me be involved during the lectures	0	0	9	21	3.7

20.4.3 Cycle 3

The intervention data were supplemented by student feedback gained from a post-study paper-based questionnaire. The post-study questionnaire contained seven questions in the format of a four-level Likert scale and three free-text comments that were designed to seek student views on the strengths and weaknesses of SRS-supported lectures. The questionnaire was completed by 30 out of 36 students of the experimental group. Responses are provided in Table 20.6.

Statements 1–4 that were designed to measure students' perceptions of the effectiveness of SRS responses were generally positive, with tests and post-test activities being particularly effective for increasing outside classroom activities. This suggests that a majority of the students indicated that SRS-supported approach made them do required and recommended reading to complete in-class SRS tests successfully and to take part in post-test activities.

Statements 5–7 were designed to elicit students' attitudes to SRS supported approach. In reaction to statement 5, the majority of students disagreed with the fact that SRS tests were frustrating and complicated their learning a lot. The average for statement 5 was 1.9. The largely positive reaction to statements 6 and 7, where the mean scores were 3.5 and 3.6, respectively, emphasises that immediate feedback on test results was very supportive and encouraging for student learning and that activity switch approach (material presentation – SRS test – post-test activities) kept them involved during lectures.

Some free-text comments provided additional insights into learner experiences and revealed their positive attitude to SRS-supported approach:

- Mobile devices are the best tools to be used for collaborative work.
- The use of mobile devices and tasks based on SRS was fun and changed my attitude to learning.

- It was not just a traditional lecture course, it was a permanent interaction and collaboration with my group mates and the instructor, I mean, it was a kind of active learning course.
- We were not passive learners, we worked hard to contribute even during lecture time and it was a very unusual and challenging experience.
- SRS-based tests are motivating and challenging.

Students' answers indicated that they had an overall positive outlook regarding SRS approach to university lecture courses. Some participants noted initial difficulties in dealing with the SRS-supported approach. They commented on the challenging nature of weekly tests and post-test activities. However, they claimed that this approach improved their overall satisfaction with the programme of study because of an innovative way of interacting in large lecture situations. There was a general agreement that smartphones and tablets were the handiest and suitable devices to use in large auditoriums. Some students commented that they did not understand what an active learning approach meant in practice. Rather than taking notes from slides or photographs of slides, students were involved in tests, discussions, polling and brainstorming activities. Students appreciated the prompt feedback they received on their own understanding of the material and highlighted the motivational nature of receiving immediate responses to tests. Students also mentioned that pair discussion time as a post-test activity was valuable because it gave them a chance to learn from each other, and a peer's explanation could be more helpful to them than an instructor's explanation. These findings were confirmed by researcher observations.

20.5 Implication for Pedagogy

The framework discussed in the paper that is based on SRS implementation and HLCE will assist instructors' understanding of unique challenges in emerging mobile learning environments. SRS implementation supported by enquiry-based learning approach has become crucial for transforming the design of the traditional lecture and student approach to learning as a matter of active enquiry, rather than students as passive recipients of their lecturers' knowledge.

The results of formative SRS supported tests based on the lecture, and required reading materials helped the instructor determine what difficulties students had with different areas of their course and to what extent. It was also helpful in designing better quality questions and feedback to improve their understanding and knowledge of the subject. The increase in the overall exam results was encouraging but not conclusive to show that only SRS tests were beneficial. One more reason for better academic performance is that students of the experimental group were actively involved in collaborative post-test activities. However, it could also be due to the lecture design transformation – division of the lecture material into chunks or flips and activity switch framework.

On the other hand, the study has some limitations. The first version of SRS which was used for the research could not pinpoint the errors of individual learners and capture data on group dynamics. So, unfortunately, instructors did not have an opportunity to collect and analyse the data of group dynamics on weekly SRS supported tests. In 2014, the updated version of SRS was introduced that enables instructors to handle test results in an easier way by exporting them into Excel and creating charts. Now the system includes a database that stores the results for each session held. Such data can be valuable to a teacher when reviewing the design and delivery of lectures and other course materials (Rubner 2012). A further limitation was that to determine the influence of SRS implementation on student performance, only a midterm and final test result data were analysed and compared. Essay and group project grades were not analysed.

20.6 Conclusion

Many researchers argue that universities today are less well aligned to the learners' needs and expectations that they bring with them due to fast-developing digital and mobile technologies and ICT resources which have become the dominant infrastructure for knowledge (Kukulska-Hulme et al. 2011). Unfortunately, in many Russian universities, a traditional lecture course presupposes transmission of the content material that is designed and presented by the lecturer to students who are looked at as passive recipients of knowledge.

Mobile technologies enable instructors to create a *high-level collaboration environment* based on an enquiry-based learning approach which inspires students to learn for themselves. The particular emphasis, in this case, is placed on fostering the development of collaborative communities in which students can interact with their peers, instructors and other specialists any time, get access to any data available on the net across time and place and share their own content. This approach implies the transformation of four main constituents of any teaching process – *material presentation, tasks and activities, feedback and evaluation and assessment.*

HLCE is created by initiating group discussions or brainstorming on the basis of SRS-supported activities aimed to determine the correct answer to the test statement. The collaborative post-test activities, as well as instant messaging apps, also help to highlight weak points of material presentation and transform students' approaches to their own learning as a matter of active enquiry and meaning making rather than seeing themselves as passive recipients of their lecturers' knowledge. On the other hand, mobile voting system SRS could enable lecturers to transform the content of the presentation and turn the traditional lecture into an interactive SRS supported lecture, then into a flipped classroom that is a valuable model of blended learning aided by open educational resources and then, in the long run, into MOOC lecture.

The framework discussed in this paper is by no means prescriptive – while such a pedagogical framework provides a spotlight to examine mobile learning experiences, account still needs to be taken of the ways of driving student motivation in HLCE, creating new formats of collaborative in-class activities and determining valid criteria for evaluation of mobile supported activities.

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Part V
Australia and New Zealand

Chapter 21
Mobile Learning Policy Formulation and Enactment in New Zealand

David Parsons

Abstract Adoption of mobile learning in New Zealand schools has spread rapidly in recent years as the power and usability of portable devices, along with broadband penetration and speed, have changed the technology landscape. This has major implications for higher education, both because it is tasked with training the future teachers who will work in digitally enabled classrooms and because the students from these classrooms will be future university undergraduates, bringing with them new expectations about institutional support for mobile learning. Policy both drives and responds to these contextual changes. National policy has driven the construction of broadband infrastructure but also has to respond to changes enacted locally. Local policy has driven the deliberate integration of mobile devices into teaching and learning, but school and university policies must respond to changes in the expectations made on them by the national provision of broadband infrastructure. Policy is also multi-faceted, as UNESCO's mobile learning policy guidelines make clear. Not only does it need to deal with core delivery issues such as infrastructure provision and teacher training, but it must also address broader social issues such as equity, advocacy and health and safety. This chapter is based on a series of interviews carried out to explore mobile learning policy in New Zealand. The results of this research suggest that policies are evolving rapidly in a rich interaction of top-down and bottom-up initiatives, impacting directly on schools and indirectly on higher education, and may provide an instructive model for others in the Asia-Pacific Region.

D. Parsons (✉)
The Mind Lab by Unitec, Auckland, New Zealand
e-mail: david@themindlab.com

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21.1 Introduction

This chapter is based on a study of both national and local policy, as it pertains to mobile learning in New Zealand schools and the subsequent impacts on higher education. New Zealand is worthy of study within the Asia-Pacific region as it has taken a proactive approach to the roll out of broadband infrastructure with a specific emphasis on the use of that infrastructure in schools. The aspects of policy discussed are analysed within the scope of the UNESCO (2013) guidelines for mobile learning. Figure 21.1 summarises the key ideas in these guidelines, mapped to the Mobile Learning Evaluation Framework (Murphy and Farley 2012). This framework provides us with some core categories of evaluation within which the UNESCO guidelines may be contextualised. While these two perspectives on mobile learning have somewhat different concerns (namely, evaluation and policy), it can be seen that the main focus of the policy guidelines from the perspective of pedagogy (learning) evaluation is that of equitable access to learning, while from the pedagogy (teaching) evaluation perspective, the policy focus is on the provision of appropriate resources and teacher skills. The technical issues are focused on infrastructure and devices but also health and safety, while the organisational aspects feature advocacy and policy.

The following sections provide some discussion around the four areas of the mobile evaluation framework and how they are evident in the scope of this study. In each case, relationships with the UNESCO guidelines are drawn out.

21.1.1 Pedagogical (Learning) Issues

Student perspectives of learning, and what students expect to gain from education, are no doubt complex and varied. Thus when seeking to justify learning, we often focus on current and intended use, leading us to question what kind of world learners are being prepared for. As technology and society rapidly evolve, we are forced to address fundamental questions about education in the twenty-first century. Knowledge production and dissemination is now a distributed and interactive activity, mediated by ICTs, entailing a shift from knowledge production to knowledge configuration (Gibbons 1998). A greater level of inclusion in education, particularly higher education, has also been seen in many countries, though simply producing more graduates is not itself a solution to the problem of educating for a changing world (Chang 2010). Rather, there is a widely perceived need to provide an education that is somewhat more pertinent to the needs of both individuals and society. An important aspect of this concept of pertinence is the articulation between education and work (Altbach and McGill Peterson 1999) with the world of work itself moving from the large, long-lived organisations of the past to small, often self-started, entrepreneurial enterprises (Vessuri 1998). A highly relevant feature of mobile learning

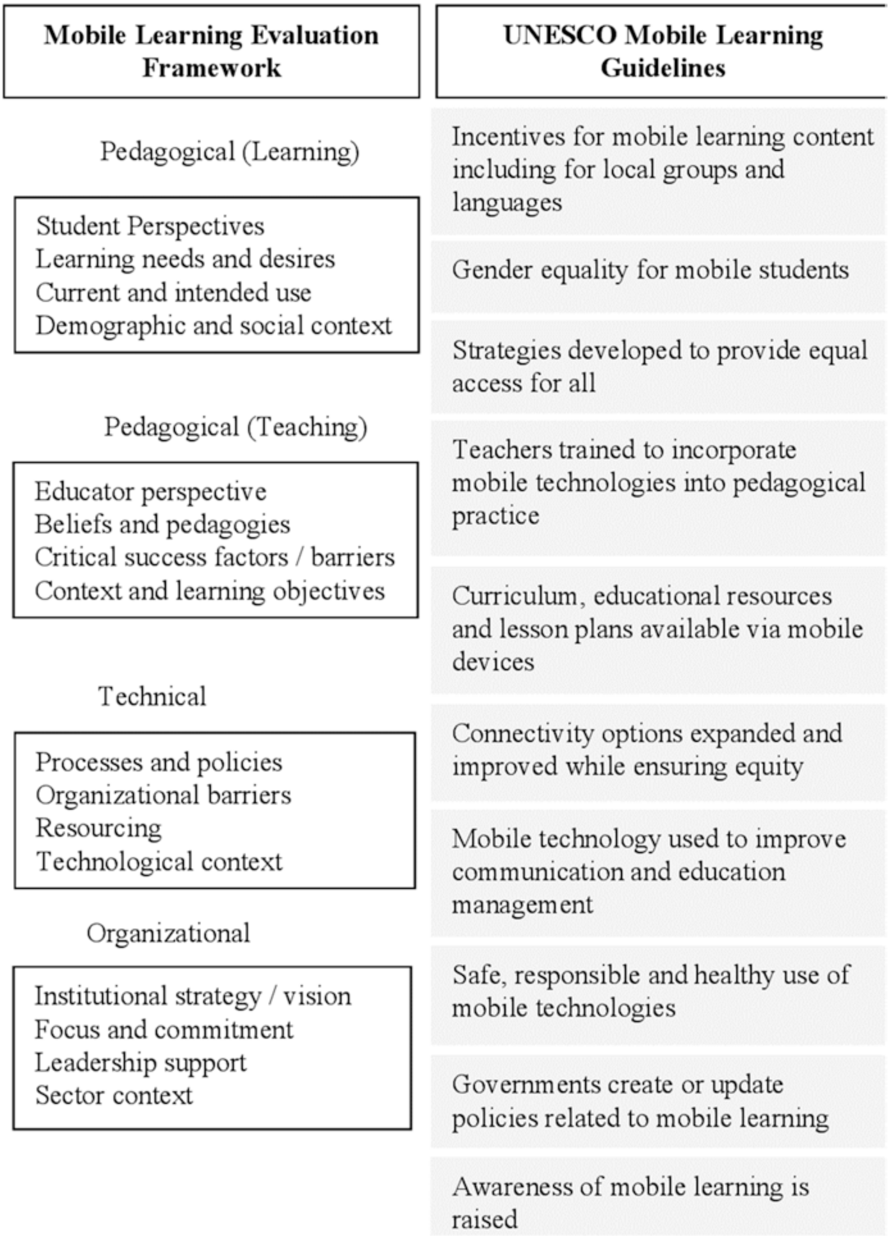

Fig. 21.1 The Mobile Learning Evaluation Framework (Murphy and Farley 2012) mapped to the UNESCO Mobile Learning Policy Guidelines (UNESCO 2013)

is that it links to the increasing mobility of the workforce and the mobile tools that are now an integral part of the enterprise (Udell and Woodill 2015).

Factual knowledge is less important in an information-rich environment, but other forms (conceptual, procedural and metacognitive knowledge) become thus more important to the learner. The higher levels of the revised Bloom's taxonomy stress the need to analyse, evaluate and create (Krathwohl 2002), but beyond these cognitive skills, today's learners also need cross-cultural adaptability (Gibbons 1998), new media literacies (Partnership for 21st Century Skills 2011), interpersonal and intrapersonal skills (National Research Council 2011) and the ability to filter out meaning from the mass of information only recently made available to us (Dede 2007). Mobile learning tools certainly fit into this context of information richness and subsequent demands on the user.

Even with these ideas about future skills, what opportunities might be on offer for those who graduate from education in the future? What might their future use of mobile learning be? More than 2000 years ago in 'The Clouds', Aristophanes complained that universities, or 'Thinkeries', left students heavily indebted and without practical skills (Roberts and Greteman 2013). Perhaps the same issues face graduates today. Furthermore, many of the service sector jobs for average workers in rich countries do not require high levels of education, while technology increasingly automates former skilled service jobs (Chang 2010).

In terms of the demographic and social context, like all countries in the Asia-Pacific region, New Zealand shares some features in common with other nations but also has some unique characteristics that reveal how generic policies need to be adapted to local conditions. Cava-Ferreruela and Alabau-Muñoz (2006) define the three most important factors for broadband infrastructure availability in a given country (a key enabler for mobile learning) as economic level, the level of competition in the telecommunications market and demographic distribution, while Bauer et al. (2005) emphasise that state policy also matters. All four factors of demographic and social context impact on issues of equity. Economic level impacts on a nation's ability to fund infrastructure; the level of competition impacts on both cost and distribution of infrastructure, while demographic distribution may lead to an imbalance of opportunity between urban and rural learners. These factors vary widely across the Asia-Pacific region, and it is, therefore, the role of state policy to adapt these factors to the local context.

New Zealand is a developed Organisation for Economic Co-operation and Development (OECD) nation yet is agrarian and remote, with a small but diverse population that is highly concentrated in a few areas. To service this population, there is an aggressive national programme of ultra-fast broadband rollout currently in progress and due to be completed by 2019 (Chorus 2015). The use of this infrastructure within education is an important component of the overall investment and is a target of state policy. The components of the UNESCO mobile learning policy guidelines that are mapped in Fig. 21.1 to the pedagogical (learning) aspects of the evaluation framework stress that the most important driver for policy implementation is to ensure equity of access, across all demographics, genders and cultures.

21.1.2 Pedagogical (Teaching) Issues

From the educator's perspective, it has been claimed that high-speed internet connections improve collaboration between teachers, parents and students and provide more efficient administration, better assessment tools and development of shareable eLearning resources, all of which support teachers in meeting their objectives (Crown Fibre Holdings 2013). A British Educational Communications and Technology Agency (Becta) study suggested that teachers may see more returns from ICT in planning, preparation and administration than in teaching, though broadband was seen as a major factor in increasing collaboration between teachers, while the wider policy target is to improve pupils' learning, but innovations have to reach a tipping point before benefits accrue (Condie and Munro 2007).

One of the main barriers to transforming beliefs and pedagogies towards mobile learning is the capability costs for staff, who have to invest their own time in bringing plans and strategies to fruition to see positive returns from ICT investment (Twining 2002). Teachers need to be supported in their training to integrate mobile technologies into their teaching. Indeed, UNESCO (2013) suggests this investment is more important than the investment in the technology platform. Nevertheless, for mobile learning to be viable within a learning environment, there are a number of critical success factors that must be in place to support teachers. There must be access to mobile devices, the support of a suitable wireless broadband infrastructure, appropriate learning content available for mobile platforms and appropriate skills and procedures in place to support teachers in transitioning their pedagogy. This is further supported in the UNESCO guidelines by the provision of teaching resources made available for mobile devices.

21.1.3 Technical Issues

A major component of ICT investments internationally is educational broadband. For example, the goals of the Digital Agenda for Europe include enhancing digital literacy, skills and inclusion (European Commission, 2013). In the Asia-Pacific region, Australia has recently engaged in significant debate about the development of broadband. While Australia is a single nation, nevertheless not all policy is from central government, given the roles of state and territory administrations. In both cases, there is concern that these parts of the world are losing their leadership in broadband provision. New Zealand's structure is relatively simple; thus policy may be easier to formulate and enact.

However, processes and policies are still constrained by economic, commercial and geographical challenges. What lessons, then, might other nations in the Asia-Pacific region learn from the Australasian experience? Perhaps one aspect is the contrasting political attitude towards broadband rollout evident between Australia and New Zealand. While New Zealand is well on the way towards a comprehensive broadband nationwide infrastructure based on consensus, the Australian National Broadband Network (NBN) faces a more difficult challenge and political dissent (Coalition 2013).

Cava-Ferreruela and Alabau-Muñoz (2006) described New Zealand's past strategy as 'soft-intervention', relying mostly on the market, rather than medium-intervention strategies that address potential market failure in reaching rural areas by pricing more publicly funded infrastructure. Some nations have engaged in hard-intervention strategies where broadband provision is state directed. Perhaps one lesson from the New Zealand experience is that a more recent move from soft to medium intervention has seen major progress in educational broadband provision. In terms of the technological context, as part of the general rollout of ultra-fast broadband capability (UFBB), 97.7% of schools and 99.9% of students will receive UFBB, with the remaining 2.3% of schools in remote areas given wireless or satellite services (Ministry of Education [MoE] 2013). Such policies can overcome organisational barriers by supporting a common approach to mobile technologies while providing external resources. In terms of the UNESCO guidelines, they can help ensure equity of connectivity while providing the mobile tools for communication and education management.

21.1.4 Organisational Issues

Mobile learning policy does not operate in a vacuum but within the broader contexts of national and international education systems and policies. Some countries have focused on lifting participation and/or quality of teaching in science, technology, engineering and mathematics (STEM) education. The direct aim of such policies is a larger STEM workforce, while indirect aims may include increasing relative rankings such as the OECD's Programme for International Student Assessment (PISA). By such means, institutional strategy and vision is often a reflection of national policy. The injection of ICT into education supposedly holds the promise of a well-educated workforce with relevant, twenty-first century skills, driving nations towards higher OECD rankings and increased economic growth. Targets such as these can enable focus and commitment to innovative approaches such as mobile learning, but, as the UNESCO guidelines point out, this should not be at the expense of the safe, healthy and responsible use of such technologies. In New Zealand, with the support of leadership within the Ministry of Education, government policy is enabling schools to access an increasing range of online tools, services and content to aid the delivery of education, underlining the important role identified by UNESCO of governments creating or updating policies related to mobile learning.

21.1.5 Description of the Study

The study used for this chapter was based on a series of stakeholder interviews with representatives of education policymakers, both national and local, with a role to play in the implementation of mobile learning. The main question addressed in the study was: ‘How is mobile learning policy formulated and enacted in New Zealand schools’? A further sub-question was: ‘What are the likely impacts of school policies on mobile learning in higher education’? In order to address these questions, ten stakeholders were interviewed, including representatives of the New Zealand Ministry of Education, ICT professional bodies, service providers and researchers from higher education and schools. Given the high profile given to investment in ICT infrastructure internationally, and common questions about the role of mobile technologies in schools, this chapter should provide insights into how generic policy is adapted to meet local conditions that can be applied in higher education.

21.2 Results

The results presented here are based on a content analysis in NVivo of free text data, using an axial, hierarchal coding scheme based on constructs from the Mobile Learning Evaluation Framework and the UNESCO Mobile Learning Policy Guidelines. Repeating ideas within these constructs were grouped into emergent themes as the data was iteratively coded. Table 21.1 shows the number of responses under each of these themes.

21.2.1 Pedagogical (Learning) Themes

21.2.1.1 Incentives to Develop Learning Content

Themes related to incentives for developers to build learning content specifically for mobile devices, including for local groups and languages, centred mainly on the conflicting pressures of cost and quality. The issue of local languages is important in many countries across the Asia-Pacific region, not least because of the predominance of English teaching and learning materials in countries where English is not the first language. Fishman (2007) stresses the role of technology in sustaining indigenous languages. New Zealand has three official languages, English, the indigenous Māori language and New Zealand Sign Language. Support for Māori language learning is of strategic importance to education in New Zealand (Māori Language Commission 2000), and significant efforts have been made to develop mobile learning tools for the Māori language (McKenzie 2014).

Table 21.1 Number of coded responses in core constructs and themes that emerged from the analysis

Mobile Learning Evaluation Framework	UNESCO Mobile Learning Guidelines	Themes	Number of repeating ideas
Pedagogical (learning)	Incentives for mobile learning content including for local groups and languages	Cost	3
		Quality	2
	Gender equality for mobile students	Gender divides in wider society	4
		Influence of device ownership	2
		Socio-economic context	3
	Strategies developed to provide equal access for all	BYOD Models	3
		Non-BYOD models	3
Pedagogical (teaching)	Teachers trained to incorporate mobile technologies into pedagogical practice	Digital skills	9
		Institutional change	4
	Curriculum, educational resources and lesson plans available via mobile devices	Sharing mechanisms	8
		Creative rights	2
Technical	Connectivity options expanded and improved while ensuring equity	Equity characteristics	5
		Equity implementation	6
	Mobile technology used to improve communication and education management	Continuity of service in a disaster	3
		Efficient use of mobile services in disaster situations	3
	Safe, responsible and healthy use of mobile technologies	Digital citizenship	6
		Potential health risks	5
Organisational	Governments create or update policies related to mobile learning	Global vs. local policy	2
		Philosophical viewpoints	2
	Awareness of mobile learning is raised	Raising awareness	4
		Advocacy roles	3

In their responses, the interviewees highlighted the issues of cost versus quality (including local relevance). There are clearly a number of forces at play in this area which makes for complex decision-making. On the one hand, the move towards everyone publishing themselves using social media and Web 2.0 tools has led to a common perception that content should be free.

> People have the mindset that you can get everything for nothing…it’s not that people can't afford it but we become accustomed to thinking it’s like air, why would you pay for it? (School)

However, a problem with free resources is that they often lack the quality control processes that would be put in place by a professional publishing house.

> If you look back at the current model of producing resources…what comes out the other end is something that's suitable for lots of people. When you've got an individual producing something…those checks and balances are not in there. (School)

Perhaps as a result of the competition between free and purchased content, and the pressures on traditional publishers to compete by migrating their content to digital formats, new online forms of content delivery have become relatively more expensive:

> The school has a $10,000 spend a year, say, on textbooks, where we get five years of use. The model the publishers are talking about at the moment is 'we'll give you access to our textbook for one year and then it disappears', which adds up to a lot more than $10,000, much more expensive. (School)

Thus there are competing pressures in the area of content generation, and it is clear that market forces alone may not deliver all that is required. This is particularly true where minority culture and languages need to be sustained and promoted. This may mean that targeted incentives will be required to support digital content in minority languages if market forces will not deliver these resources.

> From an equity perspective…maybe there needs to be some incentives for content developers and producers to deliver in as many languages as the world thinks is appropriate. (Crown Agency)

One role that higher education institutions can provide is in supporting the development of innovative mobile learning tools for indigenous language learning through research projects. There are several such examples from New Zealand that support Maori language learning (e.g. McKenzie 2014; Crow and Parsons 2015).

21.2.1.2 Gender Equality

Three themes emerged under the construct of gender equality; gender divides in wider society, the influence of device ownership and the socio-economic context. Although there was a recognition that female students were in some contexts outperforming males, gender inequality in wider society once students leave school and enter the workforce was highlighted by some of the interviewees.

> At a senior management level, the fortune 100 technology companies, less than 12 or 13 CEOs are female, 10% roughly, whereas I know at that level there's got to be women in industry who are capable. (Industry Organisation)

This issue is of course not confined to the boardroom: 'The lack of women in leadership positions is only a reflection of the low numbers of women in the sector overall' (Henderson 2014, unpaged). A study of ICT training in the UK suggested that education alone will not address the masculine norms of the IT industry and will thus not remove barriers to participation (Gillard et al. 2007).

This issue is particularly evident in engineering and science and higher degrees: 'Efforts to increase mathematics and science performance among girls…can promote gender equality even further in education' (OECD 2012, p. 4).

> [we need] to make things more open for women to get involved in coding and application software development. (Ministry of Education)

One area where perhaps there are indications of progress in these facets of gender inequality is the issue of device ownership. The introduction of BYOD into schools has addressed some aspects of the digital divide through access to ICTs, with some of the interviewees noting the effect in the classroom of each child having their own device, removing any digital access divide that might have previously existed.

> All the girls having digital device…being in charge (Local Government Organisation)

Ownership of digital devices was also seen as a means of overcoming stereotypes around images of ICT users. Possession of ICT is 'not only a matter of material resources but also of the attractiveness of this technology and the necessary skills to use it among people of different age and gender' (van Dijk and Hacker 2003, p. 319). The potential attractiveness and new affordances of mobile technology, specifically to female students, compared to older industrial images of technology, was noted in some of our interviews.

> It is different with something like mobile technology which is I guess 'cleaner' and maybe lends itself to more visual thinking (School)

Notwithstanding the above, the socio-economic context emerged as an important theme in this construct. A common response from the interviewees was that in New Zealand schools, gender inequality was not a distinct challenge, at least when compared to socio-economic inequalities, which were generally seen as more pressing. Indeed, it is recognised from previous research that gender inequality in information technology in education varies from country to country (Reinen and Plomp 1997). Higher education institutions in Asia-Pacific nations might usefully apply a similar analysis to their own circumstances.

21.2.1.3 Strategies Developed to Provide Equal Access for All

The themes in this construct, which relate to devices rather than connectivity, split into two clearly demarcated models, the Bring Your Own Device (BYOD) model and alternatives that require some provision by education provider, government or another body. The type of provision of mobile devices will have an effect on the nature of the activities that can be undertaken using them (Wenmouth 2015). Thus decisions need to be made about the purpose of a BYOD programme when deciding on what types of device should be allowed, recommended or mandated. Having an open policy may potentially lead to difficulties in effectively delivering the curriculum.

> You may paint yourself into a corner if you've not got a good enough device. Does that mean that the teaching has to go to the lowest common denominator? (Commercial Service Provider)

However, the main issue of BYOD is an economic one, so schools and universities may feel the need to allow a mix of devices for financial reasons.

> BYOD has got a bad name …. the schools call it 'device for learning' just because it seems to have got negative connotations…parents have to pay for a device (Commercial Service Provider)

While BYOD approaches come with their own challenges, alternative models, where devices are controlled and managed by the school, may result in a lack of flexibility, and excessive management demands on the school's ICT support infrastructure.

> You buy the computer from the school, it's a specific model, it gets attached to the domain. That's not BYOD anymore, that's a domain computer and it's controlled by the school (Commercial Service Provider)

One positive development as schools group together into larger clusters to negotiate procurement is that some economies of scale or even marketing power may become evident.

> We purchase more devices per year than [large individual schools] do and we have…Apple come to us saying can we loan you, 2 classes of iPads, because you're not using our devices (Educational Trust)

The analysis of this theme reveals that there are a number of different access models and that cost issues may impact on parents, students and teachers in different ways, with no single model providing all the answers. While students in higher education are increasingly likely to have mobile devices of their own, this can raise some negative issues around BYOD in terms of equality of opportunity to perform learning tasks with different types of device. Similar challenges arise when integrating a range of different devices with a single institutional infrastructure.

21.2.2 Pedagogical (Teaching) Themes

21.2.2.1 Teacher Training with Mobile Technologies

The most immediate impact that moves towards mobile learning in schools have on higher education are the new expectations on teacher training programmes. New teachers have to be trained to teach in classrooms that have been transformed by mobile learning. Otherwise, they risk entering the classroom unprepared for what is expected of them by today's students.

> [students] seriously speak out now about how frustrating it is to have a teacher come in front of them…and not know how to run a digital learning environment for them. (Educational Researcher)

Exploring the theme of digital skills of new teachers, common assumptions about them having good digital skills due to being 'digital natives' may be incorrect. In fact, new student teachers are likely to enter (and possibly leave) their professional education with traditional, conservative views of teaching and poorly developed digital skills, despite their familiarity with social media.

> You get the new grads who come in and, because they're on Facebook all the time, think they know all there is to know (Educational Trust)
>
> [new teachers are] good at the social media, games that sort of thing, as are all young people that we employ probably, but actually using it in a more constructive way needs training (School)

Teachers now need to know at least some basics of technical problem solving to help their students:

> Probably the most important thing if they are actually going to be teaching it is that they actually know how it works on the mobile side of things they become the first line of support (Commercial Service Provider)

However, technical usage alone is not enough for mobile pedagogy. Knowing how to leverage the devices for teaching and learning is even more essential.

> They're not reinventing the wheel, they're trying to make stuff relevant to the way they're teaching, the way they use the devices which, doesn't mean always pick someone else's video (Commercial Service Provider)

The other main theme identified under this construct was institutional change, i.e. higher education institutions beginning to adapt to the new demands of the workplace for their teaching graduates. Some innovations intended to address this were identified.

> We've taken 10 beginning teachers … they are going through a digital immersion programme (Educational Trust)

> The new Masters of Teaching for instance, that this university's just begun as a pilot, one of the underpinning things is about digital literacy (Educational Researcher)

From these concepts, a theme of institutional change emerged to balance the rapid evolution of digital skills requirements in the teaching profession. In particular, it can be seen that new concepts in teacher education are being developed. However, these developments appeared piecemeal from the responses of the interviewees. A more integrated approach would seem to be required to ensure that all higher education institutions tasked with the training of teachers are fully aware of the digital fluency required of newly qualified teachers entering the contemporary classroom.

Baran's (2014) critical review of the literature on mobile learning in teacher education noted areas that need further development include transforming teacher education practices with theoretically sound approaches, going beyond the tools to explore the pedagogical benefits of mobile learning within specific subject areas and developing new models for teachers' professional development using mobile learning.

21.2.2.2 Educational Resources Available Through Mobile Devices

Two main themes emerged within the construct that curriculum, educational resources and lesson plans should be made available to teachers via mobile devices. These were sharing mechanisms and creative rights. Some aspects of sharing were seen as straightforward:

> The curriculum in New Zealand and educational resources are available already online so that makes them available via mobile devices (Educational Researcher)

However, there were also concerns about whether what was shareable was necessarily relevant. There was also some scepticism about the value of making lesson plans available.

> A lesson plan is only as good as the teacher teaching it and the class you're teaching it with, so a lesson plan is never a Silver Bullet. (Educational Researcher)

The issue of creative rights was also raised. This was seen as important by a number of interviewees to ensure that the correct copyright status was conferred on shared material. This requires an understanding of Creative Commons licensing by both producers and consumers.

21.2.3 Technical Themes

21.2.3.1 Connectivity and Equity

Discussion around equitable access to connectivity centred on two aspects, first, definitions of what equity actually means (characteristics), and second, how such equity can be implemented. There was a consistent view that access to ICTs is becoming as much of a basic human right as many other aspects of modern societies.

> Technology should be a right that we are able to extend access to much in the same way as health care and education (Industry Organisation)

Further to that assumption, a definition of equity provided by one of the interviewees was that no one is left behind:

> all boats rise on the same tide…if we're doing something for someone we're doing it for everyone (Educational Researcher)

There was also an awareness that there were several root causes of inequity and that these all need to be taken into account.

> There needs to be a general consciousness around ensuring that a lack of equity doesn't creep in for whatever particular reason that could be geographical it could be demographical (Crown Agency)

The assumption here was that equity needed to be entirely consistent. There was, however, a contrary view when it came to actual implementations that there would always be an element of compromise:

> Most of society want to go ahead but you can't because this group haven't got access, stopping everybody (School)

In essence, then, in terms of implementation of connectivity in an equitable manner, the intention is universal coverage.

> No matter where you are you going to get fibre, you going to get your network upgraded, you are going to have a wireless overlay (Ministry of Education)

However as noted earlier, there will be some areas with limited connectivity due to geography. It was also noted by more than one interviewee that a number of initiatives that have taken, or are taking, place rely on some kind of short-term investment funding.

> Subsidies are unsustainable over the long run (Local Government Organisation)

The themes in this construct suggest that equitable access to connectivity raises questions not only about how equality of access can not only be provided but how it can be sustained over the longer term. Major higher education institutions have tended to be at the forefront of connectivity initiatives. However even if on-campus connectivity for mobile devices is fast and reliable, institutions need also be aware of the ability of their students to make mobile connections when off campus, particularly for those institutions who operate distance learning programmes. Warschauer and Matuchniak (2010) also make the point that access is only part of the equity debate that the way that devices are used in teaching and learning also contributes to the level of equity in outcomes.

21.2.3.2 Mobile Communication and Management

The main themes that emerged in this context, continuity of service in a disaster and efficient use of mobile services in disaster situations, were very much localised to the New Zealand context, but other nations in the Asia-Pacific region (e.g. Japan) have faced severe natural disasters. In the aftermath of the Christchurch earthquake in 2011, all schools were temporarily closed, and all the students from 9 of the city's 163 schools had to be relocated to other local schools because their own schools were too badly damaged to reopen (Ham et al. 2012). In addition, over 1000 school students became 'refugees' in the neighbouring region of Otago, with others dispersed to even more distant areas of the country (Lewis 2011). Many buildings on the University of Canterbury campus were damaged, and classes had to be relocated to temporary sites. Fortunately, mobile communication supported continuity. The University, for example, made extensive use of mobile social media (Dabner 2012).

> The continuity of education in Christchurch showed good role models on how some schools managed really well because they did have their work out there on the web, in the cloud, and others didn't (School)

ICT can contribute positively to post-earthquake recovery by enabling civic participation (Mitomo et al. 2013). The same effect is observable in educational participation.

> Even if the school itself wasn't functional the teacher was functioning (Local Government Organisation)

The message for higher education around mobile communication and management is that institutions need to ensure that they have a robust infrastructure in place, as well as a policy for mobile communications with their students and staff in the event of an emergency.

21.2.3.3 Safe, Responsible and Healthy Use of Mobile Technologies

Themes in this construct were primarily issues about digital citizenship but also some practical issues around health and safety. These themes, therefore, cover both social and physical concepts of safety. Digital citizenship was defined as being much broader than just issues of online safety.

> Digital citizenship is more than just safe and responsible use. It's actually being deeply critical and aware of what's out there and how other people use these things (Educational Researcher)

In addressing potential health risks, there were frequent references to relying on expert advice on the safety or otherwise of technologies such as Wi-Fi networks. The issue of personal choice was also raised in this context, in that any parent who wished to send their child to a school where they were not exposed to electromagnetic radiation should be free to do so. In one New Zealand school, parents have campaigned successfully to have Wi-Fi removed due to fears about possible cancer risks (National Business Review 2013). However, a number of interviewees raised the inescapable issue of background levels of electromagnetic radiation that would be beyond the control of schools even if they did not instal their own wireless networks. These may occur both at home and in the general environment, even in schools where there is no on-site wireless network.

> Parents have far more dangerous devices going on in their homes than is happening in the schools (Educational Trust)

> At […] school there is something which affects their wireless and it's just this massive band of frequency … so even if that school had no wireless network, students are still getting it. There's not a lot that they can do. (Commercial Service Provider)

Although such controversies have been less visible in higher education, with parental concern being less of a factor, the same health and safety issues still need to be constantly monitored, so that policies and practices can be updated if necessary to respond to any relevant new evidence that may be brought to light.

21.2.4 *Organisational Themes*

21.2.4.1 Creating or Updating Mobile Learning Policy

The first construct related to governments creating or updating mobile learning policies. The main themes that emerged from this question were differing philosophical viewpoints on policy and also how global and local forces acted differently on policy. The philosophical debate centred on whether policies like having mobile devices in the classroom should be mandated. However, in practice it seemed that local policies were driving change.

> That's all been taken out of the hands of government. People are just using things and so I think it's not a government policy … a local policy, perhaps (School)

Local policies are often derived from common templates provided by relevant organisations, giving a national flavour. In New Zealand, NetSafe (2010) has developed a set of policy templates that schools can adapt to their own needs.

> A lot of schools start their policies off a NetSafe one because they can generate one quite quickly … very generic but it's New Zealand generated (Commercial Service Provider)

As Duncan-Howell and Lee (2007) suggest, in reviewing a number of mobile learning policy initiatives, policy formulation in higher education institutions tends to be on an ad hoc, per institution or even per department basis, but across the sector, they also note that changing roles of both students and teachers, driven by mobile learning technologies, are inevitable.

21.2.4.2 Advocacy, Leadership and Dialogue

Within this construct, raising awareness and advocacy roles emerged as the main themes. It is a common belief that governments should promote internet usage by themselves and others (Pélissié du Rausas et al. 2011). It follows, perhaps, that other organisations, including educational ones, should do likewise in appropriate contexts, such as the use of this infrastructure for mobile learning.

The need for awareness of mobile learning to be raised through advocacy, leadership and dialogue was acknowledged by all of the interviewees. Indeed, many of them saw a major part of their role as addressing this aspect of policy. Perhaps the most important aspect of dialogue highlighted during the interviews was that which takes place between schools and parents.

> You have to involve parents really early, have to talk to them and meet them and discuss, because all of those questions about policies come up. How are you going to filter the Internet? How are you going to deal with broken devices or stolen devices? (Commercial Service Provider)

One of the most interesting responses that emerged around advocacy and leadership was the way that it is often the students, rather than the staff, who demonstrate this in the classroom:

> They start sharing with each other, they start helping each other, those different experts arise in the classroom (Educational Researcher)

This is one of the pedagogical impacts of the move towards mobile devices in the classroom and is one of those that impacts in higher education not only through changing requirements in teacher training but also in how higher education institutions will need to respond to new generations of school leavers, experienced in digital and collaborative learning, entering more traditional university lecture halls with different expectations of teaching and learning than their predecessors.

21.3 Conclusion

This chapter has addressed the specifics of New Zealand's experiences of mobile learning policy but mapped it to international policies and frameworks. The main research question was 'How is mobile learning policy formulated and enacted in New Zealand schools'? Key factors identified have been a medium intervention policy to ensure equity of access to educational broadband, various models of device provision depending on context, the ability for local stakeholders to drive forward their own policies and awareness of the institutional changes required to ensure that digital tools can actually lead to improvements in teaching and learning. Issues that may cause particular difficulty in making policy include health and safety concerns around wireless networks and the challenges of ensuring equity across all geographical areas, demographics and cultures within a nation. One particular area of interest that emerged was the use of mobile communications to support learning in disaster situations.

A further sub-question was: 'What are the likely impacts of school policies on mobile learning in higher education'? Two major areas of impact were discussed. One was the need for higher education institutions to begin training all teachers to be prepared for mobile learning in the classroom. The other was the need for those same institutions to be pedagogically prepared for the same cohort of students as they progress through the education system into higher education, including having suitable policies in place to ensure equity of access for all students and reliable communication channels during disruptive events such as natural disasters. Despite the major differences betwesen societies in the region, all of these ideas can usefully inform policy at all levels of education in other Asia-Pacific nations.

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Chapter 22
Growing a Mobile Learning Ecology: A Systemic University-Wide Strategy

Carol Russell

Abstract In 2013 Western Sydney University began giving iPads to all new first-year undergraduate students. Teaching staff were also issued with iPads. This was the largest such initiative in the southern hemisphere. It was part of the University's strategic plan for learning and teaching, integrated across several university support systems, including curriculum development, staff development and IT infrastructure. This chapter is an account of how these systems have begun to work together to support the use of mobile devices as an integral part of the university learning environment. Teaching staff have been provided with a range of training and support services to facilitate the use of iPads in teaching, as part of the Western Sydney University learning environment. There has also been substantial investment in infrastructure – such as campus Wi-Fi and learning spaces (both formal and informal) to support the use of mobile technologies on campus. The evidence for the interaction of the different aspects of mobile learning provision is drawn from student surveys, staff interviews and student focus groups, spanning the years 2013–2015. The analysis is a mixed method one, identifying large-scale quantitative patterns and using more detailed accounts of the participant experiences to interpret these patterns. The result is a context-specific map of how university support systems can grow together. This map may help other universities develop their own integrated and systemic support for mobile learning.

C. Russell (✉)
Western Sydney University, Sydney, Australia
e-mail: C.Russell@westernsydney.edu.au

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22.1 Mobile Learning as an Ecology

This is a case study of the role of mobile technologies in one university's strategy for adapting its learning and teaching systems for twenty-first-century students and technologies. The adaptation involved not just the tools and physical infrastructure but also the forms of the learning activities and the supporting educational and organisational processes.

22.1.1 The Environmental Context

In late 2012, the senior management of Western Sydney University took a strategic decision to invest in substantially enhancing the use of digital learning technologies. Western Sydney University has a higher than average proportion of students from low socioeconomic status backgrounds. It has six campuses across Greater Western Sydney, a region of culturally diverse and growing population. Students (and staff) often travel a long way to reach campus classes. Many students have paid work and family responsibilities. About a third of first-year undergraduate students, 98% of whom are enrolled for full-time study, are doing at least 10 h of paid work a week. So there are clear advantages in providing flexible learning options through access to digital activities and resources. As a key part of the digital learning strategy, the University decided to issue all new undergraduate students with a tablet device.

Accompanied by expanded campus Wi-Fi coverage and network capacity, these lightweight portable devices immediately gave new students easy access to download digital learning resources from any campus location and to use them anywhere. The University's annual survey of commencing students found that more than a quarter had no prior access either to a laptop or a tablet. Those who had access to a laptop at home would not necessarily bring it to campus. In 2012, lectures were already being recorded automatically and provided online. The library was making digital readings available. There was growing use of the online learning management system and widespread use of its basic functions. Until the iPad issue, many students would have to find a space at a desktop computer in a library or computer lab to access these digital resources and activities.

22.1.2 Universities as Complex Systems

Barnett (2000) describes the ways in which universities are complex systems operating in a super-complex environment. Learning and teaching in universities are multidimensional and dynamic. There are diverse cultures and practices. Decisions and processes affecting the development of the whole system happen at multiple levels, from senior executive to individual teachers and students within each discipline. An international study of how large diverse organisations adapted to technological and other changes in the 1990s explains the adaptive process in terms of complementarity theory, which draws on mathematical game theory (Pettigrew and Massini 2003). Any organisational system with distributed decision-making will have complementary subsystems that cannot be changed in isolation. Attempts to introduce a new technology or a new process without changing any of the complementary subsystems will usually fail. The other subsystems, especially if well established and optimised for the status quo, will suddenly become suboptimal and will begin to fight the change to protect their own operations.

Capra (2002) argues that all complex systems, including human organisations, have fundamental properties in common with biological and ecological systems adapting in a wider environment. Mobile technologies are part of the changing wider environment of a twenty-first-century university. This case study describes how mobile devices were part of a broader cultivation strategy, to enable the whole learning and teaching ecosystem to adapt to continuing changes in the twenty-first-century environment. The ecological balance in the university's learning and teaching system shifted after it was seeded with a large number of mobile devices. Then, as the 3-year strategy progressed, the range of mobile technologies available in the external environment also grew and diversified.

22.1.3 A Simplifying Model

Any model of university learning and teaching will never capture its real complexity. But it is possible to define some key components in the systemic changes taking place around mobile learning and to show how these components are interacting and growing together (Cilliers 2001). The choice of components will depend on the focus of the questions being asked. Johnson and Cooke (2016), for example, focus on the individual learner and put forward an ecological model the learner interacting with, and over time adapting to, an online instructional design environment within a university cultural macro-system. In this chapter, the focus is on the university system as a whole rather than how a designed online learning environment works for individual learners. So the map of system components starts from the institutional level. Figure 22.1 represents university learning and teaching as an open (porous) system. This particular model draws on a study of student experiences and expectations of technology, which identified three interacting components in the student experience of technologies in learning (Gosper et al. 2013). Institution-led technology provision (centrally funded facilities and services) supports academic-led technology use (structured digital learning activities and resources), and both influence student-led uses of technology (how students use their own devices to manage study tasks).

The student-led component was covered directly by the institutional provision of a mobile device. But what about the other components in the system? Unless their teachers actively organise new types of digital resources and activities, the students

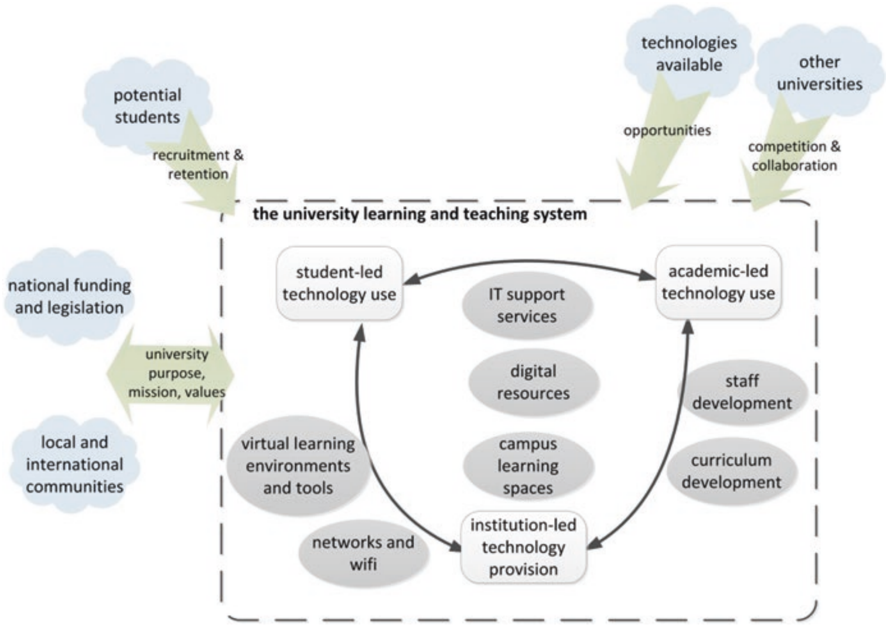

Fig. 22.1 An open system model of technology in university learning

are not going to experience a systemic transformation in their university learning environment.

Teachers were also given iPads in 2013. While some did begin to use them immediately, the plan was to build capacity for full use from 2014. Initially, optimists said that students would help to drive adoption of mobile learning activity by teachers. Cynics said that the mobile devices were just gimmicks that would be a distraction in lectures. These different views of the scope of potential change – which reflect different views of the overall system – mean that it is useful to discuss and evaluate the implementation across the institution as much as possible.

One aspect of technological change in complex human organisations is that it can be challenging to balance localised decision-making with strategic coordination (Achtenhagen and Melin 2003). For example, in curriculum redesign across different disciplines, there will inevitably be unanticipated clashes of priority and perspective to be resolved. In an interconnected system that has settled into a stable mode of operation (for traditional classroom teaching), attempts to change only one part (introducing technology without changing the organisational processes) will lead to resistance and a push to re-establish equilibrium (Whittington and Pettigrew 2003), like homoeostasis in a biological organism. Particularly in universities, negotiation and mutual adjustment between different activities and roles are needed (Russell 2009). Part of this adjustment relies on information flows, to monitor how the system is working. So it is essential to evaluate how the different system components are working together – including institutional academic and student perspectives. The growth of mobile learning at Western Sydney University between 2013 and 2015 provides some examples of how change initiatives and their evaluation can play out in practice.

22.2 First Year, 2013

22.2.1 iPad Launch

The University announced its strategy of issuing iPads to all new undergraduate students and to all continuing teaching staff, in December 2012. At first, the focus was on the logistics of distributing the devices to students taking up offers of a university place and on ensuring that their first experience of using the device was supported. As part of the bulk purchase deal, when students were collecting their iPads on campus, Apple provided staff to help students set up accounts. Wi-Fi coverage was temporarily enhanced to cope with the expected sudden demand as thousands of iPads were activated for the first time. Figure 22.2 shows the warehouse preparations beforehand.

Fig. 22.2 Warehouse with iPads ready for distribution to students

22.2.1.1 Infrastructure

In 2013 the University also began refurbishing campus buildings to provide more flexible learning spaces and to turn 'dead spaces' such as wide corridors into informal learning spaces with tables, chairs, power outlets, screens, etc. where students **could** work individually or in small groups. Even the larger lecture theatres were set up so that teachers could use mobile devices with students. Wi-Fi coverage was improved, as was network capacity.

22.2.1.2 Staff Development

Throughout 2013 there was an intensive programme of staff development, launched at an initial 2-day 'iPad summit' in February sponsored by the Pro-Vice-Chancellor (Education) and with assistance from Apple. The aim was to bring together a community of enthusiastic staff from across the University to share ideas and plan how they might be implemented. All discipline groups were represented, and of the 60 staff there, about two-thirds were teaching academics. There were hands-on sessions, keynote speakers from other universities, panel discussions and networking opportunities. Specific ideas identified to follow up were:

- Interactive digital resources to improve feedback on learning
- Curation and publishing workflows for digital resources
- Using augmented reality apps in learning activities
- Developing new apps to support a flexible curriculum
- Staff development for the use of iPads in teaching
- Evaluating the impact of iPads on learning across the University

All of these were followed up during the year, including a staff development programme. There was a series of discipline-based workshops to share ideas on the use of mobile technologies. The University's annual report noted that, in addition to regular monthly Designing for Learning forums and an end-of-year full-day showcase event:

> Since January 2013, over 65 activities have been conducted across themes such as using iPads/mobile learning in teaching, developing content and learning resources, designing e-assessment activities, and designing for learning. These activities have attracted around 2,000 academic and professional staff. (Shergold and Glover 2014)

There were basic training sessions on how to use iPads in teaching practice. There was a follow-up summit later in the year to review progress. While Apple representatives had been involved in earlier events, as the year progressed, the activities were increasingly organised by University staff alone and tailored to suit local needs within disciplines. Some ideas from earlier events had seeded new activities that could be shared. Other ideas had been less relevant and had not spread within disciplines.

22.2.1.3 Curriculum Development Support

Also during 2013, BLADE (Blended Learning Advisors and Designers) teams were established in disciplines to provide hands-on support for a redesign of first-year study units, initially with central funding. Each of the nine discipline-based schools was required to develop plans for curriculum redesign and to report on the curriculum development progress.

The BLADES formed a network of around 50 staff across the University, in a 'hub-and-spoke' relationship with a small central learning and teaching support team. In discussions with academic staff, the BLADES came across some unexpected barriers to adoption of new technology-enhanced teaching methods. One was the teacher-centred view of learning design that was embedded in some of the academic planning systems. In some instances, teaching work was defined mainly in terms of contact hours. So work on providing digital resources and activities for students to use out of class study time was sometimes not recognised. Many academic departments had allowed staff time for additional curriculum planning and development work, but there was still a lingering perception that the only teaching work that counted was face-to-face 'lecturing'. Although they had no direct influence over academic work allocation processes, the group developed a proposal to clarify the planning of study units. The proposal, which was later accepted by the University Senate Education Committee, was that study unit designs should allocate the students' nominal time between different categories of learning activity within that unit – in class, structured and/or facilitated online, independent study and work-integrated learning (e.g. placements). This effectively redefines the teaching work as student-centred facilitation rather than classroom presentation.

22.2.1.4 Flexible Study Options

In mid-2013 there was an additional spur for creating digital resources and activities. The University introduced a new intensive summer study term for 2013–2014, so that students could catch up missed or failed study units or could take extra units each year to progress faster through their undergraduate programmes. While a few of these summer term study units were run in intensive face-to-face mode, many provided additional learning activities online. New digital activities and resources developed for summer study were then often made available to main semester students too. To help academics plan student activities for the more intensive summer terms, the BLADES group developed a study unit design tool, incorporating the student-centred definition of time spent on different study activities [see http://www.westernsydney.edu.au/qilt/qilt/designing_for_learning/sunset_tool].

22.2.2 Evaluation

In mid-2013, the University began gathering evidence to evaluate the outcomes of its investment in mobile learning, in terms of access to and use of technology-enhanced learning. The evaluation criteria and methods were shaped by institutional learning and teaching priorities, as articulated in the Learning & Teaching Plan 2012–2014:

1. The student learning experience
2. Curriculum innovation
3. Capacity for quality teaching

22.2.2.1 Student-Led Use of Mobile Devices for Learning

To evaluate whether, and if so how, technology was enhancing the student learning experience, the University set up a new annual student survey to collect data on how learning technologies were being used in practice. All cohorts in receipt of iPads were invited to respond (first-year undergraduates only in 2013). The survey asks students about mobile device use, about how often they used different types of online learning activities or tools and what device they normally used for each. It also asks students to:

- Please describe the most important ways that technology has assisted your learning so far this year.
- Please describe ways in which the University could use technology to better support your learning.

Examples of 2013 comments on how technology assists what could be done better:

> The iPad has been the central source of information access for me while in the University. Although I mostly use a desktop at home, the iPad allows me to bring an entire library or collection of my unit books in a single device in uni. I can also catch up with missed lectures anywhere, anytime during my breaks using online videos. Add to that the easy to access lecture notes.
>
> More weekly content available for different units on vUWS [the University's online learning management system]. The units I have performed the best in have had a large array of content such as notes, videos and articles all set out in weekly folders on vUWS. Having the iPad has made it motivating and easy to view this content each week. If more units could take this approach it would better support my learning.

A few of the survey questions were taken from a larger 2010 survey (Gosper et al. 2013). Of the 12,300 first-year undergraduate students, 740 (6%) completed the online survey in 2013. The sample was broadly representative of the population although with slightly greater proportions of female students as is typical in other student surveys.

Comparison of first-year student responses to these same questions between 2010 and 2013 showed some changes. For example, in 2013 more than twice as many students as in 2010 viewed digital video materials provided by teachers at least several times a week, and most were using their iPads for this. Most students reported using their iPads for study in all of their study units. In the students' text comments, a noticeable change from the 2010 survey was that students were much happier with technology use on campus, as they could use their iPads anywhere and did not have to queue to use desktop computers in the library or campus computer labs. However, teachers' reluctance or inability to use technology effectively was still a significant theme in the suggestions for improvement.

While the survey responses showed that students were relying on their iPad tablets for many of the most frequent online learning activities, computers (including laptops) were more widely used for some activities such as library access and assessments.

Two of the survey questions asked: 'For your teachers who used the iPad most/least, how often have they been using it to support your learning?' The response options were 'rarely or never', 'a few times a semester', 'a few times a month', 'a few times a week' and 'at least daily'. The 'least use' responses indicate the extent to which iPad use is spreading to teachers other than the enthusiasts and early adopters, as a proxy indicator for systemic change. Figure 22.3 shows the graph of mean least use scores for different academic groups (most discipline-based schools) produced by analysis using the R statistical package. The scores are averages on a quantified scale of 1–5 representing the range 'rarely or never' (1) to 'at least daily' (5). The vertical bars represent the 95% confidence limits calculated by the software.

The results show statistically significant higher scores for two of the groups. In one of these groups, there was a completely new curriculum already planned for

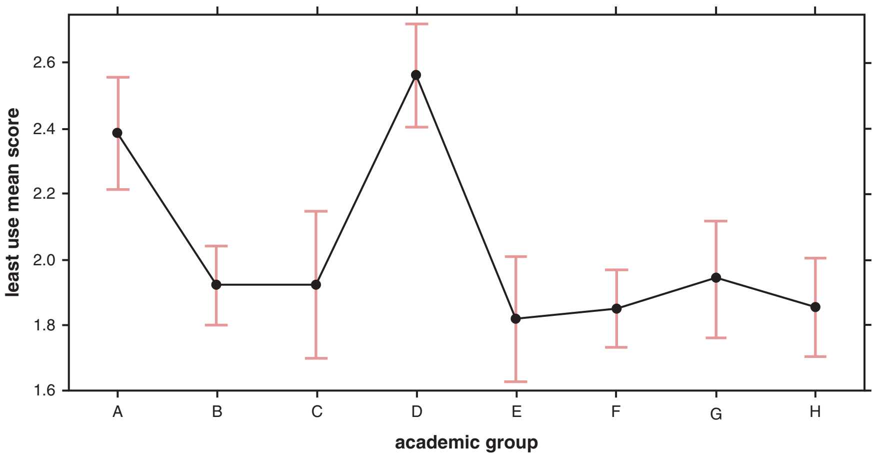

Fig. 22.3 Statistical analysis of teacher use of iPads, by academic group. The scale shows mean responses for least use (with 95% confidence limits) on a scale from 1 to 5 for each group

introduction in 2013. In the new curriculum design, the activities no longer included large lectures. Instead, students used online activities and resources to prepare for small group tutorials and practical classes. The other higher use group had already issued iPads to teaching staff in 2012, so teachers were more familiar with using the devices. These two cases provide some evidence of the influence of curriculum development and staff development in the adoption of mobile learning technologies in teaching practice.

22.2.2.2 Student Focus Groups

In late 2013, there were student focus groups with a total of 50 first-year undergraduate students who had received iPads, with all but one discipline (the relatively small undergraduate medicine cohort) represented. The focus groups aimed to find out in more depth how students were using their iPads for study day-to-day. The students described a few examples where teachers had reworked group assignments so that students now create and submit digital materials for assessment. They also echoed some of the text comments in the survey responses about some teachers struggling with or refusing to embrace new technologies and sticking to 'long boring lectures'. Overall, the students confirmed the value of the iPad for accessing learning resources more flexibly, on and off campus, regardless of their teachers' adoption of mobile learning activities.

22.2.2.3 Staff Interviews

Near the end of 2013, ten members of staff representing a cross-section of disciplines, roles and experience were interviewed. The aim was to gain a staff perspective on the provision of staff and curriculum development support for mobile and online learning. The interviewees included both enthusiasts and sceptics – in order to provide a qualitative picture of what was working well in curriculum and staff development and where there were problems.

One example of a problem was that sessional teachers, who run a significant proportion of the tutorial classes in first year, had not been issued with iPads. Yet the students were bringing their devices to class and expecting the teachers to make use of them. Another was that even the enthusiasts had occasionally come across challenges in using interactive tools in class. One had to stop showing a live question feed from students' mobile devices on screen because some students were posting inappropriate comments about other students. Social rules and behaviour do not always keep up with the technology.

Several of the interviewees were not aware of the level of training and support that was available to them. Those who were interested had sought out help individually. Others had been drawn into curriculum development projects involving support staff. But some had had only a general awareness of the institutional mobile learning initiative and saw no need to make substantial changes in teaching practice. Some expressed a lack of confidence in using mobile devices in class.

22.2.2.4 Conclusions for 2013

The 2013 student survey indicated that the main impact of the (institutionally provided) mobile devices was to enhance student-led technology use. The variation in teacher use of iPads is not surprising, given that in most cases, the teaching staff only had access to iPads, and to support for their use, during semester 1 of 2013. So there had been no time to develop new resources and activities. However, academic-led technology use, in the form of curriculum development work for 2014, was being addressed.

Some of the curriculum development was focusing on new intensive summer versions of study units, for December 2013 to February 2014. The shorter versions in many cases meant a greater reliance on digital resources and online activities to supplement, and sometimes completely replace, face-to-face classes. These digital resources would then be available for use in semester-long versions of the same study units. At the same time, there was work on adapting campus learning spaces to support the use of mobile devices for formal classes and informal learning activity. Figure 22.4 summarises the systemic changes progressed during 2013.

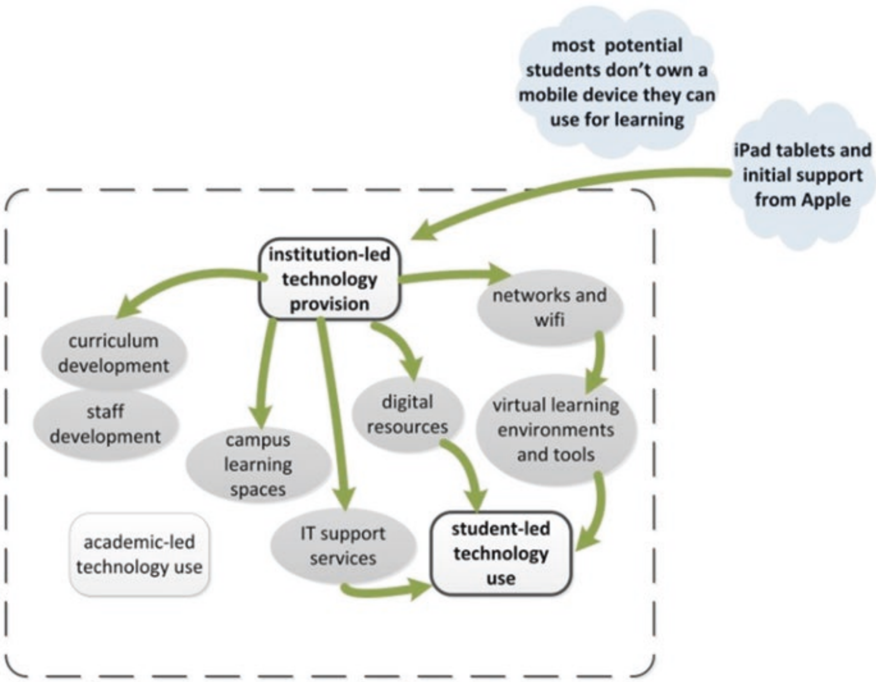

Fig. 22.4 Initial stages: seeding and preparing the ground for mobile learning

22.3 Second Year, 2014

22.3.1 Introduction of Flexible Study Options

In 2014 the University launched Western Sydney Online, which offers fully online degree programmes at the undergraduate and postgraduate level. Some fully online study unit options were also available for campus students. As with the introduction of summer term intensive study modes, the fully online designs added to the pool of digital resources and activities that academics could then make available for main semester campus-based students to access on their mobile devices. A collaboration with the UK Open University provided some of the new study units, which were adapted for use at Western Sydney. Others were developed entirely in-house.

22.3.1.1 Curriculum and Staff Development Support

The number of staff development events specifically targeting mobile device use was less than in 2013, but in 2014 there was an increase in team-based curriculum development activity which included support for more technology-enhanced learning activities, both online and in the classroom.

Curriculum redevelopment work during 2013 had in most cases focused on first-year undergraduate study units for semester 1 of 2014, with additional effort going into summer term versions of selected study units. During 2014, the focus shifted to other years of study, and some teams were also involved in developing fully online study units.

BLADE teams met monthly to compare experiences and were reporting that their credibility within their disciplines was growing as the year progressed. For example, academic responses to offers of help were shifting from 'What's a blended learning designer and why would I want one?' to 'I had an idea and they helped me implement it'.

22.3.2 Evaluation

22.3.2.1 Methods

Evaluation methods shifted in 2014, with more data (qualitative and quantitative) gathered from student surveys. Repeating the student focus groups and staff interviews was not considered valuable. Instead, the University participated in an international benchmarking exercise, along with 23 other higher education institutions, all in the Asia-Pacific Region apart from two large international distance

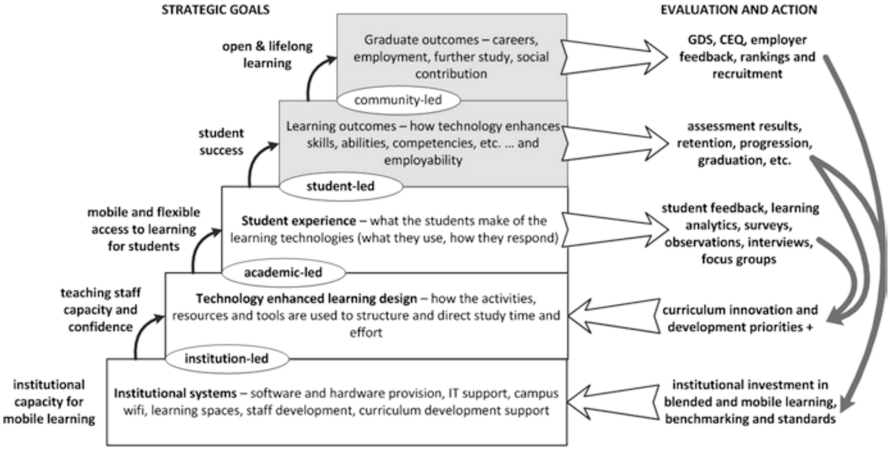

Fig. 22.5 An overview model for evaluating technology-enhanced learning in Western Sydney University (Based on Russell 2014)

universities (Sankey 2014). The benchmarking was run by ACODE (Australasian Council on Open, Distance and E-learning) and involved the 24 participant institutions self-assessing and then comparing their support for technology-enhanced learning. Western Sydney University chose to use three of the available eight benchmarks for its self-assessment exercise. The benchmarks were chosen to complement the student surveys, by focusing on the institutional and academic-led aspects, rather than on the student experience.

An overview model of the evaluation strategy is shown in Fig. 22.5. The evaluation of how mobile devices contribute to learning mainly relates to the lower three steps, especially in the shorter term. In the longer term, the University is looking for measurable results in external measures such as the Australian Graduate Destination Survey (GDS) and Course Experience Survey (CES).

22.3.2.2 Student Surveys

Following dissemination and discussion in early 2014 of the 2013 survey results, the student representatives on the University Senate asked for more specific evidence that students really wanted online lectures to replace face-to-face classes. They said that most students would understand 'online lectures' to include any structured or programmed online learning activity. So mid-year, the University agreed to run an additional student survey to address these student concerns. The survey asked all undergraduate students about their preferences for face-to-face, online or mixed 'lecture' options. The survey also asked students to comment on what 'flexibility' means for them. The responses confirmed that flexibility was

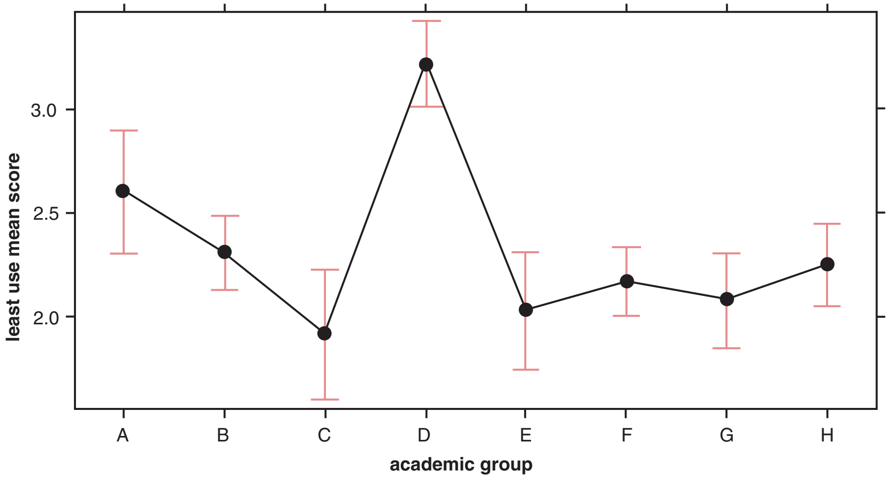

Fig. 22.6 Statistical analysis of 2014 first-year student responses to the question on 'least use by teachers' (Compare with Fig. 22.3)

universally interpreted by current (mostly campus-based) students as being able to choose whether and when to attend campus classes. Thematic analysis of the comments showed that they needed this to manage work and family responsibilities, and for some, it was also about managing the pace of study. So 'flexibility' was closely linked to the accessibility of study as a whole.

In 2014 the annual Commencing Students Survey, run early in the first semester to capture new students' first experiences of the University, introduced some new questions about technology access and use, including some explicitly on iPads. These surveys provide both quantitative (multiple choice question responses) and qualitative (text comment) evidence.

All first- and second-year undergraduates were invited to complete the same Blended Learning Survey as was run in 2013. This time, there were 1285 respondents from first year (9.6% response rate) and 699 from second year (8.9%).

The 2014 responses showed an overall rise in the 'least use' frequency score. The groups with lower scores in 2013 now had score indistinguishable from the highest two in 2013 (Fig. 22.6). The highest scoring group, where the curriculum had been redesigned, was even higher. This provided some circumstantial evidence that curriculum development and staff development support throughout 2013 had increased all teachers' use of mobile technology in learning activities in 2014.

As in 2013, computers (including laptops) were being used more often for some activities than tablets. But it was clear that the tablets were contributing significantly to flexible access to online learning activities and resources. One interesting result from this survey was that students were using tablet devices less in second year than in first year for some activities (Fig. 22.7). This was particularly noticeable in some disciplines, such as engineering, where the use of specialised software tools is more common.

Fig. 22.7 Devices used for online activity in 2014

22.3.2.3 Benchmarking Support for Technology-Enhanced Learning

The benchmarking performance indicators showed relative strengths in the overall institutional planning and in support for curriculum and staff development. However, the self-assessment raised some questions about how the staff and curriculum development outcomes were being evaluated.

22.4 Third Year, 2015

22.4.1 Developing Institutional Systems

In early 2015, Western Sydney University launched a new strategic plan for 2015–2020 (Shergold and Glover 2015). The plan has a central goal of being a distinctly student-centred university, using 'learning environments rich in technology'.

In 2015, a project to develop the 'virtual synchronous learning environment' was begun, involving:

- The introduction of a new video conferencing service (Zoom) to provide high-quality secure synchronous links between individuals and classrooms in any location

- Equipping campus teaching spaces with easy to use synchronous connectivity, to enable cross-campus interaction between students and teachers and to involve remote students and teachers
- Setting up cloud-based large-capacity systems for managing digital resources produced by students and staff

Together these three components are aiming to address some of the concerns expressed by staff about security and reliability in the use of public web services such as Skype and YouTube as workaround solutions when designing digital learning activities, especially for large groups. They also enable easy links outside the campus – with students and with professional communities.

22.4.1.1 Feedback from Staff and Students

Evaluation of technology-enhanced learning continued. This included the annual student survey on blended learning in September, this time surveying all undergraduate students, but without the extra questions on study modes and flexibility requested by students in 2014. Also, given the questions raised about the outcomes of staff and curriculum development, there was another round of staff interviews in 2015, to compare with the 2013 interviews.

22.4.1.2 Closing the Feedback Loops

There were also moves to improve the information available to individuals and teams working on curriculum development. While reports summarising student feedback on technology-enhanced learning had been provided, it was not clear how effectively these were at reaching and influencing those doing the curriculum development work.

During 2015, in discussing the results of the 2014 survey on study modes and flexibility, the student representatives on the Senate Education Committee asked that there be a regular formal review of the student experience of technology-enhanced learning.

By the end of 2015, the Senate Education Committee had approved a formal annual reporting process, where all the data relevant to the student experience of online and mobile learning is compiled into an annual report. The report will draw on multiple sources and types of data, both quantitative and qualitative, and present evidence-based recommendations about priorities for the coming years.

22.4.2 *Evaluation*

22.4.2.1 Student Surveys

The methods used to analyse the text comments in the 2013 and the 2014 survey responses included thematic analysis using manual and semi-automated text coding to identify common themes arising. In early 2015, these initial thematic analyses were used to update the automated text analytics programming in the data dashboard, to identify comments related to the use of mobile and online learning technologies. Since the same text analytics programming is used across all student survey comments, we can now pull out relevant comments on learning technology from all student surveys.

The Blended Learning Survey in September 2015 covered all undergraduate students and showed some shifts in the patterns of device usage for different types of learning activity and at different stages of study. There were a total of 2375 responses, of which 950 were from first-year undergraduates and could be directly compared with responses from 2013 and 2014.

Since the beginning of 2015, the student survey data has been available for viewing through an institutional data dashboard, so that academic groups can draw out what they need to inform curriculum design. Users can select their own school (discipline) group and can show results for different survey years to track longitudinal changes.

Figure 22.8 shows the dashboard display for questions about the perceived value of iPad tablets for learning across the University for 2015. The students in their fourth or later year of study would not have been given an iPad.

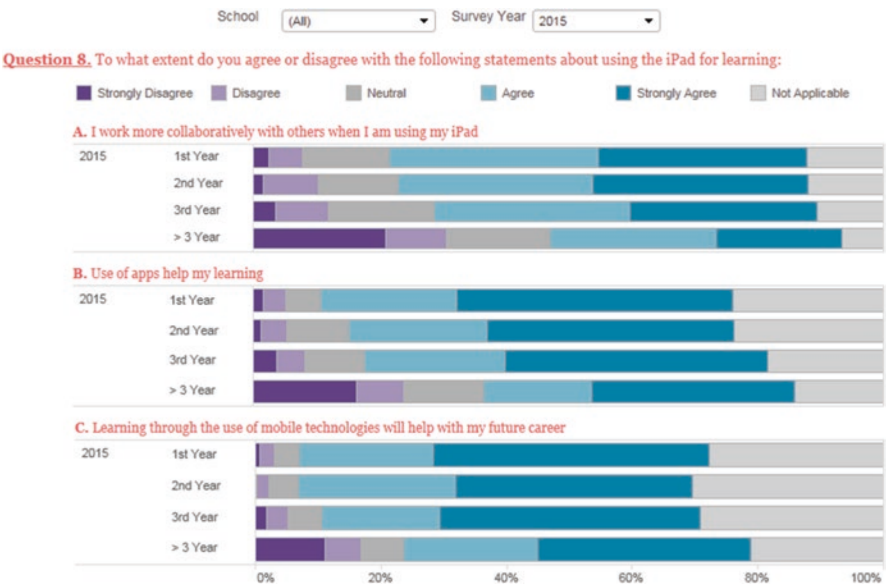

Fig. 22.8 Data dashboard display of 2013–2015 student responses on the value of iPad

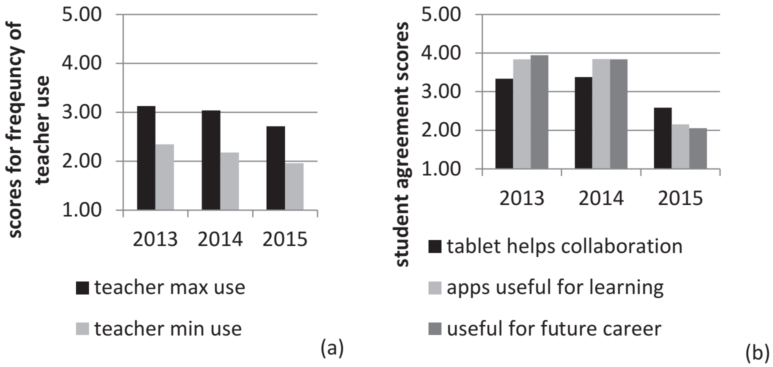

Fig. 22.9 Longitudinal changes in (**a**) teacher use and (**b**) student valuing of tablets

Figure 22.9 compares responses from first-year students who receive iPads in 2013, 2014 and 2015. Figure 22.9a shows scores for frequency of teacher use of tablets averaged across all disciplines, with 1 representing ‘rarely or never’ and 5 representing ‘a few times a day’. Statistical tests showed that the drop between 2013 and 2015 was significant (at 95% confidence limits). Figure 22.9b shows averages for multiple choice responses converted into a score between 1 (strongly disagree) and 5 (strongly agree). Both students and teachers were less enthusiastic about iPad use in 2015.

22.4.2.2 Interpreting Changes Since 2013

The more detailed questions in the survey reveal what may underlie the drop in students valuing of iPads for learning. Figure 22.10 shows that the percentage of students using different online activities as part of their formal learning was steady or rising. There also appears to be more use of interactive tools and sharing, as distinct from merely accessing digital information. So the learning activities that the iPads supported had been maintained or increased, but the use and value of the iPads had declined.

The device use feedback helps to explain this. It shows a shift to from tablets to smartphones for several of the more frequent activities (Fig. 22.11). Larger screen smartphones (sometimes called ‘phablets’) have become more widely available since 2013, and this may explain the shift and the perceived drop in the usefulness of iPad tablets.

There were other changes in the mobile device options available, such as an increasing variety of tablet devices running Windows or Android systems and hybrid devices with touchscreens and detachable keyboards. Students and staff may be becoming more aware of these as alternatives to the iPad.

In 2015, over 900 of the survey respondences from first-year students included comments on how technology helps learning and how the University could better

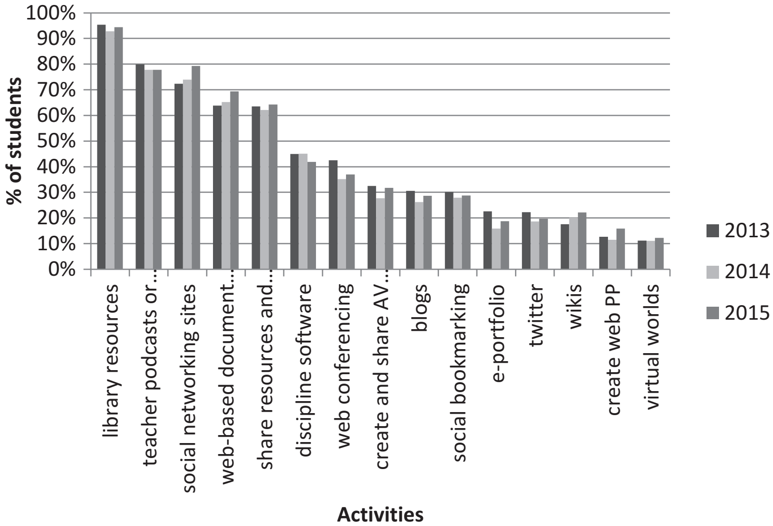

Fig. 22.10 3-year comparison of online activity use

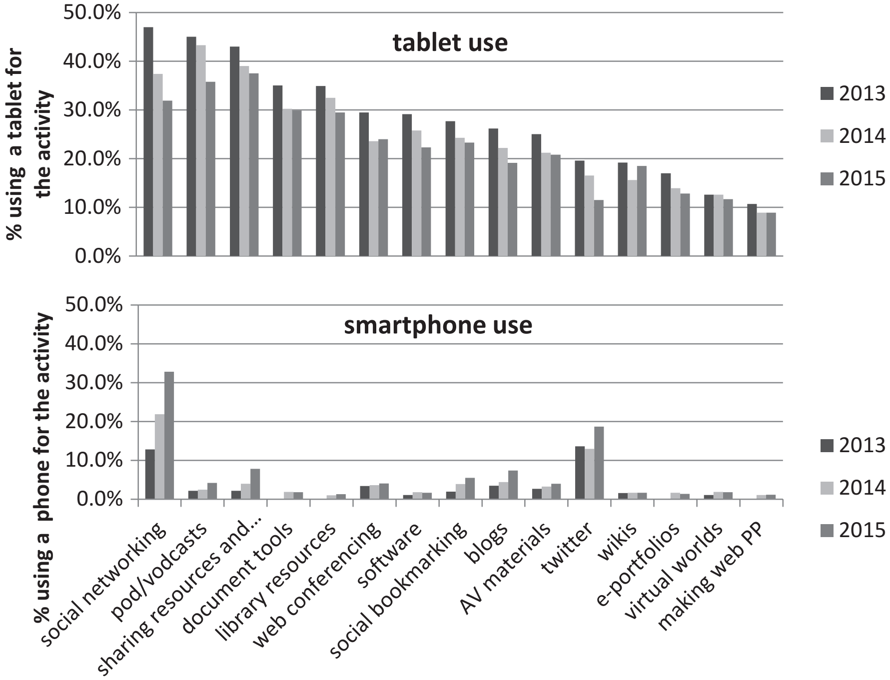

Fig. 22.11 2013–2015 shifts from tablet to smartphone use for formal learning activities

Table 22.1 Themes identified in student comments on tablets

What helps	% of comments	Improvement suggestions	% of comments
Access to digital resources and information	36%	iPad incompatible with learning resources or online systems	42%
Portability and ease of use	26%	Teachers not using the technology effectively or consistently	30%
Useful for classroom or online learning activities	22%	Laptop would be more useful than iPad	18%
Others (e.g. communication, organising study)	16%	Campus facilities for mobile device use could improve	9%

Table 22.2 Academic-led aspects of technology-enhanced design

Academic-led themes	No of refs in 2013	No of refs in 2015
Assessment and feedback	32	24
Learning activity design	27	42
Digital resources provided	20	24
Staff workload	17	10
Academic peer interaction	16	8
Evaluation evidence	6	19
Sessional teachers	5	7
Flexibility	3	4
Fully online study	2	13
Summer term	1	8

support the use of learning technologies. About 20% of these comments (both positive and negative) specifically refer to iPads or other tablets. Table 22.1 shows the results of a thematic analysis of the comments containing references to iPad tablet use, with the frequency (i.e. number of respondents) commenting on each theme expressed as a percentage.

22.4.2.3 Staff Interviews

In 2015 there was a second round of staff interviews, with five of ten interviewees also having participated in the 2013 interviews. The interview records were manually coded using NVIVO software, for themes related to academic-led, institution-led and student-led uses of technology. Table 22.2 compares 2013 and 2015 references to the most frequent themes related to academic-led aspects of

Table 22.3 Institution-led aspects of technology-enhanced learning

Institution-led themes	No of refs in 2013	No of refs in 2015
iPads	30	19
Staff development	29	19
School-based support	20	25
Curriculum development drivers	15	9
Infrastructure	13	19
Software tools	12	20
Central support services	7	12
Planning and funding	4	6
Digital content management	3	6

Table 22.4 Student-led aspects of learning technology

Student-led themes	No of refs in 2013	No of refs in 2015
How students use technology	20	18
Feedback from students	12	6
Student IT skills	9	0
Social media	8	6

technology-enhanced learning. Table 22.3 compares the 2013 and 2015 references to institution-level support for technology-enhanced learning. In 2015 there was more emphasis on learning activity and evaluation and less on individual teaching skills and devices (including iPads). The results also reflect the introduction of summer terms and fully online learning options, which are a driver for curriculum change more broadly. Table 22.4 indicates staff references to student-led aspects of technology use.

The following quotes from (the same) discipline-based support staff member in 2013 and 2015 indicate the quality of the changes around mobile technology use in the classroom.

> There isn't a lot of structured learning activity around use of iPads. So it's mostly incidental, where students are using it as a learning tool. Some academics developed structured activities around iPads, but not that many. [2013]
>
> We're using Nearpod a lot in the … practical classes. We get involved with the content expert in developing these, and with the tutors delivering the sessions. So I get to see how they're using the iPads in sessions. I'm starting to see different use of the space by tutors. They travel round the room much more and speak to groups and individuals. And the students are talking to each other more, doing drawing tasks. It used to be much more 'stand and deliver'. [2015]

Overall the 2015 interviews reflect a more assured approach teaching with technology, with mobile devices becoming a part of the routine mix rather than a novel challenge. While academics are becoming more individually confident, they are also becoming more aware that there is support available from the discipline-based BLADE teams and are more interested in evaluation. There are a few remaining challenges – including variable experiences of working with support teams and lack of time or skills to evaluate their innovations.

The staff interviews in 2015 partially addressed some of the questions raised in the 2014 benchmarking assessment, about the need to evaluate staff development and curriculum development support.

22.4.2.4 Follow-Up Actions in 2016

A new city campus is being built in central Parramatta, a suburb of Sydney, and will incorporate state-of-the-art learning spaces designed to facilitate multiple types of small group collaborative learning activity. Central to the design of the classroom spaces is the principle of mobility and flexibility in sharing information. The room supports teachers moving about the space and able to manage multiple displays from mobile devices, and there are plans for piloting learning activities for the new spaces during 2016 for 2017.

From 2016 the University is adopting a multiple device policy to accommodate different discipline needs. Some cohorts are still being issued with iPads, but others such as engineering and business will now receive laptop computers that can run specialist software. Others have chosen Windows tablets. While the 2015 student survey data supports this decision, preliminary trials of alternatives to iPads were underway before the survey results were available.

During 2015, the University approved funding for discipline-based BLADE teams for a further 3 year period – recognising that the pace of innovation is not slowing and that academic staff will need continuing support.

A repeat of the ACODE benchmarking exercise in mid-2016 is another opportunity for a systemic self-assessment review of the University's support for technology-enhanced learning, including student and staff use of mobile devices.

22.5 Reflections

After 3 years, nearly all undergraduate students at Western Sydney University have been given a mobile device to help access digital resources and activities, on and off campus. We have evidence of how this initiative facilitated the student-led use of technology for learning and was supported by institutional and increasing by academic-led technology provision. The process has been one of continual adaptation both to changes in the externally available technologies and to learning from experience and evaluations within the University. The adaptation process continues.

22.5.1 Students' Use of Mobile Devices

Student surveys showed that the most widely used digital activity associated with formal study is the use of library digital resources (Fig. 22.10). For this activity, tablets have been used less than computers, although there is a small but increasing use of smartphones. The same trend has been found in other studies internationally. A comparative study across Hong Kong, Taiwan and Japan (Ko et al. 2015) found few differences in mobile learning use among undergraduate students, although there was more use of smartphones among students from Hong Kong. That study, like the analysis of Western Sydney student comments in Table 22.1, identified incompatibility with institutionally provided online resources and systems as a barrier to the use of mobile learning. Another study by ECAR (Dahlstrom et al. 2015), predominantly in North America but including higher education institutions in other regions, found that for the first time in 2015, smartphone ownership among students (at 92%) exceeded ownership of laptops (91%), with only 2% of students not owning an Internet-capable device and the majority owning several. The ECAR report also presents evidence that students still prefer laptops for some activities but comments that:

> … this may not be the case for long. The digitally fluent next generation of college students could have a touchscreen mentality and the digital dexterity to use smartphones as their only computer. Because far more undergraduate students own mobile devices (smartphones, laptops, and tablets) than the general adult population, higher education is in a unique position to leverage these devices as productivity tools, as assets for learning, and as administrative or transactional resources. (Dahlstrom et al. 2015, p. 13)

Although the student surveys show a drop in perceived usefulness of iPad tablets in 2015 (Fig. 22.9), this could reflect a shift to using other mobile devices, rather than a lessening enthusiasm for mobile learning overall. In particular, there has been a shift to smartphones for communication and social networking around study (Fig. 22.11).

22.5.2 Academic-Led Use of Technology

The ECAR study also suggests:

> … that the greatest current impediment is probably undersupported faculty. Faculty need reasonable evidence about which technologies most benefit students, and they need help incorporating those technologies into their teaching. Help students learn by helping faculty teach with technology. (Dahlstrom et al. 2015, p. 35)

At Western Sydney University, this problem was identified in a qualitative analysis of student survey comments from 2010 (Russell et al. 2014). Since then there has been a concerted effort to address this, through investment in support for professional development and curriculum development. The benchmarking exercise in 2014 indicated that the University is ahead of the game in this respect. The staff interview data shows that there has been some progress as a result but with some challenges remaining. In particular, there is more work to be done on closing the feedback loops so that teaching teams are better able to base their decisions about technology use on reliable evidence of benefits for the student learning experience.

One of the University's strategic goals for curriculum development is to:

> Transform its teaching and learning environments by integrating digital technologies with innovative curricula and work-integrated learning (Shergold and Glover 2015)

Mobile learning devices are already playing an important role in those disciplines using work-related activity in the curriculum. For example, in health disciplines, students are using tablets while on clinical placements, to access reference materials, record notes and report back to peers and teachers. Students are able to use tablets to gather and collate information from field visits or other activities in work settings. As mobile devices become more integrated into university learning activities, they will help to break down the divide between classroom theory and work practice. From the other direction, there is evidence of increasing adoption of mobile learning among employers, to provide ongoing professional development and training (Skillsoft 2015).

22.5.3 Institutional Technology Provision

Current students at Western Sydney University clearly benefit from being given a device. However, growing ownership of mobile devices in the broader community and increasing use in local high schools may mean that a BYOD policy will become more appropriate – especially if there is some continuing provision for students who still lack a device. Since 2014, the regular survey of commencing students at Western Sydney University has included a question on device ownership before coming to university and home access to computing. In 2015, 75% of new students had home Wi-Fi, and 78% had access to a computer at home, with no differences between students identified as low socioeconomic status and others in this respect. About a third said they already owned a tablet device before coming to university. These trends will be tracked longitudinally for changes. The ECAR report (Dahlstrom et al. 2015, p. 20) suggests that (in the USA) lower socioeconomic status students are, if anything, more dependent upon and comfortable with mobile device use.

Nevertheless, even if the same pattern applies to Western Sydney University, for now, there are still benefits in continuing to provide students with a mobile device that is suitable for study in their discipline, whether a laptop or a tablet. Knowing that all students have access to a particular type of mobile device will also make it easier for teaching staff to ensure that digital resources and activities are accessible.

The University has been investing in infrastructure to support the use of mobile learning and will be continuing to build this. The infrastructure includes growing Wi-Fi and network capacity, institutional software and web services and technology-enabled physical learning spaces. There is growth too in the associated helpdesk and training support for students and staff using the institutional systems. As in any growing system, some parts will outpace others and this can lead to problems. In 2013, there was evidence of an inevitable lag between the use of mobile devices by students and the academic-led provision of digital resources and activities suitable for mobile devices. The qualitative data from the 2015 student survey (Table 22.1) indicate that some problems remain in this area. Allowing academic discipline groups to choose what device is issued to their students may help. Some students also ask for better campus facilities for mobile device use, such as more charging stations. So supply may not be keeping up with demand in this respect.

As with the academic-led use of technology, there is a need for continued monitoring and feedback to inform and adjust the institutional priorities for technology provision. In particular, mobile device ownership and use for learning will need to be tracked and the device issue strategy reassessed annually.

22.5.4 Evidence for Transformation

The surveys, focus groups and interviews were part of a mixed-method approach to the evaluation of the use, value and experience of mobile devices as part of the broader institutional strategy for technology-enhanced learning. The evaluation combined qualitative and quantitative analysis. Patterns evident in the quantitative responses were explored further through a thematic analysis of the text responses to the open-ended questions. Figure 22.12 summarises the evaluation data collection and analysis methods in relation to the relevant strategic goals.

The quantitative responses have been collated and presented visually to identify patterns across and between disciplines. In some cases, statistical analysis has

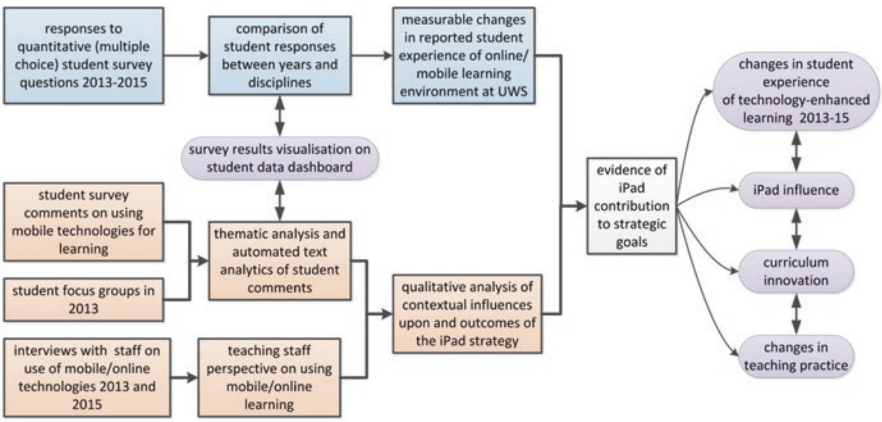

Fig. 22.12 Summary of methods used for evaluating the mobile learning strategy in relation to strategic goals

shown where these apparent patterns are significant. The student focus groups and staff interviews in 2013 provided some deeper and contextualised explanations from student and staff perspectives on how, when and why they are using tablet devices. We are therefore building a fairly detailed picture of how students and staff are using tablets and also on where, when and why they prefer to use other devices such as laptops or mobile phones.

We also have other routine survey data, such as text comments in the Student Feedback on Units, which can be mined for references to students' experience of mobile and online technologies in learning.

The annual survey on students' experience with iPads and technology-enhanced learning more broadly is to be continued annually. The results can now be loaded into the student survey data dashboard for immediate use within disciplines and at the institutional level. However, experience thus far indicates that academic teaching staff within disciplines often lack the time, and sometimes the skills, to make effective use of these data. Much of the evidence available remains unused.

The plans for an institution-wide annual review of technology-enhanced learning should support more systematic evaluation and continuous improvement. This will include evaluation of how mobile learning methods are being integrated into curriculum design and supported by physical and virtual learning spaces, formal and informal.

Figure 22.13 summarises the main components of the University's mobile learning system as developed in 2015. Support for staff development and curriculum development, in the form of the BLADES network, has been funded for the next 3 years. Curriculum changes are still underway and are now reaching through all stages of study. Summer terms and online programmes are enhancing flexibility in study mode options for students. New technologies are being brought in to support and help manage student digital activity. No longer are students just passive consumers of digital materials. They are increasingly creating digital products as part of their assessed learning.

The strategic goals identified in the University's strategic plan for 2015–2020 include continuation of the priority themes in the Learning & Teaching Plan for 2012–2014 but with a more explicit identification of the role of technology. Table 22.5 maps the goals to evaluation evidence that has been and will continue to be collected.

22.6 Conclusions and Implications

22.6.1 Levels of Strategy and Evaluation

The pyramid model of technology-enhanced learning shown in Fig. 22.5 identifies some overarching goals, in terms of the outcomes for the University's graduates and their future contribution to their communities. This case study has focused on how

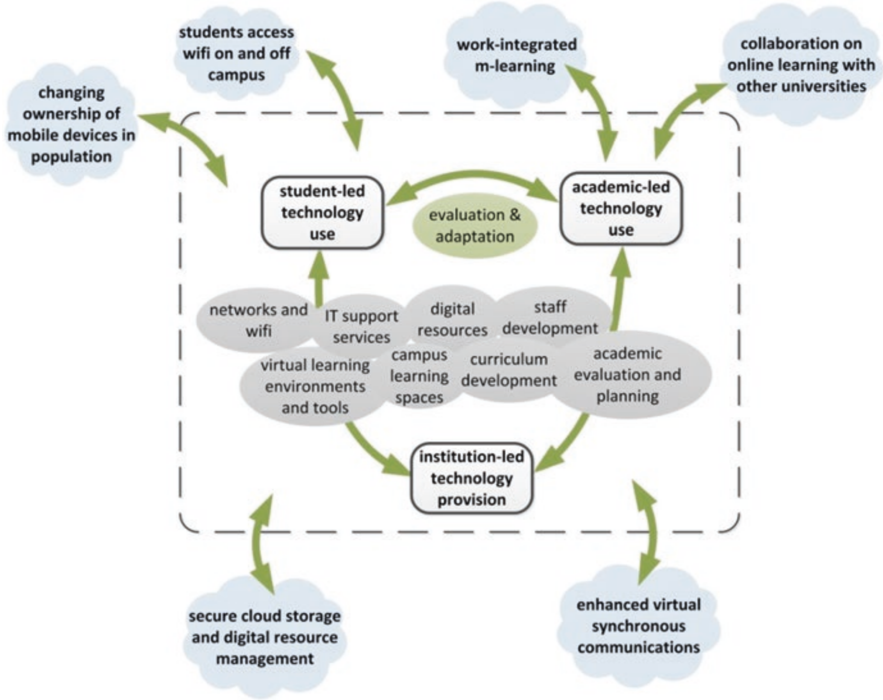

Fig. 22.13 Main components of the Western Sydney University mobile learning system

Table 22.5 Summary of evidence of how mobile learning supports strategic goals

Strategic goals	Evidence
Student experience Transform teaching and learning environments Use technology innovatively	Annual student surveys Growth of all components of infrastructure (technology-enabled learning spaces, campus facilities for mobile learning, software, web services, Wi-Fi and network capacity) Published evaluations of mobile learning innovations
Curriculum innovation Integrate digital technologies with innovative curricula Expand flexible and creative modes of course delivery	Monitoring of curriculum redesign activity and introduction of technology-enhanced learning activities Evaluation of staff development and curriculum development support services and systems Growth in availability and uptake of fully online and blended study options
Teaching quality Build staff capacity to support active learning	Availability of and participation in professional development activities for teaching staff, in the use of mobile and other technologies for learning Staff interviews and student survey data on staff use of technology

institutional support for mobile learning activities can be built up systemically to support these outcomes. In the Western Sydney University context, there was a need to build better institution-wide systems to provide access to digital resources and activities – starting with hardware, IT services and infrastructure. The decision to issue mobile devices to students was shaped by the geographical multicampus context and by the demographics of the students. But institutional support goes beyond learning spaces, hardware and software. It includes human resources to support technology-enhanced learning: staff development and curriculum development. Ultimately the rationale for investing in these comes from the top of pyramid – the benefits for students and graduates that take some time to realise.

Over the 3 years in this case study, there has been continuing use of feedback from students and staff who have been using mobile learning technology as part of their campus-based learning experience. Teaching staff are becoming more confident, and the immediate benefits for students in terms of flexible access to learning are clear, even if it is too early to confirm the longer-term, higher-level outcomes.

Evaluation feedback loops are being embedded into the institutional systems at different levels as the use of mobile learning technology grows. At the institutional level, changes in annual student feedback about the devices they prefer are shaping decisions about the devices provided. This will continue, and the evaluation methods will shift as new technological tools become available and as new questions arise. One example is the increasing use of learning analytics to link patterns in students' technology use with learning outcomes, which can be used to inform learning designs.

22.6.2 The Wider Context

The growing mobile learning activity at Western Sydney University shows how a systemic cultivation model can be useful for understanding the complexities of change in a university learning and teaching system. There was strategic intent, planning and resourcing. But the introduction of iPads was more like planting seeds in a forest clearing than simply planning and engineering a change. The seeds took root and developed niches in some places faster than others because the ground had already been prepared. Illumination, irrigation and fertilisation were arranged through staff development, curriculum development and infrastructure development. Students began to expect universal Wi-Fi coverage on campus (most have it at home). Their teachers are now expecting to talk less and interact more with students, using digital tools as needed in and out of class.

As the growth patterns are becoming established and other species of device are emerging as a necessary part of the mix, the garden is starting to take shape. New physical learning spaces are now being established, expanding the ground available for growth of learning activities facilitated by mobile devices.

Universities across the Asia-Pacific Region will differ in their environmental contexts and therefore in the way that the internal support for mobile learning is configured. Western Sydney is a multicampus university serving a growing population with a high proportion of students from low-income backgrounds. The challenges for providing mobile learning infrastructure are different from those in an affluent single-campus city centre university. However, there are a few common contextual influences, such as the increasing use of mobile technologies among the broader population, wider availability of cloud-based services and improving wireless and telecommunications infrastructure. Among students worldwide, there is a shift towards owning multiple devices, including smartphones and using all of these for study. In the longer term, the availability and affordability (and wearability) of mobile devices will grow, and with these the demands placed on universities to support their use in formal learning activity. There are predictions that mobile phone technology with built-in sensors will soon become a 'cognitive platform', able to process massive multisensory data (Pei et al. 2015). For those in cities in the developed world, existing smartphones with GPS can tell when the next bus is coming, where to find the nearest coffee shop and how far the user has run, cycled or walked each day. Applications such as reality mining and social context learning will continue to change the way everyone, and especially university students, interact with and make sense of the world. The idea that mobile learning is somehow additional to and separate from learning in general is already becoming obsolete.

One clear message from this case study is that higher education institutions need continually to gather, analyse, disseminate and respond to evidence of changes in the way students are using mobile devices to support their learning. In a complex adaptive (living) system, there will always be dynamic imbalances that drive the processes of change and growth. So it can never be perfect. There will be time lags between the signals that change is needed and the response. Sometimes this may be desirable, to maintain stability. The main challenges in evaluating and adapting university learning and teaching systems are in connecting evidence from the student experience with academic curriculum development activity. Without healthy feedback systems, the academic-led component of the technology provision will lag too far behind and become detached from students' use of technology. Western Sydney University is making some progress on this front and has plans to continue.

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Chapter 23
Rethinking BYOD Models and Student's Control

Boris Handal, David Marcovitz, Robert Ritter, and Daniel Madigan

Abstract This chapter presents a conceptual model representing bring your own device (BYOD) modes and their relationship to students' control of an instructional task and their orientation to learn. The model argues that student control is a function of the degree of prescription on the specifications of the device to be brought. Operating system (OS) and technical specifications (TF) represent the two main variables that influence decisions taken by educational institutions such as schools and universities. The combination of these two variables with degrees of freedom/restriction provided to the students results in four spaces with their own instructional, curricular and logistic challenges. It is argued that spaces closer to providing students total freedom in selecting their device will result in more student-centred environments as opposed to locked-down models, which seem to embed educator centredness. Student's age, however, will catalyse the model because cognitive developmental reasons require structured tasks, making common software/hardware preferable for younger students and therefore less choice in selecting their own device. This pattern is extended to university students who need to be provided with

B. Handal • D. Madigan (✉)
The University of Notre Dame, Sydney, Australia
e-mail: boris.handal@nd.edu.au; daniel.madigan@nd.edu.au

D. Marcovitz
Loyola University Maryland, Baltimore, MD, USA
e-mail: marco@loyola.edu

R. Ritter
University of Alberta, Edmonton, AB, Canada
e-mail: britter@ualberta.ca

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more choice for both device selection and instructional strategies. The recommendation of either various or just one particular device also influences students' learning behaviour, making instruction either more self- or more educator-directed. The chapter recommends that Asia-Pacific educators open their classroom to a more embracing and diverse range of devices.

23.1 Introduction

Mobile devices are wonderful tools because of their capacity to bring the online world to schools' and universities' classrooms. At their fingertips, students can now access virtual libraries and museums and communicate with peers and other educators around the world while being on the move. They can also and at low cost render their assignments in digital formats like wikis, blogs, electronic books and videos. Through simulator and emulator mobile applications, students can engage in complex calculations, get involved in discovery learning and exploration and participate in multimedia scientific experiments whose enactment in real-life situations would endanger their very own safety (Handal et al. 2013a).

Mobile devices also narrow down the gap between formal and informal knowledge, one where the individual and the technological artefact stay closer in space and time to the point that subject and object interface not only at the transactional level but at the personal level as well. These are tools being predicated by schools and universities for their educational power but not so much for the fact that from their very beginning, mobile devices were designed for communication and to facilitate and organise people's lives. Through mobile devices, personal and social needs for immediacy and communication are simultaneously addressed, "anytime, anywhere" (Pachler et al. 2010). Some might object that the devices have become so intrusive that phobias like nomophobia ("no mobile phone phobia") and "fear of missing something" (FOMS) have gripped people's lives, but the reality is that seamless integration between the personal and work has been attained and is here to stay for good. These fears become most relevant when all that educators do with the devices is use them as substitutes for the same educator-centred learning that was done without them, and they fade into the background when students are working on authentic student-centred tasks.

More importantly, due to their multimedia and online collaborative capabilities, these tools have empowered the ordinary individual to become the publisher of his/her knowledge and understandings. From being traditional consumers of knowledge, students are increasingly becoming producers of knowledge because these tools allow anyone to create multimodal products that can be put online, publicly and for free, for the world to see. These tools also have a democratic power because students have become virtual communication stakeholders through social media outlets, thus competing with powerful printed outlets like newspapers or magazines or even with richer media like radio and television. The digital revolution is certainly disrupting an elitist old order to make it more inclusive and democratic.

23.2 Literature Review

23.2.1 The BYOD Revolution

BYOD appears to be an emerging trend in the way educational institutions are coping with the positive disruption that mobile technology has brought to the curriculum in either schools or universities. It places the ownership of the device and its affordability in the hands of parents and students as opposed to the last decade when governments purchased laptops, for example, when the Australian government purchased laptops for each 9–12 students, known as the Australian digital revolution (Rudd et al. 2007). With BYOD, not only the purchase cost is shifted to the student but also other "hidden costs" associated with maintenance, troubleshooting and licencing. The BYOD model comes from the business culture where employees are allowed to use their own personal mobile technology to access, store and interact with corporate information regardless of working hours or geographical location.

In many of the earliest 1-to-1 programmes, the debate around school-/university-owned versus student-owned laptops involved discussions on the pedagogical goals of mobile learning programmes, a baseline minimum of technical specifications, digital citizenship and sometimes cost sharing. What the debate seems to miss is the element of personalisation enshrined in the principle that the consumer decides what is best for him/her. On a fundamental level, this helps shift from an educator-centred model to a student-centred model.

It has been asserted that when an educational institution, either a school or university, prescribes students the characteristics of the device to be purchased, it should take into account the norms and practices of students' everyday lives as well as social and cultural practices (Pachler et al. 2010), including the acceptance that students will not only engage with technology at their ability level but also will energise the medium further to create their own artefacts and their own thinking. In the process of establishing a personal relationship between them and their gadgets, with their own curiosity and interests, students reclaim the right to be consulted about choices.

23.2.2 The Student Versus Educator Centredness Debate in BYOD Programmes

The decision about which model to use has implications on the teaching environment. Sweeney (2012) suggests that the more standardised the device is, the more controlled the teaching environment would be. Educators will create learning experiences where all students will undergo structured activities through accessing common software. Conversely, less standardised tools will force educators to create more open-ended tasks where the possibility for authentic learning is provided.

Similarly, the government body responsible for schools in New South Wales (NSW), Australia, the Department of Education and Communities (NSW DEC 2013, p. 1), observes that pedagogy and technology are intertwined and notes that device standardisation will have implications on the type of learning environment to be enacted:

- In a teacher-centred learning environment, the BYOD model should focus on students having the same software and desktop experience, with either a single standard device managed by the school or a controlled range of devices.
- In the student-centred learning environment, far less standardisation and control are required. Some devices (e.g. laptops) are able to carry out more tasks than others. The potential for their use in pedagogy needs to be carefully assessed before decisions are made.

In general, BYOD approaches belong to a philosophy that is rooted in the user's personal interests and relevance. Students, as owners of their devices, buy them not only for school or university purposes but also for their own information and communication needs. This implies that the mobile learning drive should not revolve on particular applications (apps) because such an approach will be more likely to create closed-ended tasks restricting students' cognitive possibilities. Instead, mobile learning tasks must contain few elements of structure so that higher-order thinking and creativity can be stimulated. Under such considerations, the technology itself has no bearing on the educator's ability in creating meaningful learning experiences where student-centred processes, such as transformative learning, are enacted as much as possible (Puentedura 2006).

By being invited to participate with the device of their choice, students have inadvertently been given a strong say as to how they go about the instructional task. Such an empowerment might be seen as educators sharing their traditional total ownership of the lesson with their students. Thus, the educator's role has moved from the "vessel-filler" or "facilitator" role to one where she/he is required to negotiate the task design and perhaps the learning outcome itself, reaffirming the user centredness of the mobile tool while fostering authentic learning (Wong 2012).

Control over the content of a digital-based lesson is determined by the degree of command held by the learner over the application. Students' control over their digital tools has been emphasised by the literature as central to enhancing learning (Alessi and Trollip 2001; Handal et al. 2013; Kurz et al. 2005). Such a body of research recommends that more freedom over the device should be provided to the student through higher-order-thinking activities involving problem-solving and discovery learning in contrast to repetitive tasks. Tasks that require students to construct their own knowledge, embedding ambiguity, risk-taking and nonroutine scenarios, are more apt to engage pupils in deep learning. In contrast, closed-ended activities rigidly structured by the educators are more likely to engender superficial learning (Biggs 1987). The lack of sound mobile learning pedagogies, professional development and research can certainly exacerbate these tensions (Kearney et al. 2012) because educators can find themselves in unchartered waters where pedagogical knowledge has not been validated.

Redefinition	Technology allows the creation of new tasks, previously inconceivable.
Modification	Technology allows for significant task redesign
Augmentation	Technology acts a direct tool substitute, with functional improvement
Substitution	Technology acts as a direct tool substitute, with no functional change

Fig. 23.1 SAMR model for transformation of technology use (Adapted from Puentedura 2006)

23.2.3 Transformative Learning

Modern approaches to integrating technology with pedagogy look at how much space the learner is given to act upon a task in order to construct knowledge (Garbett 2011) and gain relational rather than instrumental understanding (Skemp 1978). Puentedura’s SAMR model characterises the process of going through developmental stages of task enhancement and transformation (Puentedura 2006). The SAMR acronym stands for Substitute, Augment, Modify and Redefine (see Fig. 23.1). Such a process describes the extent to which learners make a difference to an assigned task. Rather than being knowledge consumers, the model advocates empowering individuals to become knowledge producers. Hence, SAMR postulates four developmental modes in dealing with a task, namely, substituting, augmenting, modifying and redefining it. At the lowest level of the spectrum (i.e. substituting), the learner uses technology only to replace a task that can be accomplished by any other nondigital approach.

In contrast, at the highest cognitive extreme (i.e. redefining), the learner manages to create new experiences and end products where the original task has undergone significant transformations. At that stage not only deep understanding has been achieved but also other users have become involved in creating a small learning community where collaboration and sharing have taken place. At the highest “SAMR” level, the user is no longer concerned with the technology but can creatively adapt the mobile device to multiple contexts.

23.2.4 The Zone of Free Movement

The zone of free movement (ZFM) framework underpins the theoretical conceptualisation of the present analysis. ZFM, as outlined by Valsiner (1997, 1998) as part of his zone theory, provides a framework for understanding the suite of possibilities and constraints binding students as they undertake a learning activity. Applied to the implementation of educational innovations, zone theory permits examining those dynamics and how intervening variables behave as they interact with one another at given times (Goos and Bennison 2007).

In zone theory, the behaviour of each stakeholder is regulated by a working space delimited by what each is willing and able to do under certain conditions including task potentialities and limitations. The zone within which each individual acts can be characterised as both a flexible and fluid space that continuously changes, based on the decisions taken by those who exercise control over the system (e.g. policy-makers, schools, universities, bureaucrats) and by the actors (e.g. educators, students). Each of them will bring their own pedagogical understandings of the curriculum, the students and teaching and learning processes. The interplay of those opinions will endlessly re-create the boundaries of the working space in terms of how much freedom and restriction actors can exercise in the field of practice (Goos and Bennison 2007; Handal et al. 2013a).

23.3 A BYOD Model

The proposed model represents four BYOD modalities identified from the literature and from a large qualitative study conducted through several focus groups and individual interviews with academics, educators and educational leaders during site visits carried out in six states and provinces of Canada, the United States and Australia in 2014. The purpose of this study was to research the implementation of state-wide mobile learning programmes. This chapter deals only with the degree of student freedom on the selection of BYOD models for teaching and learning. Some of the locations were highlighted by the 2012 Report *Turning on Mobile Learning in North America* (Fritschi and Wolf 2012) as having "implemented state-level initiatives that focus on mobile learning" and "policies that support mobile learning".

23.3.1 Making BYOD Choices

The proposed model represents the degrees of freedom or restrictions that an educational institution gives to students in the purchase of their devices. These degrees of freedom and restrictions are provided by the level of prescriptivity on the device's specifications, mainly the operating system (OS) and technical functionalities (TF), as well as student age. These three variables appear in the literature as the main parameters through which educational institutions transmit expectations for the characteristics of devices to their students. The model argues that each of the four BYOD modes impact differently on teaching and learning as well as in other curricular and logistic spheres within an educational environment.

The most common operating systems for mobile devices available in the industry are outlined in Table 23.1. In general, iOS and Android constitute the two major OSs sharing the market with 54.27% and 35.41%, respectively, followed by BlackBerry (Zendo 2014).

In turn, technical functionalities comprise a range of electronic affordances such as 3G/4G, Wi-Fi, audio/video tools, geolocation capability, Bluetooth, hotspot facilities, screen resolution and size, storage capacity, battery life, multitasking gestures and peripheral devices such as a keyboard. These functionalities vary by brand and price.

Table 23.1 Most common mobile operating systems

Operating system	Mobile device
Apple iOS	iPad, iPhone, iPod touch
Google Android 3 OS (latest version now 4.4.2)	Google tablet, Motorola Xoom, Samsung Galaxy, Chromebook (2)
Windows RT 8.1, Windows 8	Surface 2, Surface Pro 2 (also supports Google apps)
Blackberry Tablet OS	BlackBerry PlayBook, BlackBerry smartphone
webOS 3.0	HP TouchPad

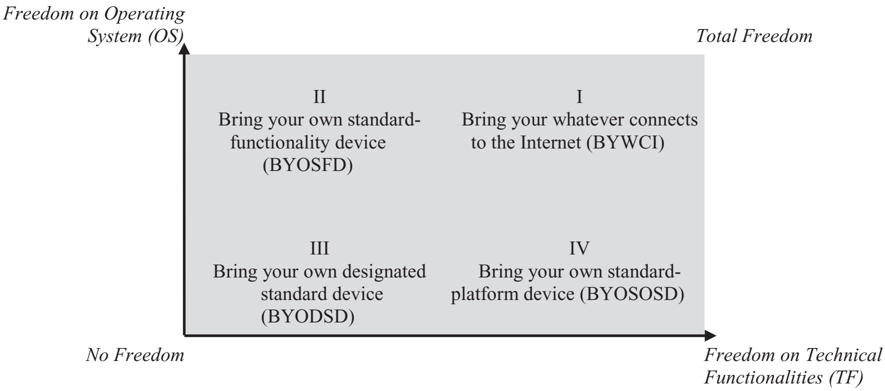

Fig. 23.2 BYOD modes by OS and functionalities – zone of free movement

23.3.2 Plotting BYOD Modes

The combination of these two variables by degrees of freedom and restriction in the selection of operating system and technical functionalities provides a 2 × 2 model showing four distinctive options as portrayed in Fig. 23.2.

The origin (*no freedom*) indicates where extreme restrictions are placed by the educational institution for both operating system (OS) and technical functionalities (TF). In contrast, in quadrant I, under the "Bring your whatever connects to the Internet (BYWCI)" mode, the institution gives students freedom on the device to be used, which might even be the one currently used by the student.

Quadrant II, "Bring your own standard-functionality device (BYOSFD)", represents choices on OSs, while restrictions on the functionalities are upheld (3G/4G, screen size, battery life, word-processing). In turn, the third quadrant "Bring your own standard-designated device (BYOSDD)" is where both OS and TF are tightly prescribed, that is, the mobile device brand is mandated by the educational institution (e.g. iPad2, Chromebook).

Finally, the "Bring your own standard operating system (platform) device (BYOSOSD)" quadrant comprises choices where there is no or little flexibility on the OS, but elasticity is granted on the device functionalities, e.g. the educational institution would accept any type of Apple product (e.g. iPad, iPad Mini, MacAir).

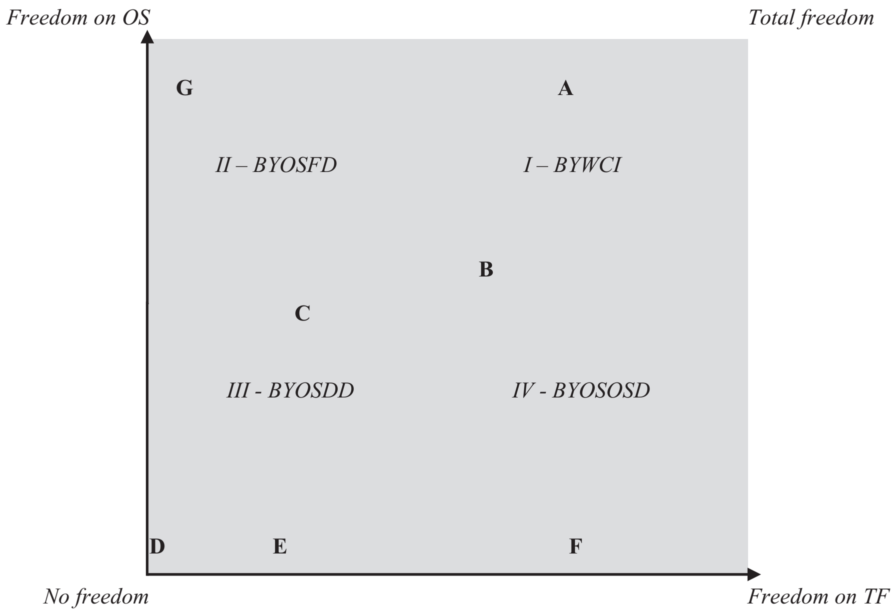

Fig. 23.3 Positioning BYOD choices

Clearly, quadrant I is the more open model, whereas quadrant III stands for a locked-down approach where little choice is given to the student. It is also evident that quadrants II and IV are symmetrically related because of their respective emphases on either OS or TF.

23.3.3 Moving Around the Quadrants

These four modes are not absolute fields but rather spaces where a variety of sub-modes can be found as depicted in Fig. 23.3. Moving away from the origin along each axis constitutes an increase in the degree of purchase freedom given to the student. For example, an educational institution can accept any operating systems and give total freedom on functionality, positioning such choice on the top right corner of the first quadrant (point A). However, a decision not strong on OS, such as banning devices with tablet software with few specialised functionalities being prescribed, will locate the choice somewhere in the middle lower part of the same first quadrant but towards the centre (point B).

Furthermore, an educational institution might be moderate in its demands on required OS and TF moving the choice selection somewhere closer to the intersection of the four quadrants (point C). Alternatively, if strict prescriptions on both OS and TF are mandated, then the choice point will get closer to the no freedom origin (point D). In another situation, where the OS is absolutely mandated, with some functionality restrictions, the student choice will position on the right bottom corner of the third quadrant (point E).

Similarly, an educational establishment can strictly prescribe the OS device but less so its functionalities, rendering a spot on the right side of the fourth quadrant (BYOSOSD) somewhere closer to the horizontal axis (point F). Conversely, an educational establishment can strictly prescribe functionalities but leave OS options open (the second quadrant (BYOSFD) which is symmetrical to BYOSOSD). The more distant a point from the origin along the vertical axis means that restrictions on the OS have been left more open. An institution might recommend two (or three) OSs or accept various versions of an operating system while keeping TF strictly prescribed, representing a choice located on a top left spot of the second quadrant (point G).

23.3.4 When Age Is Added to the Model

Age is an important element associated with the openness and closeness of tasks across all quadrants due to its cognitive developmental weight. As seen earlier, in the models for the second, third and fourth quadrants, there is a degree of institutional prescription about the device choice. Students in early grades will need to be taught skills more explicitly where the role of the app becomes more prominent. However, as students progress through their education, they are able to transfer skills across domains more easily, developing higher-order-thinking skills such as inferential thinking. Students will also develop their abilities, as they mature, in working across devices and being able to work on a free range of tasks involving transformative learning. Figure 23.4 shows student age as an overlaying variable where movement along schooling will provide more open tasks and therefore greater ability to work through any device.

In brief, the model permits representing four different BYOD modalities where each quadrant represents a decision-making process between the educational institutions and students that has to balance educational considerations with the mundane and pragmatic. It also portrays a spectrum of possibilities that the establishment may like to negotiate with both students and parents based on the current status quo of available OS and TF options, taking into consideration student age and preparedness.

23.4 Educational Implications for Each Quadrant

The modes outlined above will impact on the way the instruction and the curriculum are delivered in addition to other logistic matters, such as IT infrastructure. Some issues associated with these consequences are outlined below in Table 23.2 and were conceptualised from other studies on implementing modern learning

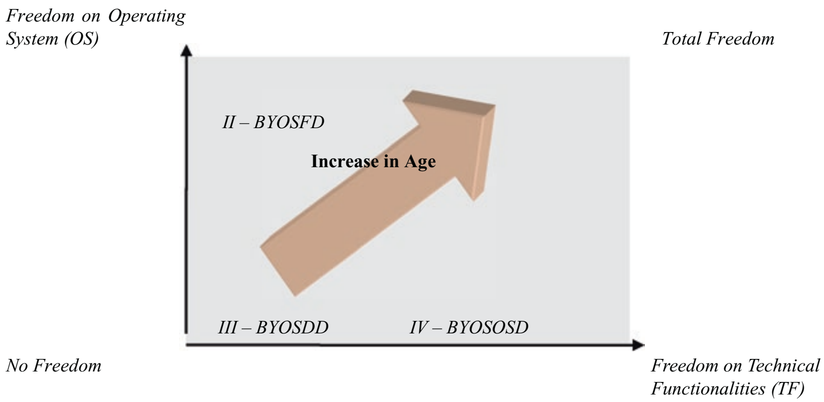

Fig. 23.4 BYOD and age

Table 23.2 Instructional, curricular and organisational implications of BYOD modes

		Organisational	
Instructional	Curricular	*Technical*	*Corporate*
Classroom management	Learning resource development and production	Cross-platform compatibility	Policy
Cross-platform literacy	Assessment	Wi-Fi technology	Workload
		Operational limitations	Equity
		IT support	

Adapted from Handal et al. (2013b)

technologies (Handal et al. 2013b). As with any other model, it represents a simplification of a complex reality where other important variables have been excluded such as the influence of cost-sharing arrangements between the educational institution and parents/students as well as other issues associated with equity.

23.4.1 The First Quadrant and Third Quadrant

As noted earlier, the first quadrant stands for approaches where the educational institution, both at the university and school level, gives freedom to students in selecting the device they wish to bring to class. From an instructional perspective, this approach permits flexibility in choosing the device that would also suit teenagers' personal digital needs in regard to information and communication including keeping contacts, photographs, videos and their own music. Parents will also be happy with this mode in that they do not need to buy a second device for their children. Parents increasingly buy smartphones for their children so as to stay in touch with them during the day and know their whereabouts.

Because the devices will bring their own different specifications, educators will find it difficult to troubleshoot them, posing classroom management problems such as those encountered by secondary mathematics educators dealing with various calculator brands at the same time. Students might also be encouraged to work with a peer to access specific applications that their devices might not have, thus encouraging collaboration. Educators will also need to be careful to be inclusive of students with weaker devices. There is anecdotal evidence that students comfortably troubleshoot each other's devices and that improved design of web- and cloud-based applications, including Web 2.0 tools, is making mobile navigation more agnostic rather than platform based. Similarly, the deployment of virtual desktop infrastructure (VDI) and learning management systems where dedicated applications are deployed and made available to any device will help to resolve the issue of platform-based devices.

While the above consequences seem to be a relative drawback of the "Bring whatever connects to the Internet" quadrant, they convey an enormous instructional benefit in that educators are forced to become more creative in designing their lessons. Making this conceptual shift will also require more professional development. Tasks would not be set around a particular application but will have to be designed in a way that encourages students to look at their own devices and accommodate their functionalities to the learning outcome. By adding this ingredient of transformative learning, the tasks will undoubtedly reflect a more student-centred approach with clearer authenticity, more knowledge production than knowledge consumption as well as cognitive ownership.

Alberta Education (Canada) (2012) guidelines on mobile learning put it this way:

> Since teachers cannot be sure of exactly what the devices will run (except for those in the specifications), they may become less directive about which software, applications or web tools students use – leaving that to the students' discretion – and simply set standards for the outcomes. (p. 14)

In a similar vein, an educator remarked:

> The second you assign a project to be done with a certain medium, you kind of commit yourself to knowing how to do it and walk kids through it. The second you give them the choice, you absolve yourself as a teacher from that responsibility of having to know every program out there. (Copeman 2013)

There are implications for the assessment of open-ended tasks in higher education. Educators will have to accept different versions of students' work for the same learning outcome. Because of students' capacity to work through mobile devices, their responses will be more diverse, partly because of the difference in devices, and therefore not as easily compared with each other for grading purposes. Assessing against standards will be more prominent, and the use of rubrics will have to reflect higher competencies. Consequently, many educational institutions are turning to the "Bring whatever connects to the Internet" mode as a popular BYOD option (Tsinakos 2013). An example of this BYOD mode is Forsyth County School District (2016) in Georgia, USA.

The third quadrant, "Bring your designated standard device", stands in clear contrast to the free format of the first mode. Here a single device is mandated or a suite of approved brands is offered to the students. Some schools, for example, have opted for the iPad solution such as Corrimal East Public School (NSW). Supporters of this model argue that instruction, in general, will benefit from students and educators sharing the same software because it will facilitate a common learning experience and classroom management. It also allows the school to negotiate lower prices for bulk purchases including maintenance arrangements. Battery charging stations are also more feasible to implement because of the common hardware as opposed to the other three BYOD modes. On a related note at the tertiary level, the Western Sydney University (2013) provides a mobile device to every new student while allowing anyone to bring his or her own device. The choice of device depends on the course the student is enrolled in.

Critics to "Bring your designated standard device" argue that many students and families already have their own devices, and therefore purchasing another brand will complicate their portability as well as adds an extra burden on the family budget particularly for students from low socioeconomic status and for families with more than one dependant.

Mandating a device will also mean that educators might rely on applications-based tasks and therefore on closed learning activities that would limit students' imagination and creativity. Sweeney (2012) uses the following analogy to demonstrate this principle:

> BYOD changes the entire teaching model from one where teachers control what students deliver (for example "use PowerPoint to do X") to one where the student controls their own delivery (e.g. the teacher says "demonstrate your knowledge of X"). Very few teachers or students are well versed in that type of education.

With a mandated device, educators will have the ability (and possibly will tend to) to move back to control what students deliver.

23.4.2 The Second and Fourth Quadrants

The second and fourth quadrants, with their emphasis on operating systems and technical functionalities, mirror each other in various respects. They stand for the middle options between the extremes of the other two modes. For instance, educators might face difficulties learning to work with more than one platform and navigation.

As with the TF-based mode, some educational institutions particularly those with specialised areas such as visual arts or students with special needs might like to recommend specific device resolution and screen size. Photography and videography are two other fields requiring dedicated functionalities. Dixon and Tierney (2012) listed a number of these functionalities that some courses might require:

- Voice, video and audio recording conferencing and collaboration

- Supports small amounts of typing
- Video and audio capture and editing
- Supports music composition, playing in, composing and so on
- Supports fully functional software for CAD, the web and graphic design
- Supports programming and handwriting recognition for maths, music, chemistry and Asian characters
- Note taking with a digital pen, intuitive and natural remote learning, fluent mind mapping, prototyping and complex visual thinking

Some of the above functionalities are related to life skills capabilities that students use on a daily basis and will continue to use within a vocational or professional environment. Hence, the suggestion from some authors to leave the brand choice to the user's own discretion (Dixon and Tierney 2012).

As with the OS-based mode, parents might have a preference for a particular platform that they would like to share with their children's devices. They might even like to give them a smartphone for school or university use and require their children to work on the more powerful laptop/desktop at home for browsing supervision purposes.

Similarly, schools are increasingly working on two operating systems, leaving freedom to the student to move between them. However, it is noteworthy that Rockingham County Public Schools (Virginia, USA), for their own reasons, have a strong one-platform solution based on Mac in their computer and mobile labs. At the systemic level, adopting one single OS would imply that the large-scale production of apps-based resources only would be accessed by users sharing the same apps platform repository such as the Apple and Google stores. There are also universities that rely on one single platform, limiting students operating on other systems.

Within the second and fourth quadrants are multiple prescriptions. Some schools like Kooringal High School (NSW) allow the use of a keyboard in tablets, but others like Sydney Boys High School discourage the idea. Other schools like Turramurra High (2016), NSW, discourage iPads and Android devices. For Chatswood High School (2016), NSW, Android OS is indicated as not being compatible with the DEC wireless protocol and other system applications. Chatswood High School will not encourage iPads and other devices with tablet OS (such as surface RT). Interestingly, universities are more flexible in letting students purchase their own platform and brand product.

In general, there is a clear trend towards BYOD programmes rather than previous 1:1 schemes where devices were provided to students for free (Shuler et al. 2013). This is a trend that passes costs associated with purchasing, troubleshooting, loss, maintenance and licencing to the families leaving financial capacity to the schools to build the local Wi-Fi technology. Interestingly, the cost associated with running the school network infrastructure has been said to be over 25% more than when devices were provided by the school (Dixon and Tierney 2012). Also, it is noteworthy that large school systems such as Alberta (Canada) and New South Wales (Australia) have adopted a general BYOD policy that leaves the last decision to each school board.

Equity is, therefore, an issue. One solution to the problem of students who might not have devices is for the school to have a limited number of devices available for checkout during the school day. Another solution is an emphasis on using devices only in group assignments so students who do not have devices can be grouped with those who do. As mentioned earlier, Western Sydney University has provided a variety of mobile devices to all its commencing students.

23.4.3 Expanding the Model to Post-school Environments

While expanding the four-quadrant BYOD model to tertiary environments, the assumption is that students as grown adults will become more autonomous in regard to their learning habits although still retaining some educator centredness inherited from their school backdrop. The degree of prescription or freedom regarding the tool to be used, which here can include more powerful interfaces such as laptops, will vary among disciplines. However, the four-quadrant BYOD model becomes more complex when we consider how more self-directed or educator-directed the task is perceived to be by the student, particularly in their transition from school to university.

Pratt (1988) characterised the tension between those two learning behavioural patterns as the dilemma between being either andragogical or pedagogical oriented. For Pratt, an andragogical-oriented person tends to be more self-directed, seeks information by himself/herself, engages in nonroutine problem-solving and is more self-internally motivated. In contrast, a pedagogical-oriented person is more likely to seek direction from his/her instructor, avoid risk-taking, prefer routine tasks and be more instructor dependent. A pedagogical orientation conforms more to a school learning environment where pastoral care is normally emphasised. However, universities are centres where learning independence is more highly valued, especially with a view to developing research skills.

In general, adults make sense of the constraints and possibilities of specific learning environments, a factor that influences the behaviour adopted (Holmes and Abington-Cooper 2000; Taylor and Kroth 2009). This means that tertiary students are mature enough to take a stance as to how to deal with a particular task depending on its content and in regard to other internal variables such as self-concept, experience, readiness, orientation and motivation to learn (Taylor and Kroth 2009). In other words, at times, a student can become andragogical (self-directed) oriented, while in another situation, the student may choose to be pedagogical (educator-directed) oriented.

Tertiary environments are characterised by greater freedom in regard to OS and TF. Generally speaking, university students are not as conditioned to OS/TF restrictions as school students. Tertiary students have more possibilities of moving across the four quadrants depending as to how the educator structures the task or modifies it as she/he delivers content.

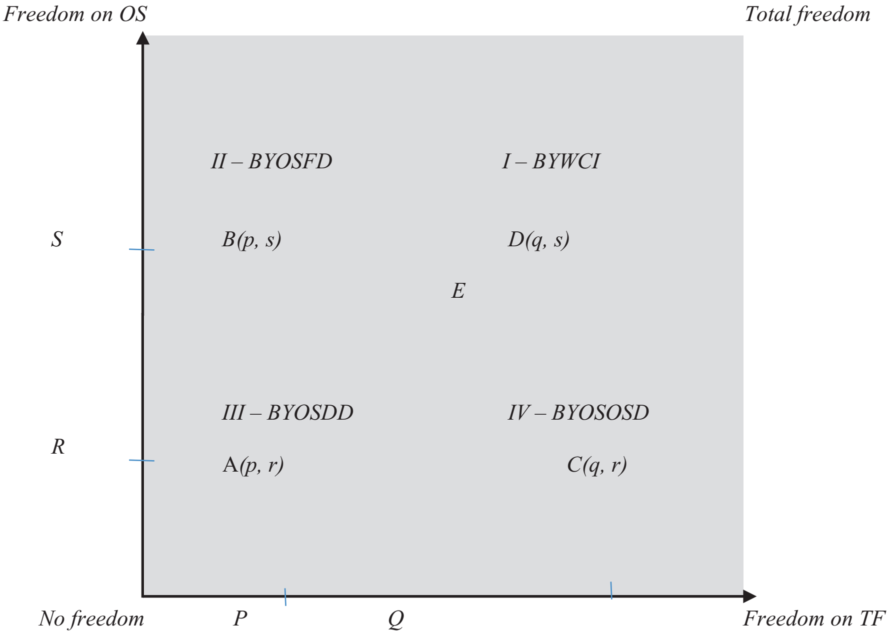

Fig. 23.5 Movements among four quadrants

Figure 23.5 indicates four equidistant points on the subsections of the BYOD plane: A(p, r), B(p, s), C(q, r) and D(q, s). Point E sits exactly at the midpoint of these four points.

A(p, r) is a point where due to restrictions students would react more pedagogically (educator centredness), rather than andragogically (student centredness), to the task. At A (p, r), the task is highly structured, having students display a learning behaviour which focusses on rigid instructions. Points B and C allow students more decision-making space given that restrictions have eased, either on OS or on TF. An educator who can assume that students have been used to a more restricted, educator-centred environment may have reason to hesitate before setting a task which gives students full freedom in both OS and TF. Instead, the educator may decide to first allow students more OS freedom, at B (p, s), before moving them to full freedom at D (q, s). A movement from A to B can be exemplified when educators might increase the number of recommended apps or even leave them up to students' choice, within a particular OS. Conversely, an educator can start from the same point A (p, r) and design a task that moves towards C(q, r) where fewer restrictions exist on the TF axis, but OS options remain restricted. Either movement would put students on the same degree of freedom, but the type of freedom would be different. The advantage of setting a task which first allows one type of freedom before setting a task which gives students both OS and TF freedom is that the educator gives students the opportunity to demonstrate the capacity to cope with one type of freedom at a time. Once students have had the opportunity to master a task with freedom in OS, the educator can then set them a task with added freedom in TF – or vice versa. This would seem to be an educationally preferable option for leading students to full freedom in choice, under most normal circumstances, than giving students a task which gives a little more freedom in OS and TF at the same time, that is, moving from point A to point E, a compromise position between restrictions and freedoms which would seem to have an equivalent degree of freedom as either point B or C. Of course, if the educator feels confident enough that his/her students can move directly from A to D, then the transformative process of making his/her students more andragogical than pedagogical oriented will be achieved within a shorter interval.

What influences educators' decision to begin from the OS and TF axis would depend on which tools and technical capabilities they feel more comfortable with. It will also depend on his/her ability to integrate technology into teaching and learning. In addition, educators might take decisions based on the type of learning outcomes they would like to assess or based on looking at students' current capabilities in regard to their zone of proximal development (Vygotsky 1978).

The above dynamics suggest that educators can deliberately set tasks that foster a change in students' learning orientation, depending on how she/he structures a task or moves through a series of tasks with freedom of choice increased strategically in stages. Hence, at tertiary environments where OS/TF are more a matter of choice, educators can begin from various combinations of these two software/hardware aspects. The overall model, therefore, depicts through a sequence of instructional decisions that offer teachers the opportunity to move to a more andragogical (educator centred) way of teaching and learning as they react to the dynamics of task structure and OS/TF degrees of freedom. It shows a zone of free movement where students navigate possibilities as well as technical and instructional constraints as they move towards more open tasks with a higher problem-solving and cognitive ambiguity component.

In brief, the four quadrants can characterise a "zone of free movement" where the complex dynamics among BYOD software/hardware, teachers' instructional approaches and students' learning dispositions can be simultaneously modelled.

23.4.4 The Asia-Pacific Context

The above models can be generalised to other latitudes according to their respective characteristics. In the Asia-Pacific context, the wide diversity of mobile learning policies across countries (So 2012), the poor-quality integration of these tools into the curriculum (Valk et al. 2010) as well as the traditional nature of their educational systems (Handal 2013) make progress slower and more difficult.

The poor integration of technology into the curriculum will cause some schools to situate in quadrant III or possibly in either quadrant II or IV, where little decision options are left to the student. Such an approach would be taken because educators are not technologically and pedagogically skilled enough to deal with flexibility and diversity. Hence, more educators will be tempted to operate at a comfort level on a device or platform for which they might have been trained. Given such a landscape, it is advisable that educational institutions, either schools or universities, do not give a commitment to a particular brand but encourage their educators to be willing to embrace variety from the beginning by focusing more on the pedagogy than on the technology. By locking themselves into a particular plan, curricular programmes and teaching strategies become dependent on technical functionalities, discouraging cross-fertilisation. Further, educators are increasingly becoming more mobile within the educational workforce, and therefore new staff within the same system might become more open to pursue mobile learning experiences with their students.

Similarly, the traditional nature of Asian education will shape more pedagogical than andragogical learning behaviours. For example, restricting BYOD conditions will encourage students to work on explorative tasks only to the extent that those conditions are met. However, it will discourage them to a degree that cannot proceed further because the task has been structured to the educator's abilities and the specific functionalities of the device (Handal et al. 2013a).

Opening the Asian classroom would require students to engage in nonroutine tasks. When this happens, projects have an open end, meaning that individuals would interface with their device to make it work to their own ability. This is particularly true given the close personal association between the user and the device (Handal et al. 2013b). Students own their mobile devices not particularly for learning but for communication and networking, for keeping their personal contacts and data and for organising their daily lives and schedules. In other words, they know intimately what their devices can do. In learning situations, educators must take advantage of such a familiarity and invite students to discover reality and explore the world based on their own tools. As the Confucian proverb says: "Do not confine your children to your own learning because they were born in another time".

In brief, this section argued that as students transition to university, they are exposed to more flexible open mobile learning environments than during their schooling. This responds to a higher ability to operate diverse devices and to engage in more sophisticated learning work. By situating their instructional environment into the "whatever connects to the Internet" quadrant, students have more flexibility to address the complex disciplinary work that tertiary education brings. Hence, universities should be aware of such large diversity in designing their online infrastructure and policies, as well as in providing professional development to their academic staff.

23.5 Conclusions

The so-called Z generation, that is, the population born between the early 1990s and the early 2010s, is thriving in our schools with the new mobile technologies. This is a cohort that never knew life without the Internet and wireless devices. This is also a highly and electronically socially networked, well-informed, generation, particularly when it comes to purchases. Today's students demand less device standardisation and broader freedom in selecting one. Students might know better than bureaucrats the products available in the market, look at their affordability and what is good for them as well as predict how they will become obsolete in the near future. This chapter also argued that, in many cases, the views of students and educational institutions' views might not mix. The former wants personalisation, while the latter advocate for standardisation.

This chapter argues that learning environments can be characterised as ranging between those where a preference for closed-ended, educator-centred environments dominates as opposed to the alternative of where students are prompted to maximise their own personal device functionalities so as to accomplish a task with broader creativity and problem-solving skills (Handal et al. 2013a). It is suggested that tasks should be defined in a more open-ended way and so that they can be achieved using a variety of tools.

Because BYOD approaches were born more as the users' own response to personal and work demands based on device mobility, it is ethical to observe the same principle when it comes to school work and avoids making device selection the prerogative of the educator and a dictatorial instrument of educational control. Hence, the never-ending quest for optimal student-centred environments should outweigh school administrators' and policy-makers' bureaucratic concerns for standardisation. More powerful devices will be invented in the coming years, such as those endowed with augmented reality capabilities, but in the meantime, we should ensure that meaningful pedagogies are developed in schools to make just and equitable use of the power of mobile learning in our schools and tertiary institutions. It is when educators put the pedagogy before technology that students are encouraged to adopt a more self-directed learning behaviour rather than feeling themselves in constant need to be provided direction by their educator.

The zone of free movement (Valsiner 1998) was used as the conceptual framework to explain learning behaviours in response to either educator- or student-centred tasks, as designed by instructors. Student control of the task, therefore, becomes a prominent issue that educators should consider in making OS/TF BYOD decisions. The discussion revealed that students might enact different learning behaviours according to whether a task offers them the freedom to exercise creativity and choice or whether students are restricted to act within activities which are highly directed by the instructor. The central argument, therefore, is that the zone of free movement does not have a static point of equilibrium. Rather, the interactions between technology, teachers' instructional strategies and students' dispositions are ever-changing and unstable. There needs to be enough space for the three elements (BYOD technology, teachers and students) to flexibly adjust themselves to their surrounding circumstances when needed, so that when change happens and the system is altered, a new point of equilibrium is found within the zone of free movement.

Hence, the chapter proposed a model where the nature of the task mediates between BYOD models and students' learning behaviours. In its simplest form, the model suggests that each of the BYOD models, with its own OS and TF restrictions and possibilities, influences the nature of the task itself. For example, the BYOD model where students are allowed to bring "whatever connects to the Internet" would seem to foster creativity and imagination. Conversely, models where the educational institution rigidly prescribes a particular device are said to encourage teaching approaches structured around what the instructor knows about the technology, thus limiting the scope for nonroutine problem-solving and student choice and creativity.

In its more complex form, the model introduces the concept of andragogy and pedagogy. We human beings are both andragogical and pedagogical oriented. Our andragogical nature shows when we want to be self-directed and self-reliant in learning, whereas our pedagogical side desires the security of handholding and instructor dependence in terms of task sequencing and prescription. Because of our free will, we certainly choose which direction to go depending on what suits us. This free will makes us behave andragogically or pedagogically depending on how we want to react to the nature of a particular task. If learning behaviours depend on how the individual goes around a particular task in the context of OS/TF restrictions and possibilities, then care should be given to creating tasks that inspire creativity, imagination and choice. This is better achieved when instruction places more importance on the teaching methods than on the technology. The aim should be to achieve the stipulated learning outcomes regardless of the device to be used, even when this might represent working in a nondigital environment.

The traditional nature of the Asian classroom with their reputation for resistance to change can be overcome by promoting less device standardisation and more device choice. As demonstrated by the models elaborated in this chapter, this is a cornerstone to creating a learning environment fostering choice, creativity and discovery. Very often, calls for a more intensive use of mobile devices come from students themselves. In a way, they have become technically more skilled than their instructors. And yet, when these devices are permitted, educators frequently use them to enact narrow pedagogies rather than transferring the learning reins to students themselves. Surely it is preferable that technology is a pathway promoting the liberation of students through greater responsibility for their learning, instead of making them more dependent on the provider and the technology itself, like many past Promethean industrial innovations.

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Chapter 24
Aboriginal and Torres Strait Islander Pre-service Teachers' Views on Using Mobile Devices for Tertiary Study in Very Remote Communities

Philip Townsend

Abstract This chapter discusses qualitative findings from doctoral research undertaken in Australia with Aboriginal and Torres Strait Islander pre-service teachers about integrating mobile devices within their tertiary studies and compares responses from those living in Very Remote communities and Inner Regional and Outer Regional locations. There are five categories of remoteness, used by the Australian Bureau of Statistics: Major Cities, Inner Regional, Outer Regional, Remote and Very Remote. These are based on road distance from five various sized centres of service delivery. Participants came from community-based Initial Teacher Education (ITE) programs in two states: Queensland and South Australia. The focus of this chapter is on the practice and preference of research participants about the use of mobile devices to provide elements of content material, administrative support, academic support and personal encouragement. The pedagogic implications for higher education institutions are explored, and technical ramifications are briefly mentioned, as are organisational policy issues. This research about the use of mobile devices is important in the context of a national initiative to increase the number of Aboriginal and Torres Strait Islander school teachers. Moreover, the research is significant as it addresses similar concerns of remote and marginalised communities throughout the Asia-Pacific Region. In addition, the research engages with global educational issues such as agency, collaboration, the supply of mobile devices and the cost of using them.

P. Townsend (✉)
School of Education, Flinders University, Adelaide, Australia
e-mail: philip.townsend@flinders.edu.au

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24.1 Introduction

Mobile devices are increasingly common around the world and used for a variety of purposes. For the purposes of the research underlying this chapter, mobile learning is defined as learning which occurs through the use of mobile devices, which are here delimited to laptops, tablets and mobile phones. In the context of the research, these were contrasted to desktop computers located in learning centres for the use of tertiary students in community-based ITE programs. A range of international agencies and organisations endorse the potential of mobile technologies for education generally and for teacher training in particular (Bokova 2013; Danaher and Umar 2010; Godfrey et al. 2014; WorldBank 2012). In a paper published by the United Nations Educational, Scientific and Cultural Organization (UNESCO), it was argued: "There is a significant opportunity to more fully explore how mobile technology can support teachers and contribute to their training, motivation and retention within the teaching profession" (Vosloo 2012, p. 35). Another UNESCO paper identifying key themes about mobile learning for teachers included the finding that "mobile phones can be used to support classroom instruction, administrative communication and professional development for teachers" (West 2012, p. 8). This was explained further: "Mobile phones, especially larger-screen smartphones … provide a cost-effective avenue for supporting the professional development and pre-service training of teachers, mainly by facilitating mentoring and participation in professional communities" (West 2012, p. 12).

This chapter is based on research with Aboriginal and Torres Strait Islander pre-service teachers and potential pre-service teachers in Australia and explores their perspectives about integrating mobile devices within their tertiary studies while living in Very Remote communities. Participants who were classed as potential pre-service teachers were Aboriginal and Islander Education Workers (AIEWs) employed in schools. Historically, this cohort has been the primary source of enrolments in community-based ITE programs. This section provides background about Aboriginal and Torres Strait Islander people, Very Remote communities, schooling in these communities and the intent of the research. Aboriginal and Torres Strait Islander people are the original inhabitants of Australia. In the phrase "Aboriginal and Torres Strait Islander", the term "Aboriginal" generally designates First Nations people from mainland Australia and the closest islands, and "Torres Strait Islander" refers to First Nations people from the islands between the continent of Australia and the northern island of New Guinea. It is suggested that in the late eighteenth century, there were about 250 distinct languages (with dialects, named varieties could have increased the total to around 700 languages spoken) and a population of about 750,000 people (Mooney 2015; Walsh and Yallop 1993, p. 1). Over thousands of years, trade and hostilities occurred between these diverse groups and with peoples in New Guinea and the major archipelago off the north-west coast. The modern nation of Australia traces its beginnings to the British invasion and colonisation of Australia which commenced in 1788. In 2011 the estimated resident Aboriginal and Torres Strait Islander population was 669,900 people, or 3% of the total Australian population. At that time, around one-third of all Aboriginal and Torres Strait Islander people lived in major cities of Australia, about one-fifth lived in Inner Regional Australia and also one-fifth in Outer Regional Australia, another 8% lived in Remote Australia and about 14% in Very Remote Australia (ABS 2013).

Discrete Indigenous communities are specific geographic settlements in which people usually have traditional and/or historic relationships to the surrounding land and to one another. There are about 1100 such communities; many of these have less than 100 inhabitants and most are in isolated areas. About 40 years after some of these were established, the positive aspirations of their beginnings were re-iterated by anthropologists and government officials who were involved in the historical contexts, as expressed in the following quote: "As Aboriginal life projects, outstations are one of the clearest manifestations of self-determination" (Myers and Peterson 2016, p. 4). Yet Hunt mentions competing rights and interests between groups in communities (2013, p. 9), and complex issues can lead to communities being labelled as disadvantaged (SCRGSP 2014). Since 2014 some state governments have suggested some communities are unsustainable economically (Howitt and McLean 2015). Nevertheless, living in these communities enhances wellbeing for Aboriginal and Torres Strait Islander people with links to these areas because it reinforces kinship ties and provides opportunities to engage in cultural activities, and people remain on their traditional lands with which they feel a deep affinity (Biddle 2014, p. 67).

The context of the research is set within the national Education Action Plan 2010–2014 which included strategies to increase the number of Aboriginal and Torres Strait Islander school teachers (MCEECDYA 2010). A snapshot of schooling in very remote communities is presented. Many communities have primary schools, some have additional classes to year 10 level, some offer individualised programs to enable a pupil to complete a secondary certificate, and some students leave their communities to participate in secondary schooling (this often includes some form of boarding accommodation). The majority of teachers employed in these schools are non-Indigenous. Often new teacher appointees to a school are non-Indigenous recent ITE graduates. There is a high turnover of staff, and teachers leave the school at various times during the year and replacements are sought (Giles 2010; J. Taylor 2010). These factors contribute to the argument for increasing numbers of Aboriginal and Torres Strait Islander ITE graduates.

Many of the participants in this research already own and use mobile devices for personal and social reasons. The research endeavours to discover ways in which these Aboriginal and Torres Strait Islander pre-service teachers and potential pre-service teachers wish to see their skills capitalised upon, supported and enhanced for professional study purposes. It privileges their voices and thereby provides evidence upon which higher education institutions can base policies and practices. The plan for the chapter is as follows: the next section provides an overview of ITE for Aboriginal and Torres Strait Islander pre-service teachers, with particular reference to low completion in two community-based ITE programs. This is followed by a brief statement about the research approach and then the results. The discussion adopts the design of the book, commenting on issues from the student perspective and from the educator perspective, as well as technical and organisational matters.

24.2 Initial Teacher Education

National reports on Aboriginal and Torres Strait Islander peoples' participation in higher education generally (Behrendt et al. 2012; Kinnane et al. 2014) and ITE specifically (Patton et al. 2012) indicate that Aboriginal and Torres Strait Islander peoples' rates of access, retention and completion in higher education are generally below those of the rest of the Australian population. Data for 2007–2011 showed that across all modes of delivery 36% completed their ITE course (Patton et al. 2012, p. 24). In contrast, over a similar period (2005–2012), the national completion rate for degrees in education for all students was 74% (DE 2014, pp. 9, 11).

About 39% of Aboriginal and Torres Strait Islander pre-service teachers study off-campus (Patton et al. 2012, p. 28), through various forms of delivery, including fully online distance or external delivery, block delivery and reverse block delivery or away from base delivery. Another off-campus mode is community-based delivery, in which a support teacher lives in a community and provides assistance at a learning centre. Pre-service teachers come to the learning centre to seek help from the support teacher, use desktop computers with Internet services and access other resources. They also complete practice teaching internships in schools away from their communities and participate in workshops at other sites or the training institution.

Two community-based programs in different states of Australia have operated for more than 25 years and are the only ones to fulfil the criteria of having support teachers residing in communities. The one in South Australia is operated by the University of South Australia (UniSA) and the other in Queensland is run by James Cook University (JCU); each will be discussed in turn. The majority of enrolments in both courses have been female. The Aṉangu Tertiary Education Program (AṉTEP) commenced in 1984 with full-time students at a community in the Aṉangu Pitjantjatjara Yankunytjatjara (APY) Lands of north-west South Australia. It was designed as a face-to-face program, and made minimal use of ICTs and did not offer online learning as a major feature of its delivery. From 1988 the Program changed to a decentralised mode with pre-service teachers remaining in their own communities, working in those schools and studying part time with assistance from tutors (Davis et al. 1995; Edwards 2012; Edwards and Underwood 2006; Gale 1996). UniSA offered three unique awards for AṉTEP, the culmination of which was the Bachelor of Teaching (Aṉangu Education). Graduates with this award have a limited registration as a teacher only in South Australian Aṉangu schools. From 1984 to 2013, a total of 24 pre-service teachers finished the full course (AṉTEP 2013). The program does not meet new requirements for accreditation as an ITE course (AITSL 2014) and has ceased (UniSA 2013a, b). UniSA has initiated an 18-month transitional program to enable Aboriginal and Torres Strait Islander people to apply for university entry (Stone 2016; UniSA-College 2016).

James Cook University (JCU) in partnership with the Queensland Department of Education and Technical And Further Education (TAFE) Queensland North offer RATEP: community-based Aboriginal and Torres Strait Islander teacher education. From the beginning, the intent was to use

> information technology to create and deliver, higher education courses to all Queenslanders, regardless of their location. Thus as part of this project, RATEP course delivery uses various aspects of information and interactive technology, with the vital addition of a tutor for the students at each site. (McGarvie 1991, p. 29).

TAFE's awards enable a student to move into the second year of the primary teacher's degree at JCU. As registered teachers with a Bachelor of Education from JCU, graduates may be employed as primary school teachers anywhere in Queensland and beyond. The Program commenced in 1990 and was called Remote Area Teacher Education Program (RATEP). It was originally designed to train Torres Strait Islanders as teachers. However, students from a variety of remote and regional locations throughout Queensland now participate (Osborne 2003). In 2012, RATEP won an award for "Programs that Enhance Learning" under the Australian Awards for University Teaching (O'Brien 2012; OLT 2012). Data from RATEP showed that 197 students had completed a diploma from 2005 to 2010, and 29 of these had graduated with a degree by the end of 2012, i.e. a completion rate of 14.7% (Mitchell and Linkson 2012, p. 26). In the period 1990–2015, there were 160 Bachelor of Education graduates from JCU (Halliday et al. 2015, p. 8). Off-site students began to study with RATEP in 2012. In 2014–2015 RATEP operated from 16 sites and had off-site students in 22 other locations (Halliday et al. 2015, p. 13 + 18).

As mobile network coverage has increased across Australia, Aboriginal and Torres Strait Islander people in remote communities have spontaneously engaged with mobile devices and now use them extensively for personal and social purposes (Auld et al. 2012; Kral 2010, 2012; A. Taylor 2012). Many pre-service teachers own and skilfully use mobile devices for these reasons.

In the preface to an edited book titled *Mobile Technologies in Open Schools*, Sir John Daniel identified three educational uses of mobile technologies: "Reminding students of deadlines, giving words of encouragement and providing bite-size learning snippets have a beneficial impact on motivation and make it more likely that students will complete and pass the course" (Mishra 2009, p. vi). This chapter focuses on the use of mobile devices for administration, encouragement and content, as viewed from the research participants' perspectives. The subsequent section outlines the methodology utilised.

24.3 Research

A Mixed Methods approach integrating both qualitative and quantitative data was used for the research project. The intent was to provide a holistic understanding and explicate data of one sort with reference to data of another kind, thus enhancing credibility of interpretations derived. An exploratory sequential design was utilised with qualitative data collected first followed by quantitative information (Creswell and Plano Clark 2011, pp. 86–90; Teddlie and Tashakkori 2009, pp. 153–155).

However, very few responses were obtained from a voluntary online survey. Thus, this chapter discusses matters based only on the qualitative data.

Given the sensitivities of a non-Indigenous male conducting research with mainly Aboriginal and Torres Strait Islander women (Moreton-Robinson 2011; Smith 2012), care was taken to seek advice from Indigenous academics as well as others who had experience working with Aboriginal and Torres Strait Islander people. Formal ethics approval was obtained from three universities (Flinders University, UniSA and JCU), two state departments of education (Qld and SA), TAFE Queensland North and the Pitjantjatjara Yankunytjatjara Education Committee. Permission was also obtained from the principals of the schools visited.

All the participants were Aboriginal and Torres Strait Islander people, most of whom were pre-service teachers from two community-based ITE programs, as well as some Aboriginal and Islander Education Workers (AIEWs) not enrolled in an ITE course. AIEWs play a major role in classrooms translating English-speaking teachers' comments into the vernacular. In the APY Lands of South Australia, they are known as Anangu Education Workers (AEWs). They are a significant link between the school, families and the community (Cooper 2008; Elliott 2009; Giles 2010; Maher 2010). There is a natural career progression for AIEWs to complete an ITE qualification.

Data was collected during 9 field trips undertaken during 2012–2014 with data collected from 15 sites: 5 in South Australia (SA) and 10 in Queensland (Qld). There were 64 volunteer participants (SA (34) + Qld (30); 55 females and 9 males). Semi-structured face-to-face interviews and focus groups were conducted using a set of 13 questions. Participants could choose not to answer questions and could also withdraw their consent to participate at any time. Interviews were conducted in English with an audio recording from which transcripts were made. Occasional comments were made in vernacular by participants in SA and translations into English included in transcripts.

Interview transcripts were analysed using a constructivist grounded theory approach (Charmaz 2014), as this "can help legitimise the experience of Aboriginal people as a source of knowledge and facilitate the development of theory directly interpreted from Aboriginal people's own words" (Bainbridge et al. 2013, p. 278). Rather than using an existing framework, grounded theory enables patterns and concepts to emerge from the data. A phronetic stance was adopted as a means to valorise the values of the Aboriginal and Torres Strait Islander participants.

The intent of this research was to understand perspectives of Very Remote stakeholders. For this reason, participants were sought from regions that the Australian Bureau of Statistics classifies as Very Remote. In Queensland, following publicity about the research, some pre-service teachers from Inner Regional and Outer Regional areas indicated their willingness to participate and were included; for this research, these were classed as "Other". In South Australia, all participants came from "Very Remote" sites.

24.4 Results

24.4.1 Major Finding

The major finding is that the majority of participants in the collection of qualitative data (40 of the 64 participants, or 63%) indicated at least one use of mobile devices for administration, encouragement or content. Responses from participants indicated they viewed "encouragement" as having two distinct categories: (1) personal or social aspects and (2) academic support. Thus, this chapter reports on four areas of usage: content, administration, personal encouragement and academic support.

24.4.1.1 Characteristics of Participants

This major finding is investigated by examining characteristics of participants according to the following five factors: location, enrolment in an ITE course, presence of mobile network service, gender and age (Table 24.1).

The relationships between variables were explored using chi-square tests. Across data for any of the four usage areas when considering location, Other students used mobile devices significantly more than Very Remote students ($x^2(1) = 16.21$, $p = 0.00$); when considering ITE, students enrolled in ITE (RATEP + AnTEP) used mobile devices significantly more than AEWs ($x^2(1) = 7.59$, $p = 0.01$); when considering mobile network service, students from places where it was present used

Table 24.1 Uses of mobile devices for content, administration, personal encouragement and academic support by characteristics of participants, showing the percentage of the pool in each characteristic

Characteristics		Pool N	Uses of mobile devices, by percentage of pool: Content	Administration	Personal encouragement	Academic support	Any
Location	Other	19	95	89	58	74	100
	Very remote	45	33	36	20	29	47
ITE	AnTEP	15	13	27	–	20	33
	RATEP	30	90	80	60	67	93
	AEW	19	21	26	11	21	37
Service	Absent	28	11	18	7	7	21
	Present	36	83	78	50	69	94
Gender	Male	9	89	78	22	56	89
	Female	55	45	47	33	40	58
Age	<25 years old	17	59	41	35	41	65
	25+ years old	47	49	55	30	43	62

mobile devices significantly more than students from areas with no service ($x^2(1) = 35.83$, $p = 0.00$); there was no significant difference regarding gender ($x^2(1) = 3.11$, $p = 0.07$) or age ($x^2(1) = 0.05$, $p = 0.83$).

24.4.2 Themes

Five themes emerged from the data in relation to the four areas of usage of mobile devices. Each theme will compare responses from Very Remote participants with those from Other places. Of the 45 participants living in Very Remote sites, 12 of 34 from South Australia gave responses, and 9 of 11 from Queensland did so. There were 19 participants living in Other locations, all in Queensland, and all gave responses.

24.4.2.1 Theme 1: Participants Use Mobile Devices to Access Content, Mainly Through Their Institutions' Online Learning Management System or Website, and Expect to Continue to Do So

Participants used 143 terms relating to content. These terms were classified into seven groups: subjects, content, readings, everything, institution's website, other websites and web conferencing. Nine of the 11 students (82%) in Very Remote communities in Queensland and 18 of the 19 (95%) from Other places provided responses about content-related usage of mobile devices. No participants indicated any of these aspects should be discontinued. South Australian participants were not using mobile devices for this reason, but 7 of 34 (21%) commented on the potential of doing so. One particular aspect of content usage mentioned by Queensland students was web conferencing, which is considered in Theme 2.

24.4.2.2 Theme 2: Queensland Participants Use Mobile Devices to Access Content Through Web Conferencing and Recordings of These and Expect to Continue to Do So

Web conferencing is a live video conference through the Internet. Participants all see the same screen. They can interact by texting and talking. AnTEP did not use web conferencing; none of the South Australian participants mentioned it. RATEP uses web conferencing for (among other things) providing lectures, through either "Elluminate" for TAFE or "Collaborate" for JCU. Seven of the 11 (64%) in Very Remote communities in Queensland and 12 of the 19 (63%) from Other places commented on web conferencing. This is clearly a major feature of RATEP. These first two themes have focused on content-related uses of mobile devices.

24.4.2.3 Theme 3: Participants Use Mobile Devices to Handle Administration and Expect to Continue to Do So

Participants identified three main administrative uses of mobile devices, including students checking notices and contacting staff of their course provider and institutional staff contacting students. Sixteen of 45 (36%) participants from Very Remote communities and 17 of 19 participants (89%) from Other locations indicated they were using mobile devices for administrative purposes. Of the four areas of the use of mobile devices for educational purposes, this is the only one currently used by Very Remote participants from South Australia. While practices identified already occur using desktop computers and telephones in the learning centres, pre-service teachers indicated they initiated using mobile devices for the same tasks.

24.4.2.4 Theme 4: Participants Use Mobile Devices for Personal Encouragement and Expect to Continue to Do So

The majority of participants from both Very Remote communities in Queensland and Other places described using mobile devices for personal encouragement: 64% and 63%, respectively, of participants made comments. No participants from Very Remote communities in South Australia reported current usage. Personal encouragement uses of mobile devices were more common between student peers than between students and staff. The most popular uses were general conversation and the identification of an online community.

24.4.2.5 Theme 5: Participants Use Mobile Devices for Academic Support and Expect to Continue to Do So

Students in Queensland were using mobile devices for academic support and desired to continue doing so: 6 of the 11 (55%) in Very Remote communities and 14 of the 19 (74%) from Other places provided responses. Even though South Australian participants were not using mobile devices for this reason, 7 of 34 (21%) referred to the possibility. Academic support uses of mobile devices were more common between student peers than from staff to students.

24.4.3 Summary

The evidence shows mobile devices are being used for educational purposes by Aboriginal and Torres Strait Islander pre-service teachers in both Very Remote communities and Other places. RATEP uses an online approach to study, and these students integrated mobile devices into their professional learning. AnTEP did not use an online approach to study. Nevertheless, across all four categories, there were responses from participants associated with AnTEP (either as pre-service teachers or as potential pre-service teachers) indicating an intention to use mobile devices for educational purposes. These included comments from participants who did not have mobile network services in their communities. There is the expectation that using mobile devices for educational purposes will continue for those already doing so, and there is a desire to do so by those who have not yet begun. These findings will be examined in the following section.

24.5 Discussion

The discussion follows the common design of the book, addressing four levels of solutions: pedagogical (from the student perspective), pedagogical (from the educator perspective), technical and organisational. The focus of this chapter is on the first two levels: practices and comments of research participants about the educational use of mobile devices regarding content, administration, academic support and personal encouragement. Throughout the discussion, anonymous quotes are from interviews with research participants living in Very Remote communities unless otherwise indicated.

24.5.1 Pedagogical Solutions (from the Student Perspective)

This section presents three observations based on research data about the four educational uses of mobile devices: content, administration, personal encouragement and academic support.

24.5.1.1 Students Want to Use Mobile Devices for Educational Purposes

One student's comment encapsulates the enthusiastic embracement of mobile devices: "So in summary, to finish things more quickly, cos it's flexible, anytime, anywhere if you have that motivation, to do it anytime, anywhere" [participant from Other site].

The major finding that 63% of participants used mobile devices for educational purposes accords with literature detailing the rapid and extensive uptake of mobile phones in Remote Aboriginal and Torres Strait Islander communities. The most recent figures indicate that Australia wide 70% of Aboriginal and Torres Strait Islander people own a smartphone, and 43% of Aboriginal and Torres Strait Islander people in remote communities own a smartphone (MIR 2014). No nationwide data is available on the uptake of laptops and tablets in remote Aboriginal and Torres Strait Islander communities. Nevertheless, Kral stated "As access to telecommunications infrastructure and small mobile devices has improved, more individuated practices have emerged with people, predominantly young people, buying laptops, mobile phones and even iPads or Tablets" (Kral 2014, pp. 6–7).

The evidence from this research fits with data from Baran (2014) who conducted a literature review of empirical research published between 2000 and mid-2014 on mobile learning in pre-service and in-service teacher education contexts and found that mobile phones were the most common device used in teacher education contexts (43%) and then tablets (18%) and laptops (13%) (Baran 2014). Many Aboriginal and Torres Strait Islander pre-service teachers and potential pre-service teachers are already using mobile devices for social purposes, and they wish to transfer skills and gain new ones for educational uses.

24.5.1.2 Students Use Mobile Devices to Personalise Their Learning and Exhibit Agency

Pre-service teachers are able to be self-directed in their learning through the use of mobile devices. They are able to choose when and where they conduct their learning and administrative activities.

Content Students in online learning programs expect that all the content of their course will be available through the provider's learning management system or website and/or CDs or DVDs. They assume this includes digital readings, recordings of lectures as well as recommended links to other websites and that they will conduct self-directed research on the Internet, as mentioned in the following two quotes:

"I think everything is delivered pretty well. On the JCU site, they've got all of our subjects, all the content there. You can just click on the site and go straight to it" and "They put your textbook on there, but then they put extra links that you might find interesting that you could relate back to that. … So I think having content material there just for referencing is good". Pre-service teachers also value participating in web conferencing sessions and watching recordings of these, as this fosters engagement with study through regular audio and visual contact with staff and peers, as expressed by this student: "But with Elluminate and TAFE they always do recordings. … They record it and you can go back in your time to go back to the recording".

Mobile devices are seen as providing freedom from the learning centre as they are able to continue study activities when absent from that site or if there were problems with desktop computers at the learning centre. Interview data indicated eight alternative sites to the learning centre: at home, anywhere, in a meeting, during a residential course, at the institution's campus, outside, in a school classroom, and while on a school excursion. The following quote shows two reasons a student was unable to use the learning centre and her alternative site:

> "I had a weekly Collaborate with the lecturers. … Especially when my children were sick, I'd sit at home and get on to it that way [on my own laptop]. And the RATEP [website] was down for quite a while, so you couldn't use the RATEP computers for it" [participant from Other site].

One student enthusiastically expressed her appreciation for being able to use mobile devices away from the learning centre: “If I’m sitting outside or if I’m sitting down the beach with an iPad, I can have exactly the same access. … You can have access to the Internet wherever you go! That’s what I love about it!”

Administration Students expect that they can use any device to handle administrative matters through various modes, including talk, text, email and social media. This includes them taking an active role to check for notices, upload assignments, download material and contact staff. Various uses are illustrated in the following three quotes:

> I use my mobile to access emails to see if I have passed a subject that I’ve sent in.
>
> It’s always with me in my hand. If I’m out somewhere … if I get a phone call that I need to do something like go online, it’s right there in my hand and I just use that. Yeah very quickly and it’s helpful.
>
> You can even upload and send assessments back to the TAFE without actually coming into the centre. Especially if an emergency happens like you said before, if my children get sick and I have to stay home, it’s so much more convenient to have a laptop, than to be worried about running in and out [participant from Other site].

Another student who worked full-time during the day said the only time she had for study and study-related administration was late at night, into the early hours of the morning: “[I use my laptop for study] Every night until about 3 o’clock in the morning! And any spare time that I’ve had. But quite often I was up to 1 or 2 o’clock in the morning doing my study”.

Evidence from the quotes above indicates that use of mobile devices gives pre-service teachers flexibility about the time they study and handle study-related administration. These matters are no longer restricted to the operating hours of the learning centre; rather, students are able to choose when they will deal with them. Participants mentioned eight alternative times for study, including handling administrative matters: at home (as a proxy for “outside the business hours of the learning centre” or “when I’m not able to attend the learning centre”), at night, after hours, on weekends, during residential courses, in the early morning, during school holidays and in spare time.

In summary, data from both content and administration indicate students are able to use features of mobile devices themselves to personalise the way they receive and access material (Townsend 2014). Furthermore, they display characteristics of being self-directed and showing autonomy in choosing the places and times of study; as with mobile devices, they are not restricted to the physical confines of the learning centre or its operating hours. They are able to handle the interruptions to study and complex demands of health, family, employment, community and culture by temporarily assigning priority to these matters and resuming study later at an increased pace or by multi-tasking through the use of mobile devices (Townsend 2015b).

These matters align with general features of andragogy or adult learning identified by Zepeda and colleagues: “Adult learning is self-directed, motivational for the learner, problem centered, relevancy oriented and goal oriented” (2014, pp. 300–301).

They are also in accord with a finding by Baran that the use of mobile devices was a way of "providing preservice teachers with personalized learning experiences" (2014, p. 24).

24.5.1.3 Students Use Mobile Devices to Form Online Collaborative Professional Learning Communities

Pre-service teachers use mobile devices to form online or digital communities of practice and learning, which are expressed through personal encouragement and academic support.

Personal Encouragement Uses of mobile devices for personal encouragement were more common between student peers than between students and staff. The most popular uses were general conversation and the identification of an online community. Results from this study suggest that the use of mobile devices for personal encouragement counteracts the physical isolation from fellow students and staff of their higher education institution experienced by participants in Very Remote communities. Use of mobile devices fosters the formation of friendships, as expressed by this student: "You really create friendships by a mobile device. You meet them once, or you don't even have to meet them and you can still develop … a friendship as such through text message, through phone calls, through emails".

Students value mobile devices for the ability to communicate with fellow students about their lives in general. This covers the emotional, social and physical status of the individual within the complex roles and responsibilities he or she holds. It may include health, sickness and injury, family and intimate relationships, community involvement and psychological and mental health issues. Quotes from two students show the constant contact between people and the extent of their sharing:

> We all stay in touch, pretty much the whole group of us. And we're all going through, so we all sort of stay in touch with each other and share life and stuff. Yes. Always. On the phone, email, Facebook even, we get on and Facebook each other. [and]
>
> All of them [are] on Facebook, [if they see] a family member has passed away, they'll see how I'm going or… if I'm doing a dance and stuff, and they'll see I'm doing something good, they'll congratulate me. … our little jokes and all that [participant from Other site].

Students appreciate institutional staff showing interest in them as individuals, as indicated in this quote: "One of the lecturers, he did call you occasionally to give you personal encouragement". The use of mobile devices for personal encouragement is an example of an online community, which is a term one participant used: "We still keep in contact and we can say that it's our little community and we're contacting each other. Checking up on what we're up to, and we're going to continue". Mobile devices facilitate communication, and students receive encouragement from both peers and institutional staff across the breadth of issues in their lives, and this is likely to strengthen their resolve to persevere with study (as will be demonstrated in point 4 below).

Academic Support Reports of actual use came only from RATEP students. As in the preceding section, uses of mobile devices for academic support were more common between student peers than between students and staff. The following two quotes emphasise the high frequency of contact and the importance of this academic peer network:

> [We] just help each other, because everybody is in the same boat and doesn't know if they are going the right way. … We often daily kept in contact, whether it was by phone, text message … to give each other a hand. … They are so far but you can still talk to them, you can still bounce ideas off each other. [and]
>
> The phone is mostly with you, and that's an easy access … to prompt – as far as – "How is the assignment going?" Or, you know "Have you submitted?" … or, maybe "Whereabouts are you up to?" sort of thing, are crucial [participant from Other site].

Several students mentioned the use of social media between peers for academic support, as indicated in the following three quotes:

> If you have to check out a site that we have to do research on with one of our tasks, we can share that through emails and messages to Facebook and all that …you can just click on it. … You go onto that [0.] Facebook site and that's what I use and talk to other students, … just asking questions about assessment tasks. [and]
>
> We've integrated through Facebook and then if I'm having issues with something I'll put it on; maybe write a couple of my friends say "Hey have you guys done this, um this unit? If so where are yous at? I'm having troubles with this task. Are yous up to there?" [participant from Other site]. [and]
>
> They all get on to Facebook when they're collaborating with each other and exchanging ideas … when they've got questions for other students and they offer their support and what-not. … at a Coffee Club and you'd have your mobile devices and you were sitting down and you were Facebooking other students to get support in regards to assignments. … And so it's been really good in that respect [participant from Other site].

Students can seek help directly from staff.

> I don't have to wait till I'm at RATEP to read my emails. … sometimes I get really impatient – I email one of my lecturers "When are you marking this?" … I ring up a lot, at least with some lecturers, the one's I feel more comfortable with [participant from Other site].

Staff are able to send academic help (and administrative reminders) straight to the students' mobile devices, as seen in these two quotes:

> The lecturers did keep in constant contact with you, by emails. Like there would often be daily from them about all sorts of stuff. Whether its deadlines are approaching or you need help or this next Elluminate's coming. So that's good, because they were constantly in contact. [and]
>
> It's good to get the feedback on the devices to make it more sort of immediate. Like a quicker response. [I've] … had a couple sort of emails, and just comments with assessment returns. And yeah I found it really good, really encouraging, and helpful you know, a bit of a boost [participant from Other site].

Evidence from both the above sections of personal encouragement and academic support reveal an active digital community mediated through mobile devices. In Queensland, it started among the pre-service teachers themselves but spread to include mentor's resident in communities and staff of the higher education institution. People communicate through calls, SMS, emails and social media (Townsend

2015a). As Baran pointed out, "pedagogical advantages of mobile learning in pre-service teacher education included connectivity and collaboration … performance evaluation, and participation in PLCs [professional learning communities]" (2014, p. 26).

24.5.1.4 Students Believe Study Without Mobile Devices Is Difficult

Students see pragmatic benefits from using mobile devices in their tertiary study (Townsend 2015b). They are able to personalise their learning and have agency over place and time of study and administration. They participate in digital professional learning networks which provide general encouragement and collaborative learning. They do not want to be without their mobile devices, either through losing or damaging them. One person said that if this happened to her she would "be devastated". Students believe that not having a mobile device would disadvantage them. One said, "I wouldn't have the opportunity to do it". Two suggested they would be unable to complete a course: "I wouldn't have been able to (probably) complete the course, or fallen well behind" and "I wouldn't be able to hack it without a laptop". Another indicated she would not enrol in study without a mobile device: "No, probably not".

One woman who had to relocate due to domestic violence and who was pregnant and wanted to continue to study with her baby strongly endorsed the use of mobile devices: "That's the one thing that I'm relying on COMPLETELY for my study is the mobile devices. … I'm relying SOLELY on it at the moment" [emphasis in the original] [participant from Other site]. Someone else suggested that if previous students had mobile devices, they probably would not have quit study. "It would've made a huge difference … to have that laptop or whatever thing at home" [participant from Other site].

One person stressed the way in which the use of mobile devices fosters motivation to continue studying when absent from the community and unable to attend the learning centre. In this regard, the use of mobile devices prevents people from giving up and quitting their course.

> They would still have access to the course, they would still have access to be able to keep in contact with other students and their Teacher Coordinator to help them stay focused because … if you're away from something for a couple of weeks for whatever the reason, you lose your routine, you lose your structure. Possibly even the interest for what you are doing, because you're falling behind and you know you've got extra work to catch up with. It can become overwhelming and possibly [you might quit]. Yes. It's easier just to stop doing your course than to complete it. So really having a mobile device with you so you can still … you've still got that motivation there, you've still got something to access it, so it's not hard. … You've got it there with you where you can still continue wherever you are.

Participants in the research clearly believed lack of access to mobile devices meant they encountered difficulties in study and that progress through a course was hindered. This first section has addressed issues from students' perspectives. The following section turns to pedagogic and andragogic concerns facing educators in higher education institutions.

24.5.2 Pedagogical Solutions (from the Educator Perspective)

This section identifies previous experience with online learning as a key to the use of mobile devices for educational purposes. It also discusses suggestions made by students about ways higher education institutions can enhance the use of mobile devices for study, in each of the four areas: content, administration, personal encouragement and academic support.

24.5.2.1 Familiarity with Online Learning Facilitates the Integration of Mobile Devices for Study

There was a marked difference in responses between participants from RATEP and AnTEP. As mentioned, RATEP uses an online approach, whereas AnTEP did not. RATEP students' familiarity with online learning processes meant they initiated the integration of mobile devices into their learning. In contrast, AnTEP students' lack of expertise with online learning processes limited their ability to utilise mobile devices for study purposes and constrained their ability to imagine such uses. RATEP has instigated off-site learning in which students study without the resources and support of a mentor at a learning centre. These students primarily use mobile devices rather than desktop computers for their study. It is possible these students may need additional support if prior experience has not included online learning. These observations fit with remarks by Baran (2014, p. 25) about lack of expertise: "Lack of expertise integrating mobile technologies was also a challenge to effective integration of mobile learning into teacher education".

24.5.2.2 Higher Education Institutions Can Heed Suggestions from Students

Research participants made suggestions for higher education institutions to improve the four educational uses of mobile devices in their ITE courses.

Content As indicated earlier, participants expected to be able to access all content through mobile devices. Very Remote pre-service teachers made two suggestions. One participant highlighted difficulties in viewing recorded web conferencing sessions. These can arise due to infrastructure and service coverage issues, as well as the capacity of mobile devices to handle the software being used. This person suggested recorded sessions could be copied to DVD and posted to students, who could then watch them on laptops. The small size of the student pool and the minimal cost likely to be incurred suggest this would not be difficult for institutions to implement. Another respondent suggested small assignments could be done online through mobile devices, while another advocated that assessments should be designed to make use of the features of touch screens.

Administration Participants want to see existing practices continue, particularly receiving reminders about various matters. One participant from a Very Remote community in South Australia recommended that AnTEP invent a course mobile application (app) for both content and administrative uses: "If they could invent one [an app], I reckon it would be easier … to see which stage you might be at". Independent of this comment, in the same year, UniSA designed and released such an app, including features such as assessment information, due dates and course results, timetables, calendar and notifications (UniSA n.d.).

Another person expressed frustration with difficulties in uploading assignments: "The thing that I hate about this course is SENDING IN MY ASSIGNMENTS! Because that takes HOURS! And when you're on a deadline, it's just like, 'HURRY UP!'" [emphasis in the original] [participant from Other site]. She requested specific training on aspects of handling administrative tasks, such as changing the size of photos, merging files and uploading assignments. It would not be difficult or expensive for institutions to ensure such training was included in induction seminars or web conferences.

Personal Encouragement Students mentioned being under pressure for various reasons, including sickness, study load, deaths and cultural obligations. Kinship often requires people to attend mourning activities, commonly called "sorry business" or "sorry" in various places, sometimes many hundreds of kilometres away. In discussing a central Australian community, Musharbash (2008, p. 38) stated: "Sorry overrides all other concerns and the announcement of an adult death means that any ritual, work, or other activity will be interrupted immediately". Referring to the variety of practices across Australia, McKay and Tighe (2014, p. 114) pointed out: "different stages of sorry business can continue over several weeks and months, depending upon the person's familial relationship to the deceased". The rate of suicide for Aboriginal and Torres Strait Islander people aged 15–24 is more than five times that of their non-Indigenous peers (Dudgeon et al. 2016), and the national age-standardised death rate for Aboriginal and Torres Strait Islander people was 1.8 times that of non-Indigenous people (AIHIN 2016). Deaths occur relatively frequently in very remote communities. Students value support to cope emotionally with grief and other matters, as described by one participant:

> But as far as keeping them motivated I think it would have to be… involve things that could give them more interaction with other students … I had three, four people die in a year and almost … and I had to defer my exams for a couple of months or something, and I know that's what happens a lot with people. They need to take time off. They don't … family comes first and their responsibilities and things like that. So it's hard to change that cause it's to do with the culture and … to put study first when lots of things pop up in life that you just need to take time off. And that could be a reason why some people don't finish [participant from Other site].

One student stressed the importance of staff from the training provider showing genuine interest in students and empathy concerning issues students faced. This could be communicated through mobile devices by emails and phone calls: “It’s all about that feeling stuff as well. It’s not just ‘Here is a room and here’s books … and away you go,’ [but] empathy, … ‘We’re working with you and for you too. We know how hard it’s been’” [participant from Other site].

Institutions could consider extensions for compassionate reasons regarding mourning; this would incur minimal expense. Again, at little cost, course providers could endorse students setting up their own social media groups or establish these for course cohorts.

Academic Support Pre-service teachers made suggestions to enhance academic support through mobile devices. One person advocated that staff could telephone a student if needing to make negative or critical feedback on a student’s assignment: “Instead of just writing comments on the bottom of your assignment I think a phone call to back it up, or prior to giving you those comments … [would be] more professional … a little more personable I suppose”.

Another student proposed using mobile devices to video ITE students in classrooms with pupils during professional experience internships:

> Staying where you are and being part of your home community … you get people through quicker, with video to do their teaching and their pracs. So that the person in the city can see that you’re competent. Rather than just hearing from someone who signs a form to say that you’re competent, he can actually [see] … you can teach in the class, they can see that you can do it [participant from Other site].

This accords with comments by West (2012, p. 12) about pre-service teachers using smartphones “to film themselves teaching a lesson or lesson segment. These video clips are then uploaded to a server where professors and peers can watch them at their convenience”. Tablets have also been used for the same purpose: “The iPad proved itself to be a powerful ‘all in one’ device for recording and reviewing the teacher’s own performance, aiding the development of reflective capacity” (Leggatt 2016, p. 444). The implementation of the practice would require no further expense to institutions, assuming ITE students have either their own or issued mobile devices.

24.5.3 Technical Solutions

Research participants pointed to several issues regarding the use of mobile devices which require higher education institutions to take action of a technical nature. These included providing Internet access at learning centres which is not limited by Education Department restrictions for minors; ensuring the training provider’s website, learning management system and preferred software operate on all kinds of mobile devices regardless of operating system; and supplying required mobile devices for compulsory subjects about mobile devices.

24.5.3.1 Unrestricted Internet at Learning Centres

Pre-service teachers from both Very Remote (one person) communities and Other places (two people) expressed frustration that, as adults, they were unable to access course material recommended by their tertiary institution when at the learning centre, due to Education Department restrictions for minors (such as firewalls, filters and prohibited sites), which affect desktop computers and mobile devices using the local area network (wired or Wi-Fi). Using mobile devices away from the learning centre through their own service provider enabled them to complete their tertiary study requirements. The following two quotes indicate the angst students experienced:

> The internet system here… it drives me crazy. … Sometimes I can't go to different sites. I need to ask, send away, ask [the Teacher Coordinator] to get me permission to view things like YouTube clips that I need for my lectures – I've [been] given certain things I need to view [yet] I've got to get permission. And also when I'm just searching things on Google, if I'm at home, I can just easily click on all kinds of different sites, but with this … it's been very frustrating enough for me not to come in here at times. So I just get more done at home as far as my research and things [participant from Other site]. [and]
>
> In RATEP we're on the Education Queensland computer system, and we have SO many blocks. … We were just getting Block, Block, Block, Block! … and most of our uni work is through YouTube! Some things we HAVE to do. … The students are at uni level and they need fairer restrictions [emphasis in the original] [participant from Other site].

Under both community-based programs, learning centres have generally been at school sites, and, thus, the Internet system is affected by policies regarding minors. It may be possible to establish direct Internet connectivity at a learning centre that bypasses the local Education Department Internet system. Another idea is to issue students with prepaid dongles (i.e. a device to enable Wi-Fi connection), so they avoid using the local Education Department Internet system. The first option requires an initial infrastructural cost, while the second involves ongoing top-ups. However, the matter of restricted Internet access is clearly extremely frustrating to adult tertiary students.

24.5.3.2 Operating System Neutrality and Software Upgrading

One person had difficulties accessing web conferences when using an iPad. This occurred at a time when she had relocated due to domestic violence and contributed to her withdrawing from study.

> Now that was *really* hard for me because, um my sister had an iPad and I took it with me, cos I was like "Oh yeah, I can still do everything because of the way the course is delivered, is you know, online." So I was like "Oh yeah, I can still do everything – I can go, you know with JCU: Blackboard, Collaborate." But then every time I tried to jump on to a Collaborate session it wouldn't let me. and I'm like "What's wrong?!" and I'm always ringing, like messaging my lecturer. I couldn't get on – "technical difficulties". … I end up finding out that their technology in the uni wasn't up to date for them to deliver it on the iPad. But now this semester they've updated it all. So I can go on Collaborate on my phone. … Because

> they did that one thing and upgraded their technology for devices, it's like amazing! If that had of been the case last semester, I probably would have followed through [with study and not withdrawn] [emphasis in the original] [participant from Other site].

The same person noted that at that time she was unable to use official Word software on an iPad.

> We all have to use the desktop at one stage or another, and then making it, we can do it on the mobile device. For example Word – I tried downloading another Word app, but I don't think it's official Microsoft Office apps or something? I do not think it's up to their level. … Like the iPad is a real essential [participant from Other site].

Regardless of whether an institution advocates for a limited number of preferred models of devices or endorses a bring your own device (BYOD) approach, it must ensure that whatever resources it presents to its students are accessible and fully functional across all three main operating systems, such as Apple, Microsoft and Android. So too, the resources must have displays appropriate to mobile devices. Moreover, software and apps used by the institution must also be able to work properly on mobile devices, and any upgrades must be supplied to students. There will be costs to institutions in implementing these actions. Nevertheless, they would not be limited to ITE course participants only, but be part of a whole-of-institution long-term strategy, and thus encompassed within an ongoing vision.

24.5.3.3 Supply of Mobile Devices for Subjects in Which Their Use Is Compulsory

Two people described fellow students who almost failed the course because the institution did not supply an iPad for a compulsory topic about iPads.

> She didn't – for that whole iPad module (that was done in the last week of her course … because there was actually two of them [students]) – didn't have an iPad; TAFE didn't send them one. That whole module … they nearly didn't pass their whole Diploma because they did not have the correct resources to complete that unit. [and]
>
> And it's hard, like the iPad here, cos there's only two [iPads]. I've seen how all the TAFE students struggled to do their, complete their module – only two iPads and they all had to use those iPads [participant from Other site].

If an institution includes a compulsory topic that in which a specific mobile device is required, then the institution must supply at least two such devices to every learning site or perhaps supply the devices on the basis of one device to four students at a learning centre. In addition, the institution must supply the device to off-site students, perhaps on a loan for a designated time. There would be an initial capital cost for purchasing the mobile devices, but this would not be a major expense.

24.5.4 Organisational Solutions

Two major issues raised by research participants were the responsibility of supply of mobile devices and the responsibility for the cost of mobile network service.

24.5.4.1 Supply of Mobile Devices

In the current research, neither of the institutions offering community-based ITE had a policy to integrate mobile devices into study. By default, this led to a situation of BYOD. A few years ago, the Australian government funded the issue of a laptop to every senior secondary school pupil (Buchanan 2011). That program stopped, but many schools offer schemes to enable pupils to have laptops or tablets. A number of higher education institutions are issuing mobile devices to tertiary students (Dalziel 2013). Two respondents noted that they are being trained as professional school teachers who are required to demonstrate competency to teach school children how to use current technologies, including mobile devices. They suggest that it is inconsistent to provide mobile devices to school pupils but not to pre-service teachers.

Most of the RATEP students (17 of 30 or 57%) suggested the institution issue a mobile device to students. Six of the 30 RATEP students (20%) suggested students hire, rent or lease mobile devices from the training provider; two of whom indicated the student keep the device at the end of the course. Four of the 30 RATEP students (13%) proposed that the institution loan devices to students for the course and students then return them. Another person suggested the institution loan mobile devices for a temporary period at the start of the year. Four RATEP participants raised the possibility of students being given funds to assist in purchasing a mobile device; one suggested this could happen through government welfare or study programs, and one advocated funds be linked to government loans for tertiary tuition. Of the South Australian participants, 31 of 34 (91%) made no comment about the responsibility of students obtaining mobile devices; one said students could buy their own, and two suggested the university should issue them. Among the 64 participants, there were 26 who commented on the supply of mobile devices; only two said it was the responsibility of the student, and the rest (23 of 26 or 88%) mentioned the institution issuing, hiring or loaning mobile devices. It was suggested that the use of mobile devices would enhance completion rates. One person proposed current students could write a letter advocating their use.

> [Our letter would be] so people can see that "Oh … these people are using the technology in the mobile devices and they're *flying* through with flying colours; and you've got people who are just lagging behind, a few, a little bit, because they have to *wait* till Monday. They can't do it on the weekend. They have to wait till Monday. You know, too bad they're sick, then they stay home again. They don't come in and they lose a whole lot of work because they don't have [a mobile device]. … If something like that could have been subsidised for students, then you'd have all these students getting it [a mobile device] and jumping on board and not failing and not wasting government's money and time on dropouts or you know on their courses. [They would not have people] saying "Nah, don't want to do it any-

more, cos it's too hard, don't have any time, and I keep failing my assessments" [participant from Other site].

A significant question facing higher education institutions is whether they require students to use a limited number of preferred models of mobile devices or whether they support students using a bring your own device (BYOD) approach. BYOD is a significant global trend in universities as indicated in the following quote:

> The BYOD movement is enabling students to learn using the technology with which they are already familiar and comfortable, providing them with a greater sense of ownership over their learning. … today's students expect to be able to use whatever devices they choose to access learning content, take notes, gather data, and communicate frequently with their peers and instructors. In this sense, the adoption of BYOD does not revolve around promoting technology use, but facilitating ubiquitous learning and productivity gains (L. Johnson et al. 2016, p. 36).

Training providers also need to establish policies about issuing, hiring or loaning mobile devices. They must determine whether they will fully fund or partly subsidise the cost to students of purchasing mobile devices and whether they will support funding for this purpose from other sources. These are major issues affecting an institution and require intensive investigation – including seeking students' opinions – and extensive preparation (Russell et al. 2014).

24.5.4.2 Cost of Mobile Network Services

As indicated above, in the current research, neither of the institutions offering community-based ITE had a policy to integrate mobile devices into study, and thus there was no policy about the cost of mobile network services to students using their own mobile devices. By default, this led to a situation in which the student paid. Of the 64 participants, 18 (or 28%) made comments about the cost of mobile network services. Two stated their usual prepaid allocation quickly runs out, as it gets used by other members of the family, and watching recommended YouTube clips and web conferencing rapidly deplete credit. Another person remarked that students cannot afford to pay for their Internet usage, and another said that it was a financial burden for most students.

> It could become financially challenging for them to have to expect to pay additional money on top of their fees, on top of textbooks and whatever else is laid out in their course to have to pay all their Internet connection for a course they are already paying for.

Of the 18 who made comments, 8 (or 44%) recommended pre-service teachers be given some kind of assistance with the cost of mobile network services. Three suggested the institution pay, including one who proposed the institution issue prepaid or plan-enabled dongles (accessories for connecting mobile devices to the Internet), one said the government should pay, and another raised the possibility of a specific government funding program for Aboriginal and Torres Strait Islander students paying the costs. Three recommended grants, allowances or subsidies be given to students. One person raised the possibility that if assistance of some type was given, it might not all be used for study purposes. Two others said it was the students' responsibility to pay for mobile network services.

> Well maybe TAFE could set up something that we could access that on our mobile, the tablets, that maybe they could put towards us so we could access for free! They could pay for it. … Yeah, I reckon they should have that support where they could give us tablets or wireless things [dongles] that we could use, from TAFE.

A major question facing higher education institutions is whether assistance is offered towards the costs of mobile network services. This is likely to become more pressing as institutions make their courses available to students in locations where there are no learning centres. This could be considered a matter of social justice. If a course is only offered through online mode, and there are no learning centres close to the students' homes, and no fixed-line services to the students' residences, then the only possible way to do the course is through mobile network services. Yet these services generally cost more than fixed-line services and are often more expensive for remote locations.

The most recent Australian Regional Telecommunications Review noted the impact of data charges and data volume for remote consumers and proposed four measures to avoid inequalities and enhance affordability: reasonably comparable pricing between metropolitan and non-metropolitan areas, exempting selective content from download quotas (e.g. gov.au or edu.gov sites), support for those on low incomes (e.g. the current Telephone Allowance and disability groups) and targeted Indigenous requirements (RTIRC 2015, p. 51).

Specific arrangements about costs to students need to be implemented. From a long-term perspective, education institutions and authorities, mobile network operators and government telecommunication regulatory bodies need to cooperate to establish policies about universal service obligation, in regard to mobile service and data access, as the notion of a standard telephone service by fixed-line is increasingly irrelevant.

24.6 Conclusion

This chapter explored the perceptions and practices of Australian Aboriginal and Torres Strait Islander pre-service teachers and potential pre-service teachers about integrating mobile devices within community-based ITE programs. The majority of the research participants used mobile devices for educational purposes: content, administration, personal encouragement and academic support. A person enrolled in an ITE course who was from a location that was not Very Remote which had mobile network service was significantly more likely to use mobile devices for any of the four educational uses than peers who were not enrolled in an ITE course and who lived at a Very Remote site without mobile network service. There was no significant difference regarding gender or age.

It is clear that there is a strong desire to use mobile devices for educational purposes, by both current and prospective tertiary students. Students use mobile devices to personalise their learning and exhibit agency. They also use mobile devices to form online collaborative professional learning communities. They believe study without mobile devices is difficult and conversely believe the use of mobile devices can boost retention and completion. Training providers can ensure students are familiar with online learning approaches as this will facilitate the integration of mobile devices for study. Furthermore, they can act on recommendations from students to enhance the pedagogic and andragogic practice of the institution.

At a technical level, higher education institutions need to provide unrestricted Internet access at learning centres when these are located at schools. Otherwise restrictions established to protect minors prevent adult tertiary students connecting to required sites or researching areas relevant to their study. Training providers need to ensure that the software they use is regularly updated and that it works on any mobile device regardless of the operating system. They also need to guarantee they have adequate numbers of mobile devices at learning centres or available for loan to off-site students, in order that students are able to complete any subject for which that mobile device is compulsory. Two significant policy issues require consideration at the organisational level: the supply of mobile devices and the cost of mobile network services. Both can be considered issues of social justice. A summary of the key points of the chapter on each of the levels of the framework (Murphy and Farley 2012) is presented in Table 24.2.

This chapter presents information specific to the two community-based ITE courses and experiences of the participants in the research. Nevertheless, it raises issues relevant to tertiary study in remote locations which could apply across the Asia-Pacific Region. The evidence from this research indicates the enthusiastic

Table 24.2 Chapter summary

Pedagogical solutions (from the student perspective)
Students want to use mobile devices for educational purposes
Students use mobile devices to personalise their learning and exhibit agency
Students use mobile devices to form online collaborative professional learning communities
Students believe study without mobile devices is difficult
Pedagogical solutions (from the educator perspective)
Inculcate online learning approaches to facilitate integration of mobile devices
Implement suggestions from students about content, administration, personal encouragement and academic support
Technical solutions
Provide unrestricted Internet at learning centres
Ensure operating system neutrality and software upgrading
Guarantee supply of mobile devices for subjects in which their use is compulsory
Organisational solutions
Supply mobile devices
Assist with the cost of mobile network services

adoption of mobile devices for study purposes by tertiary students in Very Remote locations. This scenario is already occurring in other situations and is likely to be a significant trend across the Asia-Pacific Region.

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Chapter 25
Enabling Effective Mobile Language Learning: Students' Perspectives, Wants and Needs

Caroline H. Steel

Abstract This chapter presents learner perspectives on the pedagogical use of commercial mobile learning applications for acquiring Asian and European languages at an Australian university. It contributes to this book by addressing one of the key organising questions: What are the different ways of conceptualising, identifying and evaluating mobile learning initiatives in higher education in the region? Specifically, it utilises the student perspective from the 'pedagogical' level of the Mobile Learning Evaluation Framework, whereby students were co-partners in an inquiry that focused on evaluating how mobile devices and applications could be used for learning foreign languages. It aims to build a better understanding of students' emerging mobile learning practices and preferences in the Asia-Pacific region through learners' own evaluations and experiential accounts in learner-determined contexts. Over three iterations of an undergraduate class (2011–2013), language students selected and actively evaluated current and emerging technologies for their potential for assisting language acquisition. Simultaneously, students were encouraged to gain pedagogical intelligence (Hutchings, 2005) about themselves as learners and how they were taught languages. Increasingly, students selected mobile devices and commercial applications as the focus of their evaluations. In pairs or individually, 63 students created a total of 36 radio-style podcasts to share their discoveries with language

C.H. Steel (✉)
The University of Queensland, Brisbane, Australia

Blackboard International, Washington, DC, USA
e-mail: caroline.steel@blackboard.com

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teachers. Approximately 25% of these students were from Asian countries such as China, Korea, Japan and Vietnam. This chapter presents the perspectives of regionally diverse and pedagogically intelligent learners on enabling effective mobile language learning. Their wants, needs and recommendations are summarised for institutions, teachers, learners and mobile learning application developers in the Asia-Pacific region who are seeking to enable effective mobile learning.

25.1 Introduction

The potential for mobile learning is growing exponentially on university campuses across Asia-Pacific given the increasing numbers of students with their own personal mobile devices (Adkins 2015). Influenced by lower prices and wider choice, students are investing in a diverse range of personal devices loaded with commercial applications they hope to use productively for learning in and beyond their university classes. However, to date we have little insight into students' experiences of using these commercial applications for learning. As technology owners investing in their own education, it is important that mobile learning applications are meeting students' needs and expectations and are designed on sound pedagogical principles that are meaningful for current and future learners.

Foregrounding students' perspectives, this chapter addresses a key organising question for this book: 'What are different ways of conceptualising, identifying and evaluating mobile learning initiatives in higher education in the region?' In doing so, this chapter argues that students should be central in shaping and influencing the future of mobile learning and associated educational initiatives in the Asia-Pacific. Drawing on a discipline-based initiative conducted over 3 years with students in an undergraduate foreign languages class, a collaborative co-inquiry approach was used to uncover students' insights and experiences. Student perspectives were further informed through an in-class process that equipped students with 'pedagogical intelligence' (Hutchings 2005) so that evaluations of mobile learning devices and applications were pedagogically informed. Hutchings (2005) defines pedagogical intelligence as the ability to understand how learning happens and a disposition and capacity to shape their own learning. Using their pedagogical intelligence, students shared their insights, wants and needs through radio-style podcasts that were analysed in this chapter for language teachers, institutions and application developers across the Asia-Pacific region who are seeking to enable effective mobile learning.

25.2 Mobile Learning in the Asia-Pacific

In the Asia-Pacific region, barriers to student ownership and use of mobile devices, particularly smart devices, have previously impeded student-initiated use of mobile devices for learning. These barriers included high pricing for smartphones, high pricing for mobile web access and data packs (Cochrane 2005), small screen size and poor resolution (Stockwell 2008), awkward text entry (Mellow 2005) and limited memory and battery capacity (Stockwell 2008). However, many of these concerns have now been addressed. For example, in recent years smartphones have become more affordable, mobile web access has become less expensive in most countries, the interfaces for text entry are easier and quicker to use and memory storage and battery capacity have also improved. This has meant that student ownership of mobile devices is growing. For example, a Malaysian University study (Song et al. 2013) highlighted substantial increases in student laptop and smartphone ownership between 2008 and 2013. By 2013, laptop ownership had reached almost 100%, and smartphone ownership was around 81%. Ownership of smartphones in South Korea exceeded 78.5% by 2012 (Korea Internet and Security Agency [KISA] 2012), and 37.51 million Koreans owned smartphones by 2013. In Indonesia, market penetration for mobile ownership reached 40% by 2014 (GSMA 2015), while approximately 60% of people in the Pacific Nations now have access to mobile phones (Cave 2012).

Some higher education institutions and governments have taken steps to ensure that mobile technologies are adopted and used as enabling educational tools. For example, in 2011, in South Korea, the Korean Ministry of Education, Science and Technology (KMEST) provided financial support to seven online universities to promote and integrate mobile learning in ways that enabled learners to access their study through their own devices anywhere and anytime (Joo et al. 2014). At an institutional level, some universities are providing all new commencing students with a mobile device as part of the university's blended learning strategy. For example, the University of Adelaide and Western Sydney University provide an iPad to new commencing students. Clearly university provision of mobile devices for teachers and learners is commendable; however, as Baroudi and Marksbury (2013) pointed out, 'a laptop or tablet program is not required to impact a campus or university; its stakeholders bring their own devices, making every institution a mobile one, in absentia' (p. 371–372). With increasing student ownership of mobile devices across the Asia-Pacific region, our institutions are undoubtedly becoming more mobile – with or without strategic intent. Indeed, according to an Ambient Insight Regional Report (Adkins 2015), 'Asia is the most vibrant and unique Mobile Learning market on the planet' with mobile learning revenues predicted to rise to $7.7 billion by 2019. Given the ownership rates of mobile over PC, in some rapidly developing Asian nations, mobile is the only viable learning technology for much of the population seeking education.

Even so, ownership or access to mobile technologies does not necessarily equate to effective mobile learning or quality mobile applications. We have more to learn through gaining a better understanding of how students are using and want to use their devices for learning, knowing what students find beneficial in mobile applications and combining this knowledge with sound pedagogical design. Studies from various disciplines have provided initial insights into these aspects of mobile learning. For example, Song et al.'s study (Song et al. 2013) of first year undergraduate creative multimedia students in Malaysia found that 76% of students who owned smartphones reported using their devices for learning activities. Typical learning activities included taking photos and videos (91%), social media-based communication (79%), taking notes (77%) and sharing information with other students (74%). In a different discipline, an Australian survey of 782 undergraduate foreign language students across three Australian universities (N = 782) (Steel and Levy 2013) revealed that mobile applications featured in the top six technologies that students used both inside and outside of class. Furthermore, most students believed that mobile applications were beneficial for their learning languages.

While these kinds of studies provide a sense of students' mobile learning use and activity types, more knowledge is needed to bring visibility to learners' perspectives and experiences so that mobile application design is more purposed towards what students want and need from their applications in their formal and informal learning settings. We need to combine this understanding with sound pedagogical knowledge to develop high-quality mobile learning applications, particularly in Asia where there is 'a near insatiable demand' for educational game-based and language learning applications across the region (Adkins 2015).

Such an inquiry is well positioned to draw on Murphy and Farley's (2012) Mobile Learning Evaluation Framework with reference to student pedagogical perspectives. Specifically, the author proposes that in order to uncover a richer and more productive understanding of what learners want and find effective in their mobile learning applications and experiences, students need to contribute from an 'informed' pedagogical perspective. That is, they need to gain better pedagogical intelligence about themselves as learners and how they are taught – generally and with technologies. In this way, students will be better informed, and thus positioned, to contribute deeper insights from their evaluations of their mobile learning technologies and experiences.

25.3 Methodology

This study was conceived within a constructivist theoretical framework that acknowledges learning as an active and creative process that seeks to connect new knowledge and skills with current and past knowledge (Bruner 1996). Collaborative co-inquiry, in particular, was a key to the methodological approach that saw both teachers and learners engaged in a process of defining inquiry objectives and finding answers (Wells 1999).

In this study the teacher's contribution was in setting up the overarching aims of the inquiry and providing students with in-class opportunities to gain pedagogical intelligence and exposure to a range of technologies. Learners contributed by selecting technologies to evaluate, determining how they would evaluate them and producing radio-style podcasts to share their discoveries and recommendations. Learners were given a great deal of choice as to the technologies they evaluated. However, broadly, students selected the technologies based on their foreign language, the types of language skills and knowledge they hoped to develop. Their evaluation focused on uncovering the pedagogical approaches and learning theories used and their affordances and constraints for learning.

In this way, the inquiry was conducted as a collaborative co-inquiry, whereby students worked in pairs to conduct the main work in their own learner-determined contexts and the teacher supported their inquiry through in-class activities that assisted students to develop pedagogical intelligence.

25.3.1 Sample and Study Context

The context for the co-inquiry was an elective undergraduate subject on technologies and language learning. One of the assessment tasks required students to work in pairs or individually to select and critically evaluate a technology of choice and summarise their findings in student-created and produced radio-style podcasts. Their brief was to inform language teachers and mobile application developers about the potential of technologies for language learning and teaching from a learner perspective. In tandem with their evaluative inquiry, students were introduced to several theoretical lenses such as learning and language acquisition theories and affordance theory to assist them to critically evaluate their self-selected technologies. Affordance theory was a useful lens because affordances (Gibson 1979; Norman 1988) describe the properties or possibilities of an object for action by an actor. In the context of this task, the object was the technology, and the actors were the teacher and/or student. In recent years, affordance theory has commonly been used to describe the properties of technologies that enable or constrain student learning or teacher practices. Combining these theories with in-class activities and pedagogical modelling helped students gain an awareness of their learning approaches, strategies and preferences and the different teaching styles they typically encountered. Additionally, they provided an important lens for evaluating technologies from an informed pedagogical perspective.

Students chose any technologies to evaluate, and these were not just mobile applications. In 2011, just 11 students or 38% of the class selected mobile devices and applications to evaluate, and this grew to 23 (51%) in 2012 and 29 (72.5%) in 2013. Over the three iterations of the undergraduate subject (2011–2013), 63 students worked in pairs or individually to critically evaluate 58 mobile learning technologies. Of the students who chose to evaluate mobile devices and applications, most were studying a Bachelor of Arts degree (56%), and the remainder (44%) were studying either a dual degree like Arts and Education, Business, Law, Social Sciences, Engineering or Communication. Approximately 33% were international students with 25% from China, Korea, Japan and Vietnam. Student projects on mobile learning culminated in 36 student-created podcasts (typically 5–7 min in length).

Transcripts of these podcasts were analysed through several repetitive cycles to interpret and locate themes representative of students' constructs in relation to their perceived needs and wants around mobile language learning as well as their recommendations for language teachers. This analytical approach is appropriate for a constructivist design, whereby constructivism accepts reality as a construct of the human mind. For example, in this study, students' understanding was constructed through reflections on their personal experiences of learning and being taught, combined with their new knowledge of themselves as learners using mobile technologies to support their preferred learning modes, contexts and approaches. These themes were then categorised as general needs and wants and pedagogical needs and wants. The general needs and wants encompassed some of the general attributes of mobile learning in terms of the types of affordances they broadly offer, while pedagogical needs and wants are more specific to the pedagogical purposes students believed the technologies could offer them.

25.4 Students' Perspectives, Wants and Needs

The 63 students who voluntarily contributed to this study selected and evaluated the devices and mobile applications outlined in Table 25.1. The findings reported in the sections below work from the broader and perhaps better-known advantages of mobile learning to the more pedagogical (from the student perspective). Each category contains a number of sub-categories that provide illustrative student excerpts along. Finally, student recommendations for teachers are presented, and limitations and conclusions of the study are noted.

Table 25.1 Learner-selected technologies 2011–2013

Learner-selected technologies	2011	2012	2013	Total technologies evaluated by type
Mobile devices				
Smartphones; iPads; iPods	3	4	5	12 (8 Smartphones; 3 iPads; 1 iPod)
Mobile applications and mobile accessible technologies				
App that offered a structured learning programme	1	4	9	14
Podcasts	4	3	0	7
Flashcard apps	4	0	2	6
Dictionaries/thesaurus app	1	1	4	6
Translator app	0	3	2	5
Game app	3	1	0	4
YouTube app	1	0	0	1
iBook	1	0	0	1
Photo blogs	1	0	0	1
Community-centred app	0	0	1	1
Total technologies evaluated by year	18	12	14	58

25.4.1 General Needs and Wants

An analysis of the general needs and wants expressed by students in relation to mobile learning revealed a number of pragmatic themes. Students desired the flexibility to learn across time and space, mobile applications that were affordable and user friendly, as well as mobile tools and learning activities that could augment interactive and multimodal learning.

25.4.1.1 Flexibility to Learn Across Time and Space

Student clearly valued the flexibility of mobile learning across time and space. As one student commented 'Omnipresent ownership of mobile phones means students can now extend learning well beyond the classroom'. With the ability to use their devices and apps anywhere and anytime, students recognised that 'Idle moments we once would have wasted away now become precious study minutes'.

This kind of flexibility, combined with built-in and downloadable mobile learning applications, meant that students had access to tools to integrate their in-class and out-of-class learning. For example, students who used a flash card application (e.g. *Anki*) could create their own sharable vocabulary decks in class and use them across devices and locations. 'You can take note of words you didn't know on the *iPad* in class and then revise later on my phone, on the bus using *Anki*'.

Naturally the portability of internet-enabled mobile devices, combined with the range of tools and applications available, afforded the flexibility to learn across time and space. As one student commented:

> Smartphones have countless affordances. To name a few, they are portable, able to connect to the Internet, have a readable screen, they are widely available and can be used any way and anywhere and are very user friendly.

25.4.1.2 Affordability

Most students were price sensitive and expect good value from their investment in mobile learning. Many perceived that mobile devices and applications have become more affordable and thus accessible to students. There was often an expectation that mobile applications would be free or very low cost. 'The lessons are also completely free, making language learning open to more people than ever before'. For some, there was a perception that high quality could incur a justifiable cost – 'Not all of them are free, you have to pay for the really good ones'. However, when there was a financial cost, students weighed up the benefits. 'The app costs around $3 but compared to the $40 you might spend on a paper dictionary that's nothing'. Compared to the traditionally high cost of paper-based text books, mobile applications offered an affordable alternative, especially if they offered the same content or a more convenient (e.g. portable) or enhanced (e.g. easily searchable or interactive) user experience.

25.4.1.3 User-Friendly Design

Students expected mobile applications and devices to have a user-friendly design. 'I am so impressed by this app – it is simple and easy to use – and it is not an app that requires you to have a Master's degree in order to learn a second language'. Typically, students do a little research before purchasing a mobile application. 'Most applications are self-explanatory and before installing you can read the reviews from other users'. Smartphones, particularly, were singled out as being very 'user friendly'. Often user friendliness equated to ease of use such as 'I just downloaded it whilst you were talking… It's super simple and really user friendly. Students highlighted ease-of-use for teachers too. For example, 'anyone can use it', 'this technology is user friendly to both teachers and students'.

25.4.1.4 Multimodal and Interactive

Students were very positive about the ways that mobile devices and applications offered them interactive and multimodal features. They often highlighted these interactive aspects when evaluating mobile applications. 'Wow, so it sounds like quite an interactive application'. For those evaluating mobile devices, interactivity was a key feature – 'whichever way you approach smartphones, they do offer a multimodal approach to learning, incorporating reading, writing, listening, and speaking through an interactive platform'. Mobile devices loaded with mobile applications offered learners a rich and diverse multimodal and interactive technology tool set. Access to such a toolset was a clearly compelling proposition. They offer 'language learning dictionaries, translators, games, voice recording, flash cards, word of the day and podcast… *Skype*, video chat and *FaceTim*e'. Some individual applications too (like *Duolingo*) offered a rich variety of multimodal and interactive activities such as 'audio questions', 'voice recognition', 'quizzes', 'flashcards', 'interactive games' and 'listening and grammar tasks'.

25.4.1.5 Discussion

Students' general needs and wants from mobile learning were both pragmatic and contemporary for the times. Out of class, students access their mobile devices for a raft of social, entertainment and everyday purposes across time and space. It is perhaps unsurprising that many seek a continuance of mobile use throughout their learning. At the same time, students showed great awareness, and sometimes concern, for the disruptive nature of technologies and how that could impact on their learning. Nevertheless, students need flexibility to learn across time and space to fit learning into their busy lives (Steel 2012). In order to do so, mobile learning must be affordable, user friendly and multimodal and interactive so that it is engaging for learners, if not entertaining as well. Increasingly undergraduate students need to work to support their studies and lives (Coates 2011). This means that they need to be economic and astute with their time as well as their finances. Mobile learning and technologies enable learners to more efficiently utilise their 'everyday lifeworlds as learning spaces' (Pachler et al. 2010, p. 6) more fluidly. Complimented by an impressive range of commercial mobile applications, students' personal devices present convenient, portable, customisable and cost-effective opportunities for learning interactively and in multiple modalities. In turn, this means that 'pockets of time available at certain times of day can become profitable moments of learning, and places that were previously dedicated to one purpose can assume a different role' (Kukulska-Hulme 2012).

25.4.2 Pedagogical Needs and Wants

Students' perspectives on their pedagogical needs and wants were informed by the pedagogical intelligence they developed as part of the in-class and theoretical work for the undergraduate subject. In this way, they were equipped with more of an 'informed consumer' perspective to inform their evaluation approaches. As such, students expressed a preference for mobile applications that drew on contemporary pedagogies and were suited to the mobile environment. Consequently, their pedagogical needs and wants focused on being enabled to self-regulate and personalise their learning, to experience learning in social and engaging ways, and for their learning to be based on sound pedagogical principles.

25.4.2.1 Personalisation

Students enjoyed being able to personalise their learning and learning environment. The enormous variety of mobile applications meant they had a lot of choice in customising their mobile learning experience. Speaking about flashcards, one student noted:

> Students can decide how long they want each session to be or how many cards should be reviewed and even what font and colour coding they want. So the customisation features for aesthetics and structure are really complex. If you're really interested in the statistical aspects of your learning, you can even tag cards for high or low priority and do a number of graphs which track your progress.

In some mobile applications, this ability to customise and personalise gave students choices that meant they could tailor learning to their particular learning needs:

> It is designed in different levels so I can always find the one that is suitable for me. The content is interesting and it varies, the first time I listened to it I got really excited and motivated, it's just like my personal tutor who is so patient with any of my requests.

In this way, personalisation was empowering for students as it put them firmly at the centre of their learning experience:

> Mobile learning is a ground-breaking approach to teaching as it differs from the usual pedagogical approaches and teacher-based learning. This is done by creating a student-centred personalised learning experience where the responsibility of learning is in the hands of the learner.

While some mobile applications were overly structured programmes and less flexible, applications like flashcards meant that students could create content that matched their in-class learning or their interests:

> *Spanish Anywhere* has flashcards with the capability of being able to create your own. Here the user becomes the producer and thus has a greater input in their own language learning process.

Some students reported that podcasts too could be adapted to their learning preferences:

> The great thing about podcasts is that they can be adapted to the requirements of the language task at hand as they include audio and/or visual content, be it images, video or subtitles. This way podcasts, much in the same way that they lend themselves to different learning pedagogies, can be adapted to suit the learning challenges of a vast array of languages.

25.4.2.2 Self-Regulation

While different learning preferences and challenges could be catered for, student also wanted personalised feedback to help them self-regulate their learning. For example, 'one specific feature of the program that I found extremely helpful was the personalised dashboard'. Students valued the ability to self-monitor their learning via mobile applications. A number of applications provided instant feedback, analysed students' learning data and presented it back to them in easily understandable learning analytics (scores, graphs, etc.). Together, these features helped students self-regulate and take control over their learning at a metacognitive level:

> My favourite feature is that it can accurately track the words and phrases that you most commonly make mistakes on, which, to me, provides this massively useful metacognitive tool to see where I make the biggest mistakes so I can focus on rectifying them.

Some mobile applications took this even further by offering personalised feedback that could, in turn, generate future learning experiences designed to address students' weaker learning areas:

> Every time a lesson is completed, data is provided about what the user struggled and excelled at. This application then creates future lesson plans to cater to the user's needs. It customises their learning experience.

Acquiring feedback and information about their performance meant that students had the evidence they needed to reflect on and exercise more control over their learning. The source of feedback and evidence could be derived from analytics, algorithms, crowd sourcing or pattern matching:

> In terms of language learning through reading and translating, *Duolingo* provides instant feedback and instant dictionary, crowd sourcing through community feedback and learning by reading and translating real web pages. There's also a speech recognition function that assesses your pronunciation based on a pool of recorded native voices that *Duolingo* has collected – awesome!

25.4.2.3 Socially Connected

While inbuilt functionality for self-regulated learning and a personalised learning experience were important, students sometimes appreciated the opportunity for socially connected learning. For these students, the potential for social learning afforded by Web 2.0 enhancements was persuasive. For example, 'users of *Duolingo* are also able to communicate with friends, comparing language levels and abilities while allowing for a social learning experience'. For language learners, being able to communicate online in their target language is desirable. Some applications linked into internet-based technologies that allowed for such socialisation. 'The use of *Skype* for chatting online is a very useful and engaging tool'. 'Students also have the opportunity to access a chat room with other language learners, supervised by a native speaker'.

In these terms, some students were able to relate social learning to pedagogical approaches. '*Duolingo* follows an unconventional and appealing style of learning, and following the social constructivism method, users can invite friends using Facebook or Twitter to learn together'.

25.4.2.4 Playful, Authentic and Engaging

In addition to opportunities for social learning, students found authentic real world learning and playful, gamified design elements engaging. In one podcast, students asked 'what are the two things most modern students are doing in their daily lives today?' They answered 'Social interaction and playing games. Think about it. How often do you go on Facebook, text your friends or play games on your smartphone?'

In parallel to their technology uses outside of learning, some students expressed the desire for mobile learning that was also playful, fun and enjoyable. Playful learning 'feels less like study' and can be motivational particularly for out-of-class learning:

> The game based learning approach makes the software really addictive, with elements like skill points, lives and a community leader board. Users soon realise that their heightened sense of competition, play and fun while using *Duolingo* mirrors their experience with non-educational games that they enjoy playing.

Even in non-play-based formats, such as radio-style podcasts, students felt engaged through entertaining formats. '[Podcasts] allow a mixture of authentic and pedagogical content in one short entertaining and easily accessed recording'.

Clearly, combining education and entertainment (edutainment) was a familiar, fun and engaging way to learn. 'There is a conflation of education, technology and entertainment that is so great it can only mean one thing – learning no longer has to be boring'.

Mobile technologies could also enable authentic learning. For language learners particularly, real global connections were highly desirable. 'Allows you to communicate with anyone, anywhere in the world'. As one student put it, mobile learning 'has the flexibility of taking the classroom outside into the real world'.

25.4.2.5 Sound Pedagogical Design

As much as students wanted to enjoy learning, they also wanted their applications to be designed using sound pedagogical principles. When students encountered inferior pedagogical design, they questioned the design.

For example, an application called *Busuu* was evaluated in one podcast. Busuu offers structured lessons based primarily on a flashcard system and the ability to connect with other learners across the globe. The students commented:

> *Busuu* is very active and sets out to coach and train you according to their linear and pre-defined lessons. The audio visual flashcard system is simple translation, it'll show you the word in Spanish and then the English version will appear below. This is similar to the grammar translation method of language learning … it will only show you about 10 flashcards, and only with the words that are directly relevant to the lesson, nothing less, nothing more.

The students felt that the limited context of the application and the lack of explanation were a real limitation. They wanted the ability to personalise the content and for more user interaction with the language. They concluded '*Busuu* isn't terrible but I think the developer needed a clearer pedagogical goal in mind when creating the app … we all know the grammar translation method is not the most interactive way to learn'.

Some students also pointed out that traditional pedagogies can sometimes help with learning some fundamental language skills:

> Most apps support the grammar translation and audiolingualism learning approach. These mainly help students learn vocab, grammar, spelling, listening and pronunciation skills … the focus is on drill, repetition, practice and error corrections.

However, repetition can become boring, and students wanted access to deeper learning strategies and approaches.

> Involves repeating the same few words and a few relatively simple structures ad nauseam. Now, this is a great tool for memorisation, but it may lack the sufficient depth in other learning strategies.

Students could recognise the limitations of some teaching approaches and expressed a desire for more student-centred and interactive approaches. Speaking about podcasts in general, one student said:

> The majority of pre-existing podcasts designed for second language learning often subscribe to more traditional theories like behaviouralism, wherein teachers are considered as the sole holder of knowledge, passing information on lecture-style – passive viewer. It

seems that the general pedagogical assumption of many podcasts so far is that knowledge is best achieved through individual learning and repetition, rather than interaction.

Equipped with some pedagogical intelligence, these students were hoping for more pedagogical sophistication from their mobile applications:

I found the same thing with *Duolingo*. What it does with grammar translation it does well, but it fails to utilise the modern advances in language learning pedagogy that are used in modern language classrooms. It is stuck about 50 years in the past with its focus on grammar translation and behaviouralism as its core teaching theories. As such, it doesn't really provide a well-rounded education.

Students could also imagine more pedagogically complex applications that could be task based, gamified and interactive:

Student 1: 'However, we're yet to see apps that really embrace task-based language learning or communicative language teaching theories. I mean, your app *Busuu*, was close, but you still only observed a conversation between Ange and Brad about how Jennifer is jealous that they're dating. *Busuu* asked, who is jealous, rather than letting you interact with the characters and discover that Jennifer has a devious plot for revenge.

Student 2: Yes, I'd love to see a game where you can interact and talk with realistic characters, an app where you can be part of the conversation.

25.4.2.6 Discussion

Providing students with the opportunity to develop some pedagogical intelligence appeared to heighten their focus on themselves as learners, their learning experiences and the pedagogies they encountered. They were able to weave this into their evaluation to the extent that they were more 'informed consumers' and thus evaluators of mobile learning. The idea of students as informed consumers is not new. For example, back in 1998, McMillan and Wergins' book 'Understanding and Evaluating Educational Research' was aimed at 'helping students become better and more informed consumers of public research studies'.

Overall, students noted that mobile application development was still immature with limited pedagogical variance. They discerned the dominance of audio-lingual, grammar translation and behavioural pedagogical approaches over those that supported social learning or the capacity for authentic and task-based language tasks. They could see and imagine the current and future benefits of applications that they could personalise, interact more fully with and use to self-regulate their learning.

25.5 Key Insights

Overall there are a great deal of insights from this longitudinal study that could benefit institutions, teachers, learners and mobile application developers across the Asia-Pacific region who are seeking to enable effective mobile learning. A few of the most pertinent insights follow:

Insight one: Students want, need and desire the flexibility to learn across time and space with mobile devices and applications that are affordable, user friendly, interactive and multimodal.

Learners across the Asia-Pacific are on the move and equipped to learn wherever and whenever the opportunity presents itself. This may be a combination of on-campus, off-campus or interwoven with their personal and work lives. They expect a rich learning experience through the different modalities that are common on their devices and the internet more generally. They are price sensitive about mobile applications and expect to be highly engaged, if not entertained as well. They do not want to be hampered by poor design, or by data or battery hungry applications. In some parts of the Asia-Pacific, it is important to be able to continue to use applications offline as well.

Insight two: Students want, need and desire mobile learning that is adaptable for their personal and learning preferences and contexts with inbuilt tools that allow them to easily self-regulate their learning.

Wherever learners are across the Asia-Pacific region, they want mobile learning to be personalised for their learning preferences as well as their regional contexts. Choosing their own suite of mobile applications allows for this to some degree. However, not all mobile applications are designed to allow students to learn in ways they can personalise or adapt to integrate in-class and out-of-class learning. Students want to be able to learn independently and with friends and to get instant and personalised feedback to help them self-regulate their learning.

Insight three: Students want, need and desire mobile learning applications and activities that provide playful, authentic or simulated real-world experiences that can connect socially with others where desirable or beneficial.

We all know that when learning is fun and/or meaningful, students are engaged. Students enjoy the playful and gamified aspects of mobile applications. Increasingly, they also see how mobile devices and applications can provide meaningful social and authentic real-world, and even global, learning opportunities. Given the affordances of mobile devices, all of these elements can be designed into learning and into mobile applications to engage learners more fully.

Insight four: Students equipped with 'pedagogical intelligence' can identify the benefits of mobile applications that are designed based on sound pedagogical principles and contemporary pedagogies.

Students enjoyed learning about themselves and learning how they could better understand and shape their learning through gaining pedagogical intelligence. With this kind of awareness, they were better positioned to evaluate the types of pedagogical designs in mobile applications and to assess their suitability to their learning. With current education trends across the Asia-Pacific towards more learner choice in their education, it is important that students are equipped with pedagogical intelligence to make informed decisions about the technologies they use for learning as well as their education more generally.

Insight Four: Students want their teachers to be digitally literate in mobile learning, able to provide guidance and conducive to appropriate use in class.

Some students expressed a desire for more pedagogical guidance from teachers about which mobile applications were most suited to their learning and disciplinary context. They looked to teachers 'to advise students on suitable applications to use in their study'. This flies in the face of policies in many universities across the Asia-Pacific where personal devices are banned in class. Students want mobile learning to be meaningfully integrated into their classes where appropriate. As one student said 'if teachers could promote the usage of smartphones instead of seeing them as a sign of disrespect when used in class, a new world of opportunity would open for the teacher'. This means that students want their teachers to be more digitally literate and confident in mobile learning. Certainly, a number of students believed that 'teachers could get more involved with how the technology could be used in language learning'. 'Educators now need to devise pedagogical processes that focus on multimodal learning as well as time constraints and the realities of their students' lives'. Perhaps this last quote is the most poignant for teachers and institutions, 'Educators need to do more than just watch technology influence people'.

25.6 Limitations

Although a large volume of data was collected through the 36 podcasts, the data was limited to just 63 foreign language students' critiques of mobile devices and applications over a 3-year period. A further limitation was that the study was conducted in an Australian university where only 25% of students were from Asian countries such as China, Korea, Japan and Vietnam. This limitation meant that students' needs and wants to enable effective mobile learning were not able to be distinguished by country.

25.7 Conclusion

This chapter offers an emerging picture of how students are using their devices for learning and what they find beneficial about mobile learning in the Asia-Pacific region. It reported on students' critical evaluation of mobile devices and technologies as part of a class podcast assignment over three class iterations (2011–2013). It drew upon the student perspective elaborated in the Pedagogical Level of the Mobile Learning Evaluation Framework (Murphy and Farley 2012) to address a key organising question for this book: 'What are different ways of conceptualising, identifying and evaluating mobile learning initiatives in higher education in the region?'

Arguing that students should be partners in evaluating mobile learning, the study centred on pedagogically aware students as co-partners in the inquiry. This collaborative co-inquiry approach was both powerful and empowering for students who were generally eager to be stakeholders in this important field of learning. In their evaluation of mobile devices and applications, students articulated pedagogical needs and wants that linked to their understanding of good learning and teaching, themselves as learners and their lives outside of formal learning contexts. Most of all they provided student perspectives and imaginings that could be harnessed for the future development of mobile learning.

At a time when many institutions feel challenged by both the rate of technological change and the huge variety of devices and platforms that students are now bringing on campus involving students, as key stakeholders is a smart move. As evidenced by this chapter, pedagogically intelligent students, in particular, have a great deal to contribute. However, additional comparable studies are needed in different disciplines and parts of our region.

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Chapter 26
Improving Student Language Learning in Adult Education Through the Use of Mobile Learning: Barriers, Challenges and Ways to Move Forward

Chris Campbell and Martie Geertsema

Abstract Students learning languages, particularly English in the Australasian and Asia Pacific regions, have many ways to engage with mobile devices to assist with their language learning. This chapter reports on the latest teaching tools and identifies one mobile application (app) that can be used, *Dragon Dictation*, to assist with improving pronunciation. This chapter also presents the results of one pilot study that used *Dragon Dictation* to support English pronunciation. Results of this study indicate that *Dragon Dictation* is a useful tool to have available in the classroom context as results suggest that it assist students to improve their English pronunciation. Barriers for learners include difficulties in learning to use mobile devices as well as teachers and students knowing the best apps that are available to assist with English language learning. For teachers, barriers include learning to teach using these apps as well as teaching students how to use them. Fortunately, there are several ways to move forward in using mobile apps for learning, with research suggesting that good professional development of teachers in how to use apps is the best way to improve their teaching in this area as well as their comfortability in teaching students to use them as this will increase pedagogical affordances in this area.

C. Campbell (✉)
Centre for Learning Futures, Griffith University, Nathan, Australia
e-mail: chris.campbell@griffith.edu.au

M. Geertsema
School of Education, The University of Queensland, Brisbane, Australia

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26.1 Introduction

Traditional paper-based literacies possess typical features that challenge learners in the meaning-making processes requiring them to work to decode their meaning when exercising receptive skills. The use of technology can assist with this meaning making, and there are now numerous ways that mobile devices can facilitate learning in the language classroom. Thus, mobile devices can assist language learners in a variety of ways and can add to a positive classroom environment when used well (Geertsema and Campbell 2013). The barriers and challenges to using mobile devices for learning have changed over the years. This is because previously students may have lacked access to sufficient bandwidth and technical expertise. Today these barriers are generally overcome through advances in technology and ease of use of commonly used apps. However, there are some barriers to using these mobile devices which include attitudes of both teachers and students as well as a lack of developed apps and network problems.

This chapter will outline some of the ways mobile devices can be used to assist language learners, how they can be used to enhance classroom teaching and the perceived barriers to using them. Practical steps on how to use mobile learning in teaching languages and some ways to improve how mobile devices are used for language learning will also be included in this chapter. Specifically, when students learn English, there are some specific errors that they often make which can pertain to the country they are from. In Asian countries, these include the Asian L1 inference, for example, the /l/ and /r/ confusion as well as the pronunciation of word endings as suggested by Cunningham's (2013) research on Vietnamese learners.

There are numerous reasons to use mobile devices for learning. These include the fact that many students have devices and, importantly most students have Internet-connected smartphones. These devices promote ubiquitous learning and can be used when travelling to and from university and work as well as most other places. Although some papers list the various activities that use mobile learning in the classroom, it is important to remember that these activities should always have good practice underlying the ideas.

With no newer data available, it is worth mentioning that previously there were 250 apps on language learning available for Android, and 499 available for iOS, specifically for the use of ESL learners, with many of the Android apps also able to run on iOS (Kim and Kwon 2012). This suggests there is a large market for apps that can be used for ESL learners.

26.2 Pedagogical Approaches

With the increasing use of flipped and blended classrooms, mobile devices lend themselves to being used for learning. When flipped classroom instruction with video is used, then videos can be accessed from mobile devices. However, it is important to remember that pedagogy needs to be taken into account when implementing a new technology (McQuiggan et al. 2015), including mobile technologies. Using mobile devices in higher education allows students to access their devices in lectures with one study (Roberts and Rees 2014) concluding interestingly that although students do other tasks on their devices when in class, they do use their laptops and smartphones for learning. One does wonder whether lectures are a suitable context in which to teach students using these tools for learning because students in the study generally accessed their laptops for taking notes, conducting lecture research and accessing the lecture presentation (PowerPoint notes, etc.) as their on-task behaviours in the lecture and those using iPads had the same on task behaviours. Only a small number of students in this study used their smartphones for related research and taking notes (Roberts and Rees 2014). This suggests that perhaps lecturers could make use of students having these devices in lectures to enhance their pedagogy by, for example, asking questions and using an online learner response system, such as Responseware, Top Hat Monocle or Echo360 Active Learning Platform (Campbell and Monk 2015). These active learning platforms can also be used in the language classroom (Agbatogun 2014; Cardoso 2011; Langman and Fies 2010).

Using apps that have been created specifically for learning purposes is a start to spicing up learning and bringing real life into the class. However, a parallel could be drawn with the pedagogies of using textbooks compared to authentic material. Using apps created specifically for learning is not the same as adapting tasks so that apps, which have been designed with other real life purposes in mind, could be used for learning as it lacks a sense of authenticity and purpose (Scrivener 2011). Consequently, it is necessary to explore ways of making the use of technology more authentic and relevant in aiding the learning process, as well as positivity impacting on learner outcomes. Chen's (2011) research suggests that mobile phones used in class create a more positive learning environment in which learners are more eager to practise oral skills. He did find, however, that a major limitation was the predicament of how to provide learners with sufficient feedback, as individual feedback is most often required.

Also, personalised, individual feedback could be seen as a positive benefit to using technology in class. Kartal (2006) found in his study with 13 basic education adult learners that they not only were more engaged, but they also more bravely attempted self-correction in their pronunciation, something they had not attempted in front of the other learners in a whole-class situation. Consequently, he suggests using technology where there is a one-to-one interaction between the learner and the technology as one way to increase the learning experience. Liaw (2014) agrees that the increased individual attention is beneficial for learner development and especially as there is increasing pressure on teachers to provide a personalised, individual yet social learning experience technology could be a useful tool. The fact that technology can also be used to highlight errors in learner pronunciation (Mushangwe 2014), that programs are easier to operate and access, and that more language learners can self-access, self-regulate and increase their learner autonomy (Chamot

2014) both inside and outside the class makes technology the obvious choice for a current learning and teaching tool.

Yet, Gray (2008) cautions that technology should always be used to increase the quality of learning as a tool to achieve pedagogical goals and not as a means to itself. Higgins, Beauchamp and Miller (2007) agree that if the pedagogy is not sound, adding technology will only add to the embarrassment of bad window dressing, and that excellent teaching is also possible without technology. Technology should, therefore, be seen and used as a teaching tool, the same as a textbook, a dictionary or pictures. Ng (2012) echoes this sentiment that technology should have a purpose and not be used as a babysitting tool.

26.3 Mobile Apps in Language Classes

Currently, there are numerous teaching tools that help foster increased intelligibility in spoken English. There are now numerous apps created especially for the purpose of being used in class for language learning. Kim and Kwon (2012) report that of the English language teaching apps on the market, 50% require learners to use "recognition and recall" (p. 49) and that most of the apps are targeted for children or young adults. Although a range of apps have been used over the years for language learners. Uther and Banks (2016) suggest there has not been a great deal of research on either the design or the evaluation of their usability.

The most common use of mobile phones currently seems to be through various activities that use the function of SMS to increase vocabulary using one-word responses (Golonka et al. 2014). Kim and Kwon (2012) also found that the ESL apps being used for classrooms function primarily as a substitute for traditional methods. Their research of 87 ESL mobile apps shows they are being used for activities that are "teacher-directed such as tutorials (75%) or drills (40%) with 17.5% of them learners' own reconstruction of text or voice. Quite a number of applications (40.6%) include activities such as games and tests." (p. 41). Another researcher agrees and reports that learners who regularly use the SMS function for educational purposes performed considerably better than students who had more exposure to the Internet or paper-based exercises, especially if the focus was on extending learner lexis (Lu, 2008). A possible explanation might be found in a report from Golonka et al. (2014) that using technology in class adds a fun element to learning and consequently learners took pleasure, stayed longer, and focused better on the tasks when they used technology. They also found that despite the fact that technology is increasingly being used in language classrooms, in the last 30 years a lot of the research focuses solely on either "describing the particular affordances offered by particular types of technology" (p. 23), or on the affective impacts (for example, motivation or enjoyment) on learners. They call for more work to be done on the feasibility of specific technologies to sustain and support language learning, incorporating evidence on how to practically improve language learning processes and outcomes.

One popular computer program (Alcorn 2012; Lee 2012) for helping learners create meaning is *Audacity.* This is a speech-to-audio program with which learners can listen to a model sample and record their own voice, play it back and analyse and compare their own audio samples with the (frequently "native speaker") model. But what if learners cannot hear the difference between their English and the model? Furthermore, individual feedback from the teacher is time-consuming because the teacher has to listen and relisten after class to the learner samples and identify patterns that can be addressed in future in class. Moreover, the teacher's feedback is most often dependent on the teacher's skill and interpretation, because of the transient nature of the sample.

With the free mobile phone voice recognition app, *Dragon Dictation,* speech is turned into text, thereby making it possible for learners to compare the original written text with a visual transcription of their audio sample on their personal phones (Nuance 2016). This app was introduced in 2010 as a free app, and it has three different varieties of English which include UK, USA and Australian varieties. Thus, the user can set to the type of English they wish to pronounce to. This has many potential benefits for both learners and teachers. Theoretically, learners will receive immediate visual feedback on pronunciation errors that might not be recognised in speech-to-audio applications. They will then receive immediate individual feedback on their pronunciation, and this immediate feedback is standardised and does not depend on the teacher's skill and experience. Consequently, learners will potentially be able to increase their pronunciation accuracy and intelligibility, and hopefully, continual use outside of class will help learners become more autonomous in their own learning.

Potential benefits for teachers are that by using *Dragon Dictation* on the learners' personal phones, teachers will have the opportunity to save time by not having to provide individual pronunciation feedback after class as is required by audio programs like *Audacity*, because teachers can simply refer to the immediate visual transcription of the group's individual pronunciation problems. The app has a feature that allows the learners to share their sample on Facebook, send it as an SMS, tweet it or email what they have dictated into their phones. This sharing feature provides the teacher with the option of analysing learner problems and tracking student progress outside class. Moreover, using this app will potentially lead to a different distribution of class time: instead of going to the computer laboratory at the college to record texts and sharing the school resources with the rest of the student population, *Dragon Dictation* used on personal mobile phones offers the chance to teach and practise pronunciation more regularly in class as part of daily teaching and learning that will not disrupt school operations and without preplanned scheduling of computer lab time. Lastly, it is not only the learners who receive immediate feedback on their performance, but teachers too can consequently receive immediate feedback on the effectiveness of their teaching methods and materials.

In order for speech recognition software to be effective, the literature suggests that it needs to meet four criteria. These include:

- That it should be able to analyse individual parts of uninterrupted speech into meaningful portions.
- Accommodate a variety of accents and unclear enunciation (Liaw 2014).
- Recognise variants of English to accommodate language learners.
- In order to provide corrective feedback for learners, the software needs to have the ability to identify learner mistakes in the same way a native speaker-listener would (Derwing et al. 2000).

Previous studies have aimed to explore and verify whether *Dragon Dictation* adheres to these criteria and could, therefore, be used as an example of good voice recognition software. In Coniam's study (1999), the possibility of using voice recognition software for testing purposes was explored. He piloted the desktop, commercial version of *Dragon Dictation* to investigate the claims of the company that it can achieve a 95% or higher accuracy. He found that the accuracy promised was based on "translating" words into written text and consequently claimed that the desktop version of *Dragon Dictation* was potentially a very useful teaching tool. The main reason for this was that the program typed the spoken form into normal, recognisable English and not into the phonemic script. For second language learners, this feature is important because "since what might be called 'standard deviant' forms for a particular language group (e.g. / l / and / n /, / v / and / w / confusion) do not appear in their incorrect forms in the output" (p. 51), thereby showing the beginnings of possibly using visual links to correcting errors that might not be audible for learners.

In Derwing et al.'s (2000) study comparing the ability of native speakers and listeners with that of *Dragon Dictation* to detect second language learner mistakes, they found that the live listeners were better at detecting pronunciation mistakes, but that the software did perform at 90% accuracy on native speech and 71–73% for non-native speech. They do however conclude with "these findings demonstrate that the properties of ESL speech that adversely affect the software tend not to interfere with comprehensibility and intelligibility for human listeners" (p. 601).

26.4 Language Learners Using *Dragon Dictation*: An Example

In a small study of six students conducted over ten lessons with English language students at a college in Brisbane, Australia, it was found that using *Dragon Dictation* assisted the students with their English language speech development. Students downloaded the app and then did a pretest, reading an Aesop's Fable, The Dog and the Shadow into the app and then emailing the audio file to themselves. Students also completed a post-test which was the same Aesop's Fable. An example of the results can be seen in Table 26.1.

As shown in Table 26.1, these two students improved in several areas of the text. As can be seen in the pretest, the students had numerous errors in their language pronunciation. In the post-test, they had fewer errors, and there are chunks of the

Table 26.1 Student results shown including pretest and post-test

Student name and country	Script read	Pretest	Post-test
Victoria (Chile)	The Dog and the Shadow:		
	It happened that a dog had got a piece of meat and was carrying it home in his mouth to eat it in peace. Now on his way home he had to cross a plank lying across a running brook. As he crossed, he looked down and saw his own shadow reflected in the water beneath. Thinking it was another dog with another piece of meat, he made up his mind to have that also. So he made a snap at the shadow in the water, but as he opened his mouth the piece of meat fell out, dropped into the water and was never seen more	It happened that a dad had got an peace of meet and west Kyrene it in Hees mouth to eat it in case	It happened… Had left a piece of meat unless Chironna come in his mouth to eat eat in peace
		No unchaste way home he had to cross aplite lighting I Kruss I Runningbrook	Now on his way home he had to cross up plunk lying Actros I Runningbrook
		I hate crosshatch he feel kept down I'm so he's always Chicago reflected in the water bayonet	As he crosshatch Shadyoak it dwn so he's on Shado reflected in the water then it
		Thinking it was another Duhnke which another piece of meat he made up his mind to have that Olsen	Thinking it was another dog with another piece of meat. He made that his mind to have that also
		So humate not I Dechado in the water but as he openedhis mouth that piece of meat fell out drop it into the water and. Less never see more	So she made oughts not Dechado in the water but I Shishi abetment he smiled she did piece of meat Serpe
			Drop it in 30 Watchacow was never seen more
Nelly (Thai)	The Dog and the Shadow:		
	It happened that a dog had got a piece of meat and was carrying it home in his mouth to eat it in peace. Now on his way home he had to cross a plank lying across a running brook. As he crossed, he looked down and saw his own shadow reflected in the water beneath. Thinking it was another dog with another piece of meat, he made up his mind to have that also. So he made a snap at the shadow in the water, but as he opened his mouth the piece of meat fell out, dropped into the water and was never seen more	It happened that don't tease me and was carrying home in his mouth to eat in peace now I'm Heasley pain he had to cross time lying across a running brook as he crossed you down and so teaspoon shadow effect in the water beneath thinking was not the dock and not keys of meat he made up his mind to pass that also so you make a snack at the shadow is the water but as opening his mouth piece of me	It happened that dog got a piece of meat and was carrying it hard in his mouth to eat eat in peace now on Heasley home he flatcars the plank lying across auramine broke as he can't he looked down and he sold his aun shadow respected individual it vital beneath thinking it was another dog with another piece of meat he made up his mind to have that also so he made a snap at the shadow in the wider that S Hico

text that are correct and intelligible. This improvement was due to practice in several areas of their language pronunciation with the text. It is important to note that the text was not practised at any time other than for the pre- and post-test. Results from the control group show that students did not improve their spoken language during this time. This suggests that students who use the *Dragon Dictation* app to practise their spoken language are able to improve their intelligibility.

There is clear evidence from the pre- and post-tests, the observations and post survey that *Dragon Dictation* is a very useful teaching tool when used regularly in a focused manner as a learning tool in class. The learners in the post-treatment survey stated that two of them “agreed” and four “strongly agreed” that *Dragon Dictation* was a useful app and five in total said they would like to continue using it outside class in their personal lives. Almost half of them said they would introduce their friends to *Dragon Dictation*.

A further positive outcome of this project is that *Dragon Dictation* is potentially a viable resource that can support learning, help address fossilised pronunciation errors and increase learner autonomy outside of class. This can happen with increased use both in and out of the classroom and through the practice of letters, words and phrases that are known to be a problem for certain learners. With the more frequent, targeted use of mobile phones in class, it might be possible for teachers to start addressing some of the factors that marginalise learners.

26.5 Barriers to Using Mobile Devices in English Language Learning

Common barriers in language learning include:

- Common pronunciation mistakes in the English Language by Asian students
- Factors influencing teachers adopting mobile learning as a tool (see Mac Callum et al. 2014)

The sheer number of apps that are available to support language teaching could be seen as a barrier. Kim and Kwon (2012) report that in 2011, 43.4% of the market users were using Android, 18.2% iOS, and 22.1% Symbian. There were 250 apps available for Androids, and 499 for iOS, specifically for the use of ESL, but many of the Android apps were also available for iOS and consequently, it is “statistically relevant to say that iOS apps can represent the overall trend and features of current apps in the ESL field” (p. 38).

26.5.1 Barriers: An Authentic Example

One of the barriers to using mobile learning devices in class could actually be the students and teachers attitudes and beliefs in using the devices in class. Here is an example from the case study. In the in-class group discussions, many of the participants expressed their belief and concerns about using mobile phones as a learning tool in class. This excerpt shows Victoria voicing her concern that mobile phones and learning are mutually exclusive, as phones are a distraction. Sami agrees by saying that phones are a distraction because you will then have to multitask:

B: I can't use… in class.
D: Yeah. I think that is for all student, in every place… in every country. Well, if you use that in class, it's … of course, the teacher will say "No, you can't use that." It's normal, but… because you are in class so you have to learn and if you do that you are doing two things so you are in two parts different… So, you are … one is… half…
B: I can't multi-tasking…
(laughter)

Other reasons learners voiced varied from the fact that it is a distraction to suggesting that social media and instant messaging would make it hard for them to focus on the lesson. Some students also felt that their social life should stay outside the class because a classroom is for learning and that using dictionaries in paper format has been good enough for years when they were at school, and it could be useful now too. Compared to their beliefs in the in-class discussions, the experience changed learners' opinions in several areas. Eight of the 11 now "strongly agreed" and two "agreed" that mobile phones were useful in aiding learning, and nine of the participants now thought that they liked using technology to learn, whereas in the discussion many participants said they preferred more traditional methods like books and speaking to other students. In the post-study survey, almost all the participants had changed their minds by saying that mobile phones are useful in learning English and that they would recommend *Dragon Dictation* to their friends. This is a positive change in their attitudes and suggests that the students worked through the barriers that may have limited their learning if they had not changed their attitude.

26.6 Challenges of Using Mobile Devices for Learning

Both teachers and students need to be trained to use their devices for learning in order to get the best outcomes from using them, which unfortunately means that for students owning the technology, this in itself does not guarantee that teachers and students will be able to use the mobile device for learning (Khaddage et al. 2015). Challenges also include apps not being available on a variety of platforms which then disadvantages students who do not own the type of device that the app is available on. This includes apps such as *Dragon Dictation* which is only available on iOS.

Another challenge, and indeed one of the main pedagogical challenges that presents itself is a lack of learning design and learning frameworks that have been developed to be used as well as "what instructional strategies can best be deployed to enhance student learning" (Khaddage et al., 2015, p. 627). Challenges regarding technical issues include that a lack of training by teachers may mean they choose an incorrect app, or one that is not as well developed or "best" for their students (Khaddage et al. 2015).

26.7 Ways to Move Forward

Steps for using mobile learning in teaching languages include the need for learning ways to overcome a lack of knowledge regarding apps such as the *Dragon Dictation* app. Previous research suggests that elementary school children's learning of English as a foreign language improved as a result of using speech recognition software (Liaw 2014). This study with 11 Year 5 students, who were identified as more advanced than their peers, received computer lab instruction in an online reading program twice a week for 40 min each time in an English club in a school in Taiwan showed that they were able to improve their pronunciation in spite of a system that provided ineffective feedback and was imperfect (Liaw 2014). This goes a long way to improving our knowledge on how mobile devices can be used in language learning in a positive way. Studies such as that of Oberg and Daniels (2012) research pertaining to using mobile devices in Japan to enhance the learning of course material over a group approach have found that there may be some advantages to using a mobile device to learn the course material. Advantages including using the touch devices to revisit the material and not having the need for an instructor to be present during use. Once again in this study, the pedagogy was changed for the experimental group who used devices for learning. There are many benefits of mobile learning. These include student interaction, portability, collaboration, engaging learners as well as increasing learner motivation (Hashemi, Azizinezhad, Najafi, & Nesari, 2011). Students can also use their devices for just in time learning.

In the example given above of English language students in Brisbane, it is interesting to note that they were observed as becoming increasingly more confident as they used the *Dragon Dictation* app in class as they saw their immediate and personalised results from using the app. On day 0, several learners exclaimed in frustration: "This app is broken!" and one threw the phone across the table; on day 4 while reading a text on the benefits of chewing gum, the teacher pointed out the meaning difference in *shoe* and *chew* when learners mispronounced it. Learners then autonomously produced their phones, started dictating *shoe/chew* into their phones to check their own pronunciation and persisted until they got it right; on day 6 learners self-identified that /b/ and /v/ were an area they need to address and asked for help. On day 7 learners independently started peer correcting each other by showing the correct mouth movements to make certain sounds practised before, and on day 9 learners said "We are ready. Test us tomorrow!" As can be seen from the samples of the treatment group, even before statistical analysis, the improved results on learner accuracy are clearly visible.

With a mathematical value attributed to the groups' performance: the control group significantly decreased their accuracy by −7.1%, whereas the treatment group significantly increased their overall accuracy by 5.3% with individual students improving between 27.4% and 1.6%, and two students performing less accurately. The iPhone users on average increased their accuracy by 5.5%, and the Android users 4.6% so, although the learners had to share their phones with each other, on average there was not a significant difference between Android and iPhone user performance. The real difference lies in the individual performance. It is possible that the iPhone owners might have practised outside of class in their own free time with their devices, but there is no evidence that would support that claim at the moment.

The study previously described suggests there is clear evidence from the pre- and post-tests, the observations and post survey that *Dragon Dictation* is a very useful teaching tool when regularly used in a focused manner as a learning tool in class. The learners in the post-treatment survey stated that two of them "agreed" and four "strongly agreed" that *Dragon Dictation* was a useful app and five in total said they would like to continue using it outside class in their personal lives. Almost half of them said they would introduce their friends to *Dragon Dictation*.

26.8 Conclusions

Meaning making involves both the encoder and decoder in the message, that is, generally or often the teacher and the student. Exploring the use of an immediate feedback tool on a mobile device has shown that it can assist learners in encoding and decoding their messages more effectively, thereby helping the decoder to construct meaning more easily. The results of the study reported in this chapter show a clear increase in the intelligibility and confidence of the learners. They also show a change in learner beliefs that daily technology can in fact aid daily learning in the English language class, as long as learners can see a purpose and progress. A further positive outcome of this study is that *Dragon Dictation* is potentially a viable resource that can support learning, help address fossilised pronunciation errors and increase learner autonomy outside of class. With the more frequent, targeted use of mobile phones in class, it might be possible for teachers to start addressing some of the factors that marginalise learners and improve pedagogies associated with using mobile devices.

Thus, the ubiquitous nature of mobile phones makes them appealing teaching resource in language classrooms. Moreover, they could potentially be highly instrumental in increasing digital literacy in adult learners. It is important to remember when teaching using technology in any context that teachers should remember the pedagogical goals of the lesson and not just the technological ones (Gray 2008). This is the same for any technology, not just mobile devices and for any types of lessons, not just language learning. It is also important that the teacher overcomes constraints and challenges that they might come across (Monk et al. 2013). However, leaders need to be aware that for teachers to be able to implement the technologies training needs to be provided (Campbell and Monk 2015). Finally, pedagogies will change (Keengwe et al. 2009) as teachers become more comfortable using mobile devices in the language classroom.

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Part VI
Oceania and Pacific Islands

Chapter 27
A Pilot Study of Mobile Learning in Higher Education in Samoa

Satoru Ozawa and Edna Temese Ualesi

Abstract The recent development of ICT facilities for eLearning in the Pacific island countries is briefly reviewed revealing that the introduction of the new type of eLearning based on the advanced functions of mobile devices has become today's challenging topic in higher education in this region. A questionnaire was administered at the National University of Samoa to establish the present status of the usage of mobile devices, in particular, what perspectives regarding mobile learning were held by the students, the teachers and the authorities of the university. The first pilot study of mobile learning in Samoa was intended to develop examples of mobile learning materials and to show them to the students, the teachers and the authorities of the university so that they might understand the merits of mobile learning. The results of the pilot study are examined in depth and the future perspective is presented to realise a sustainable mobile learning system in Samoa.

S. Ozawa (✉)
Graduate School of Science and Engineering, Ibaraki University, Mito, Japan
e-mail: satoru.ozawa.prof@vc.ibaraki.ac.jp

E.T. Ualesi
Computing Department, Faculty of Science, The National University of Samoa, Apia, Samoa
e-mail: ednat005@gmail.com

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27.1 Literature Review

The concept of mobile learning was established a few decades ago in the early 1970s by Alan Kay (Najmi and Lee 2009), but the capability of using mobile devices as a learning tool has just started recently. The cell phone remains the most widely owned mobile device and the most used device today. According to the International Telecommunication Union (ITU), there is an estimation of seven billion mobile subscriptions worldwide, which is equivalent to 95.5% of the world population. It is predicted that by the end of 2016, there will be 8.5 billion subscribers. Many looked at mobile learning as a form of eLearning or eLearning using mobile technology (Doneva et al. 2006; Georgiev et al. 2004; Quinn 2000). However, mobile learning excelled in its capabilities as a tool of learning, having its own identity. There are many theories relating to mobile learning. The uses of mobile technologies in higher education, in their design, reflect their theoretical approaches as well (Herrington and Herrington 2007). There are many practical reasons to adopt mobile learning strategies and technologies in higher education (Gayeski 2007), but mobile learning theories cannot be ignored such as the theories defined by (Naismith et al. 2004) which includes behaviourist, constructivist, situated and collaborative theories. There are other approaches that can be used in higher education which reveal the benefits of mobile learning.

Previous studies show student perceptions of mobile learning in higher education. The majority believed in the learning mobile devices can provide and would like to use them in the classroom. Students also welcome access to learning at any good place and time (Bottentuit Junior and Coutinho 2008). Students can engage more frequently in learning activities outside of class using mobile devices (Kim et al. 2013). The student's positive attitudes varied in the different context they are introduced to such as portability, flexibility and convenience (Al Fahad 2009; Cavus and Ibrahim 2009). Some show excitement on ownership (Venkatesh et al. 2006) and the need to use it as a medium to engage in learning activities in the classrooms (Maniar 2007; Cavus and Ibrahim 2009). In fact, most learners find mobile learning enjoyable (Clarke et al. 2008). The different studies show that students have mostly positive perceptions of mobile learning. As there are no previous studies for mobile learning in higher education in Samoa, this study is expecting similar positive results to these recent studies presented.

27.1.1 ICT Infrastructure

Thousands of islands in the Pacific Ocean make up Micronesia, Melanesia and Polynesia. There exist strong demands for higher educations in this region, but the problem is how to educate people who are distributed thinly on thousands of separate islands. eLearning provides a method of distance education that could be beneficial in this region. There are some important universities such as the University of Hawaii (USA) and the University of South Pacific (Fiji) which work as hub universities with remote campuses on other islands. Figure 27.1 shows an example of a satellite eLearning campus in Samoa to which classes are broadcast from the

Fig. 27.1 An eLearning building and parabolic antennas for microwave satellite connection in Alafua Campus in Samoa (*Left*), the University of South Pacific (USP), Fiji and eLearning session (*Right*) at USP Alafua Campus in Samoa broadcast from the main campus in Fiji

University of South Pacific in Fiji utilising microwave satellite connection system for distance education. Prior to the eLearning session, the textbooks are distributed to the students. The lecturer's voice and face and the image of teaching material are transmitted through the microwave system and all teaching materials are text-based documents. One or two network specialists take care of the eLearning class session. The multimedia-type eLearning is not used yet because of the narrow bandwidth of the microwave connection.

In the Pacific Ocean, the main submarine optical fibre cables are settled between Japan and the USA. Some of them directly connect the two countries and the others connect via Hawaii. There are some other submarine stem cables which connect the USA and New Zealand or Australia via Hawaii and Fiji. Nowadays, branch cables are growing from the stem lines. The microwave connections are gradually being replaced by the optical fibre connections whose bandwidth is 10–1000 times larger than that of the microwave connections. The bandwidth of the Internet connection is being improved so that multimedia supported eLearning becomes available which will help the eLearning environment in this region to be much improved in the near future.

The most important change in ICT infrastructure is the improvement of the Internet access in the islands. Availability of hand-held or palm-held mobile devices (Internet-enabled mobile phone, tablet, etc.) is rapidly increasing especially among the younger generations of the countries. There are two major Internet service providers in Samoa. Figure 27.2 shows that their service area covers almost all the populated region of Samoa, with even people in small villages being able to enjoy the Internet. Because of the improvement of the Internet connection and the updated functions of mobile devices, mobile learning, as a new approach to eLearning, has become a challenging topic in sectors of higher education in Samoa.

27.2 Preliminary Survey

This section is concerned with the first pilot study introducing mobile learning techniques at the National University of Samoa (NUS). Initially, a questionnaire was administered to investigate (1) the present status of the usage of mobile devices; (2)

Fig. 27.2 The coverage of the services of the two major Internet service providers in Samoa. The *yellow* areas (*top*) and the white areas (*bottom*) show the Internet available region

the perspectives held by the students, the teachers and the authorities of the university regarding mobile learning; and (3) ICT resources of the university and administrative aspects regarding mobile learning. These are described in the each of the following subsections.

27.2.1 Students' Perspective

In order to obtain student data on mobile learning, a questionnaire was used to investigate the proportion of mobile device users, what kind of mobile devices the students have, how they use them in the university, and what perspectives they have regarding eLearning in general and mobile learning in particular. Data were collected from 500 students on the campus during the first semester of 2013. It has become clear from the survey that the students use mobile devices mainly for communications with family and friends in the forms of calls and emails, and that social networking is popular. Use for learning or other educational purpose is limited at this moment. Further details of the results from the questionnaire follow.

Figure 27.3 shows what kinds of technologies are currently used by students. The most popularly used are computers and mobile phones, while the users of video cameras or digital cameras are less than 10% of the 500 respondents. This probably reflects that video and still camera functions are partly integrated into modern mobile phone technologies. Figure 27.4 shows what type of phones students currently use. The advance features of touchscreen phones are popular and most students have switched from bar or flip phones to touchscreen phones. Figure 27.5 shows the students' preference among mobile phones. It seems that the students choose particular mobile brands based on what they prefer in regard to popularity, cost and quality of

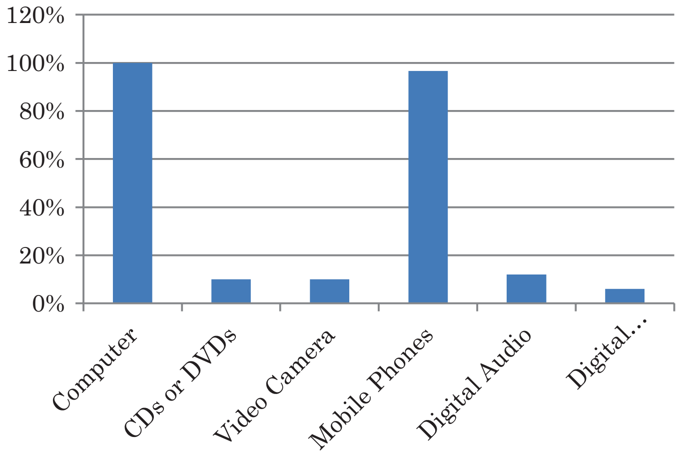

Fig. 27.3 Information technologies vs their usage percentage by students

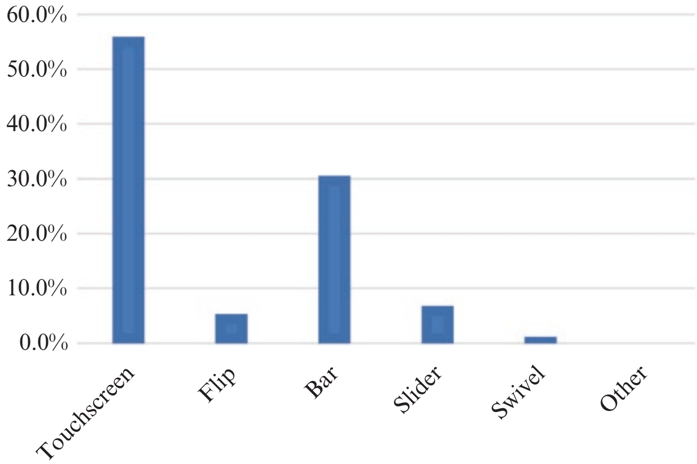

Fig. 27.4 Types of telephone machines that students use today

the interface. Currently, Nokia is still very popular, but others are still new in the market and Samsung, Alcatel and iPhones are becoming more popular.

The students were also asked how often they use their mobile device for the questioned activities and the results are shown in Table 27.1. Students use mobile phones mainly to communicate with people, mostly with family, friends, classmates, and sometimes with lecturers. It is worthwhile to note that they do use mobile phones as learning tools. They listen to, or read, course materials on their mobile phones as well as do self-assessment exercises and write assignments. Table 27.2 shows the students' general usage of mobile phones in their daily life. Most students use their mobile devices for social networking and emails. Shopping, enjoying movies or games are less popular uses. The use of mobile phone for learning is moderately ranked.

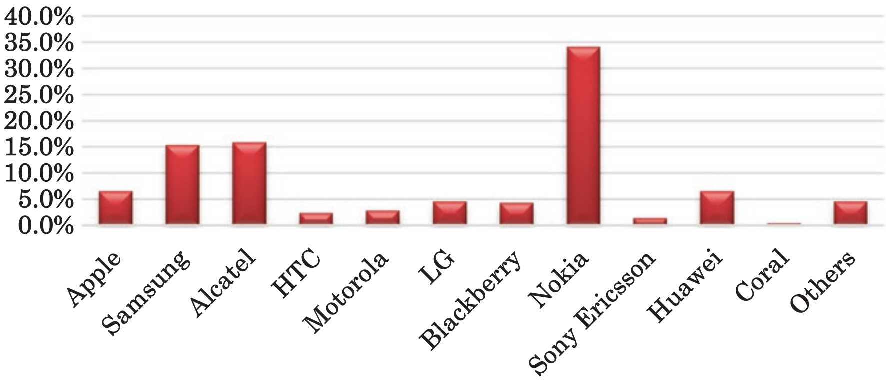

Fig. 27.5 Phone brands that students prefer

Table 27.1 How frequently the students use mobile phone for the questioned activities

Activities	Rare (%)	Moderate (%)	Frequent (%)
Communicate with classmates	6.1	12.1	81.8
Communicate with family	3.0	12.1	84.8
Communicate with lecturers	31.3	43.8	25.0
Gathering information	7.1	35.7	57.1
Listen to course material	50.0	0.0	50.0
Read course material	33.3	0.0	66.7
Self-assessment exercise	12.5	37.5	50.0
Writing an assignment	0.0	66.7	33.3

Table 27.2 Students' general usage of mobile phones in their daily life

Activity	Rare (%)	Moderate (%)	Frequent (%)
Mail	6.5	31.8	61.7
S/networking	7.2	31.5	61.3
Music	5.4	64.0	30.6
Movies	41.9	50.5	7.6
Learning	17.8	46.7	35.5
Games	33.9	59.6	6.4
Shopping	77.0	21.0	2.0

Figure 27.6 shows the results for the question "Do mobile phones help your learning at university?" It is seen from the figure that mobile devices are accepted by the students as good tools for education. In summarizing the questionnaire on the student's perspective of mobile learning, it can be said that (1) most students have Internet access on their mobile devices; they have already started using mobile terminals for accessing learning materials and (2) they are interested in using mobile devices more in learning, but they do not know how they are benefiting from mobile learning.

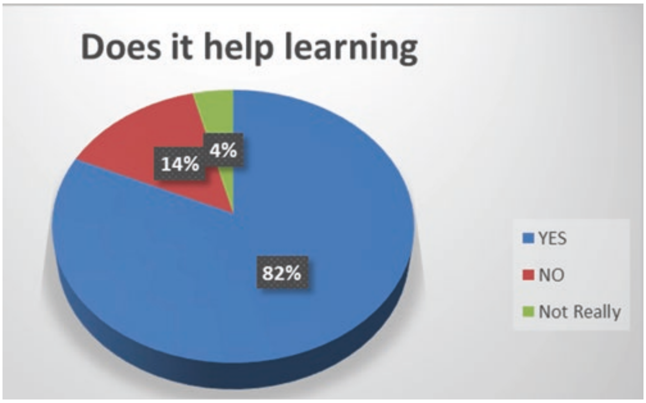

Fig. 27.6 The response of students regarding the question “Do mobile phones help your learning at university”?

Table 27.3 Evaluation of multimedia-type eLearning content by ICT staff

Questions	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)
I am interested in eLearning	0	0	0	20	80
I am using eLearning materials in my courses	0	50	10	40	0
I can create eLearning content	0	33	22	45	0
There is enough resources to help me	0	50	3	47	0
I am interested in mobile learning	0	0	0	60	40
I can create mobile learning materials	30	50	15	5	0

27.2.2 Teachers' Perspective

The questionnaire was also administered to the teaching staff of the university. The survey showed that the teachers are interested in creating eLearning materials, but there are limited ICT facilities in the university; the teachers are also interested in the new aspects of mobile learning, but they are not familiar with creating mobile learning materials and application programs as shown in Table 27.3.

The teaching staff in the computer department of the university were given some eLearning materials and were asked to evaluate them in view of the quality of the material, i.e. the qualities of the content, the organisation, the instruction and the design. The eLearning materials were video tutorials that explained how to use Microsoft Office applications for novice users of computer applications. They were distributed to teachers via USB devices, computers and mobile devices. Table 27.4 shows the results of the evaluation. It has been found from this examination that the video-type tutorials are suitable for eLearning.

Table 27.4 Evaluation of multimedia-type eLearning content by ICT staff

Evaluation points	Poor (%)	Good (%)	Very good (%)
Content	0	23	77
Organization	0	0	100
Instructions	0	8	88
Design	0	15	85
Total Quality	0	0	100

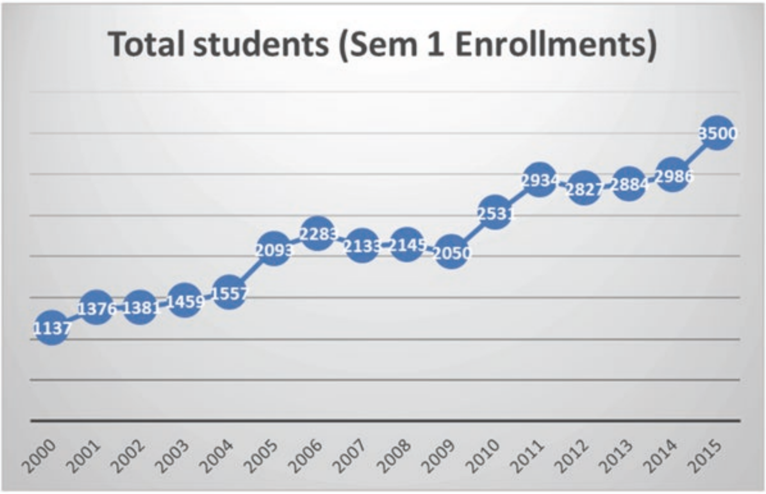

Fig. 27.7 The trend of student enrolments in NUS

Through the author's educational experience in Samoa, it has been noted that the majority of teachers consider that multimedia eLearning materials are very effective and should be introduced in their teaching activities, but they feel strongly that it is difficult to find time for creating such materials that attract students' interest through the updated multimedia technologies. The pervasive use of the mobile platform for eLearning allows teachers to consider the development of effective learning materials for realising good mobile learning system in the university. Suitable, systematic training for teachers to create effective mobile learning materials, and mobile application programs is needed as they have no current experience.

27.2.3 Infrastructural and Organisational Aspect

In 2006, the National University of Samoa (NUS) merged with the former Samoa Polytechnic and the University expanded its programs, staff and facilities. Although the facilities were at a satisfactory level at that time, as years passed, they have become insufficient for the increased number of enrolments into NUS. Figure 27.7

shows changes in enrolment numbers into NUS in the last 15 years. At present, six computer labs with 120 computers are hosting about 3000 students. The students have to wait for their turn to use a computer in the labs. Another problem is low bandwidth of the campus LAN. If there is a need for video conferencing, it has to be scheduled at night due to bandwidth constraint, or all uses of computers other than the video conference have to be suppressed during the video conference. There is a slight improvement in the network response because of the new submarine optical fibre cable which was installed recently between Samoa and Hawaii, but there is still a considerable lack of network response during business hours.

The recent increase of mobile device users on the campus is making a remarkable change in the usage of ICT. Mobile devices such as smartphones or tablet computers can work as good tools for accessing the Internet. The students can more easily access Internet content by using their mobile phones rather than waiting to use computers in the university labs. The students use mobile phones only because the number of computers in the labs is rather limited and because the LAN capacity is too small and the traffic is too busy. The connectivity to the Internet during office hours is much better via mobile devices than via campus LAN computers.

In order to introduce a system into the university that supports mobile learning, a lot of discussions are needed regarding the role of mobile learning in the university. At present the authorities of the university do not have a clear vision of the future of mobile learning. Since mobile technique is something new, the university has not yet established any policies for mobile learning. If this is a phase the University is willing to advance to with the aid of mobile technology, there is a need for the inclusion of mobile learning infrastructure and pedagogies into the future strategy of computer-aided education systems in the university.

27.3 Pilot Study of Mobile Learning

The aim of this pilot study was to show examples of originally produced mobile learning materials to the students, the teachers and the authorities of the university, so that they can understand the advantages of mobile learning which is free from various constraints such as time and place of learning and the ICT infrastructure restrictions. The following subsections explain (1) how the mobile learning content was produced, (2) how they were distributed, and (3) how they were accepted by the students and the teachers. The results of the pilot study are used to obtain future perspective of sustainable mobile learning systems in NUS.

27.3.1 Preparation of Mobile Learning Materials

The examples of mobile learning content that have been developed in this pilot study are video-type eLearning materials that are supplemental to normal class lessons in NUS. They have interactive features presented to users by means of text,

Table 27.5 The contents of the video tutorials that works on mobile terminals

Application software	Topics of video	Length (minutes)
Windows Explorer	Managing files	3.49
	Managing folders	4.37
Microsoft Word 2013	Formatting text	4.07
	Formatting paragraphs 1	3.27
	Formatting paragraphs 2	3.17
	Symbols and tabs	2.50
	Tables and graphics	4.41
Microsoft Excel 2013	In preparation	
Microsoft Access 2013	In preparation	

images, audio and video. In the pilot study, there were two major steps in preparing the mobile learning materials. The first step was creating the elemental video content using Camtasia Studio (https://www.techsmith.com/camtasia.html). The second step was the development of a mobile application program in which the video content prepared in the first step is embedded. The mobile learning materials were of multimedia-type, and the elemental video content has been produced on the basis of the materials which are now being used in normal classes of a computer training course at NUS. It is an introductory course that explains how to use Microsoft Office applications for novice users of computer applications. The video tutorials cover some important topics in the computer training course of NUS, especially the topics of practical character of the applications. Table 27.5 shows the topics and length of each video tutorial produced for mobile learning.

Camtasia Studio provides advanced and necessary features to build the video tutorials, and its effectiveness in eLearning has been discussed previously (Schnall et al. 2005). They found that the video content can conveniently be produced by this software which integrates videos, audios, images and text.

Once the video content is produced, it is uploaded to a server on the campus LAN from where students can access the video content online. Another method of distribution is to copy the video contents on CD, DVD or any other portable devices. In the present study, the video content is accessed from mobile devices. For the creation of the application program, the Android development software, Eclipse is used (https://eclipse.org/) which is free software available online from various sites. The video content is linked using the custom software. In this step, mobile design guidelines were necessary order to obtain a well-designed mobile application program, and user requirements also needed to be considered. The system requirements define the software system functions, services, and operational constraints in detail. They are usually classified into functional requirements and non-functional requirements (Sommerville 2007). Figure 27.8 shows the interactions between the elements of the system in the present model case. This model study was intended to analyse, identify, clarify and organize the system requirements. It was confirmed by the model analysis that the owner and participant of the classes have their own functions in the system.

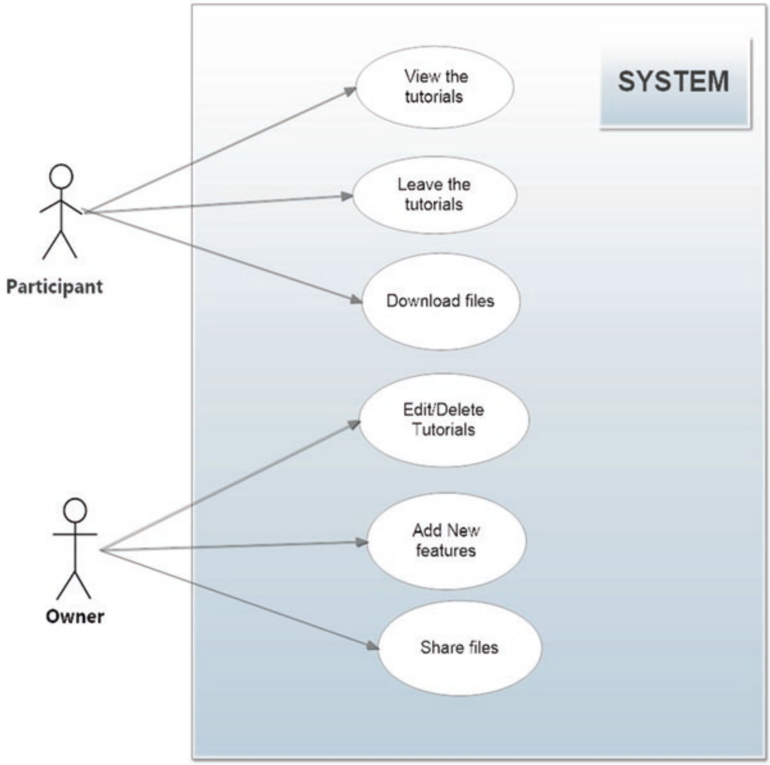

Fig. 27.8 System case model

The guidelines include architectural design, software design and interface design. When a project is created in Eclipse, it consists of classes and subclasses according to the content. These classes have activities and the overall responsibility of initializing the mobile application program and showing output on the mobile screens. Figure 27.9 shows an extended class diagram for the project.

The user interface is everything that the user can see and interact with on the screen in Android Developer 2014. This project uses the Relative Layout throughout, as shown in Fig. 27.10. It displays how it looks in vertical and horizontal views of the Main Screen. Android Developer has functions of selecting themes and input controls, and it makes sure that each button opens up a link as shown in Fig. 27.11. These components are inserted in the application program and are activated when the application program is started. Video View displays a video file; in order for the user to pause, stop, rewind and fast forward, a media controller is added to make the full functional media player as shown in Fig. 27.12. The application program is coded in Java. The code of the main activity of the application program is shown in Appendix.

After the project was fully developed by using the tools that developed needed functions in the Android environment, a series of tests were carried out to confirm

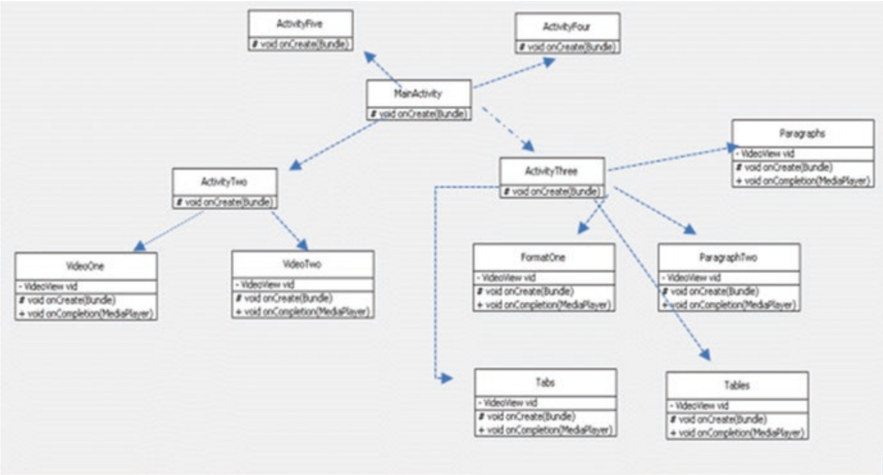

Fig. 27.9 Simple extended classes

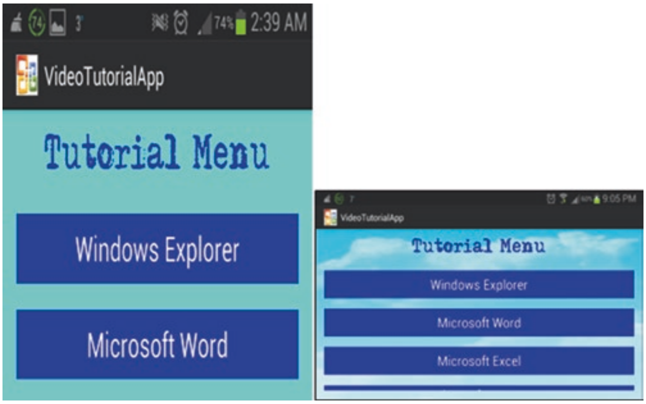

Fig. 27.10 Relative layout image of the vertical and the horizontal views

that the code works successfully with the aid of test user interface. Each component of the application program underwent interface testing. It was confirmed that the program passed all the tests of functional and non-functional requirements, as shown in Table 27.6.

27.3.2 Execution of Mobile Learning

After the testing described in the previous subsection, the application program was ready to be distributed. This application program was distributed through the Google Market Place, rather than a NUS website because the target audiences are not only specific students of NUS but all other novice users of Microsoft Applications

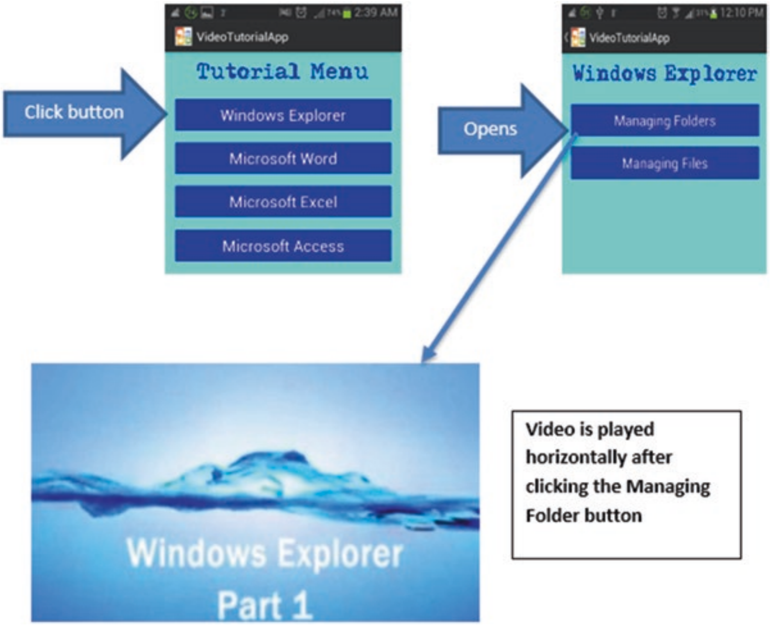

Fig. 27.11 Themes and input controls

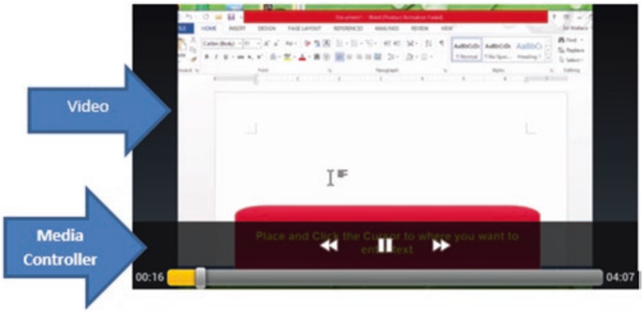

Fig. 27.12 Video View and Media Controller

worldwide. Figure 27.13 shows how the mobile application program appears at the Google Store. Email was also used to distribute the application program to select people who evaluate this mobile learning content by accessing it offline. The Market Place has an advantage in attracting more users. The most important consideration is to prepare many suitable keywords in the promotion of the program to enable the user to find the contents.

Several users evaluated the application program, including ICT expert evaluators and user-based evaluators. From the expert evaluators, positive comments were obtained that this learning content has the potential to help students with learning particular subjects especially when it is used in mobile learning for tertiary students in the university. They also commented that there remains a lot of work that is

Table 27.6 User interface for testing the codes

Test ID	Test content	Result
TUI-01	Checks that the application UI shows a Menu in all screens	PASS
TUI-02	Check that the application UI shows all buttons correctly on all screens	PASS
TUI-03	Checks that the application UI shows the Action Bar that can direct the app to the previous screen	PASS
TUI-04	Checks that the application displays the videos orientations correctly	PASS
TUI-05	Checks that all screens have lack of crashing UI errors	PASS

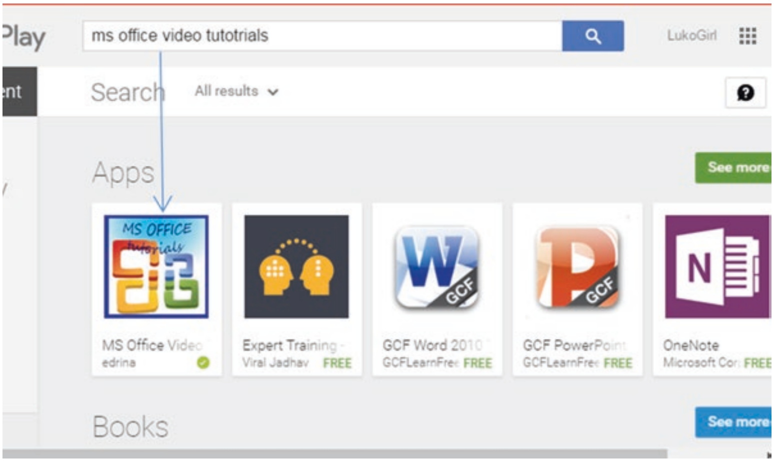

Fig. 27.13 The appearance of the application program, MS Office Video tutorials when it is searched on Google Store

needed to further develop the content of the tutorials and their design. The user-based evaluators all gave positive feedback regarding the interface part of the application program, as shown in Fig. 27.14. After the application program was opened to the public, some people posted good ratings and positive reviews as shown in Fig. 27.15. More than 5000 users downloaded the application program in the 8 months after publication. In addition to the interface part of the application program, the content of the video tutorials were also evaluated by users. The results of the survey were also very positive; all participants understood the video tutorials, and they easily followed the images, audio and text and learnt a lot from the tutorials. It should be noted that the present pilot study of the mobile learning provides a supplemental learning method to the normal class learning in the university. The eLearning content is basically the same as what the normal class receives and is designed for tertiary students in the university. Only 20% of the total students in the class actually used the mobile learning contents at the university. The other users were outsiders of the class.

The feedback from the students is shown in Fig. 27.16. The contents were effective for following up normal class lessons and accepted by the students with good impressions. It is worth noting again that the content of the present pilot study of

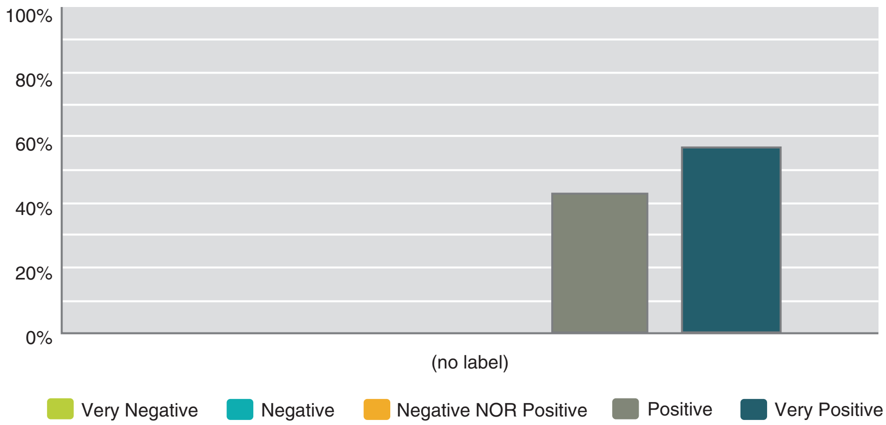

Fig. 27.14 Results of user-based evaluations on the interface and features of the application program

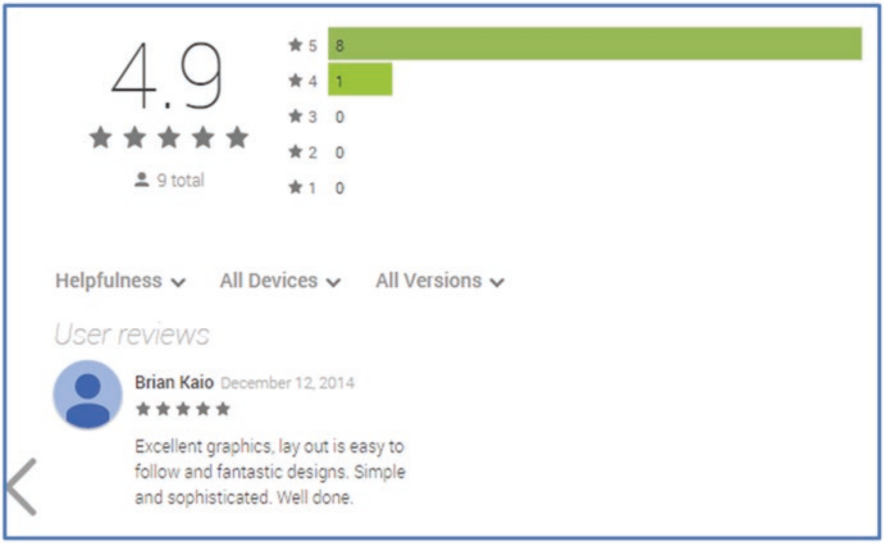

Fig. 27.15 Ratings and reviews of users

mobile learning has been produced for assisting tertiary students who cannot fully digest normal class lessons of the computer training course of NUS. In this framework, the pilot study seems to be successful. However, mobile learning should not be limited to such supplemental teaching; rather it should be applied to any fields of education of which targeting students are interested in. In the author's recent experiences, one example suitable for mobile learning is the application of mobile devices in fieldworks in which people communicate with each other using mobile devices with the aid of the function of GPS. The author learnt mobile devices can be good tools for "mobile learning" in environmental research and education in the Asia-

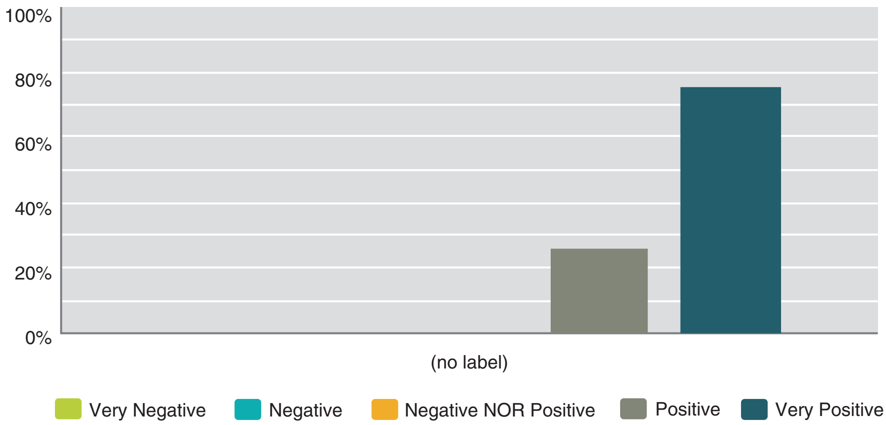

Fig. 27.16 Feedback from the students who evaluated the quality of video in the mobile learning contents

Pacific countries. It should be noted that the mobile devices should be used in various fields where they play suitable roles reflecting their mobile character.

27.4 Sustainable Mobile Learning

In the previous section, the pilot study of mobile learning in the National University of Samoa was described. Mobile learning is still something new in the Pacific region, and it needs more attention to explore other methods of learning. The problem addressed in this section is how to make mobile learning sustainable and in full practice in the university. One of the most important factors for sustainable mobile learning is the quality assurance of the eLearning materials. The materials depend on the content the educator needs to deliver and should be compatible with the mobile technology available. This section describes how to prepare good mobile learning materials in Asia-Pacific countries. The key questions are (1) what characteristics are required for good mobile learning materials, (2) how should they be produced, (3) how should they be distributed and maintained and (4) what environment is needed for the production, the distribution and the maintenance of the mobile learning materials. Author's answers to these questions are presented in the following subsections, which naturally form conclusions of this chapter.

27.4.1 Quality Assurance of the Mobile Learning Materials

The quality assurance of eLearning materials is a key requirement for good mobile learning. Just placing textbook materials used in traditional classes into mobile learning systems does not make sense. In traditional methods of teaching teachers can flexibly select words as they observe the student's response to their lecture. There can be human interactions between teachers and students in normal classes. In technology-mediated learning, such flexible teaching is difficult to be realised, and the students are easily bored unless the eLearning content is skilfully produced so that they attract and keep the students' interest. This is the reason why quality assurance of the material is important. On the other hand, eLearning has some merits; multimedia-type education by impressive photos, clear audio, attractive movies and gamelike teaching can easily be realised with the aid of modern techniques. These multimedia-type materials should be carefully selected, considering the user's interests, the level of their education and the quality of ICT infrastructure in Asia-Pacific countries. These are commonly required things in eLearning and also in mobile learning. In addition to these factors, one more important factor is needed for mobile learning; the content must be converted to match with the small displays of mobile devices. In summary, it can be said that the required characteristics for mobile learning materials are (A) multimedia-type, (B) interactive-type with game character and (C) matching with small display (Ozawa 2007).

In order to produce good mobile learning materials, extensive ICT knowledge and techniques are needed. The problem is that these knowledge and techniques are developing quite rapidly making it difficult for individual teachers to keep up with the changes in the technology. The following subsections suggest ways to solve the problem: One method is to set up an organisation to support teachers' activities of mobile learning and the other is to share knowledge and experiences of eLearning among teachers in Asia-Pacific countries.

27.4.2 A Mobile Learning Centre

One of the roles of the teacher is to study good educational methodology and to actualise it in classes. ICT is just a tool of education for teachers. Current ICT is very highly developed, meaning it is difficult to produce good mobile learning materials based on the latest technologies by the efforts of teachers alone. ICT specialists who assist teachers' activities of eLearning are needed. Once new mobile learning content is produced, it must be distributed to users in a method which is suited to the ICT environment of the country. It frequently happens that the content needs modifications after publication in response to user feedback. The distribution of mobile learning content, management of users, and keeping user's feedback channels are systematically maintained. For these purposes, "a mobile learning centre" or "one division of mobile learning in ICT centre" is needed which provides good production, distribution and management tools for sustainable mobile learning. In this pilot study, the mobile learning content was produced by the effort of a few teachers; however, the distribution of the produced content depended on a commercial Internet service provider. In order to realise a sustainable mobile learning system in the university, good software and hardware and high-quality technical staff for the maintenance of mobile learning content must be provided in the university. In particular, it is expected that the mobile learning centre will carry out effective activities of “teaching teachers” that promote teacher’s abilities of handling multimedia and interactive mobile learning content (Ozawa 2007).

27.4.3 Knowledge Sharing

There are many good and successful examples of computer-aided education all over the world. However, just importing the method of the successful examples into Asia-Pacific countries does not make sense. This is also true in mobile learning. It frequently happens that the most updated technologies do not fit well with the ICT environment of the developing countries. Technologies must be imported and used after they are well digested in the developing countries. In this sense, experiences in the countries with similar levels of development can provide more valuable information for designing ICT applications for the developing countries. The KISSEL (Knowledge Integration Servers System for eLearning) project (Grant-in-Aid for Scientific Research, Japan; 2008, 2012), which has been carried out to promote ICT abilities of teachers in Asia-Pacific countries, is noted in this regard. The project can help the production of mobile learning materials in cooperation between teachers in Asia-Pacific countries.

The KISSEL servers have been installed in some Asia-Pacific countries and are being used by the teachers and the researchers as their eLearning and E-research platform. The KISSEL servers have been settled in Japan, Samoa, Sri Lanka, Bangladesh, Vietnam, Indonesia and Poland. Figure 27.17 shows an example of data sharing between the teachers’ community in Vietnam and one in Japan. The content of the KISSEL server is divided into two parts. One is the international sector where English is used as the common language, and the other is the local sector where the content is expressed in their native language. Only the content in the international sector is copied between KISSEL servers by the mirroring function of

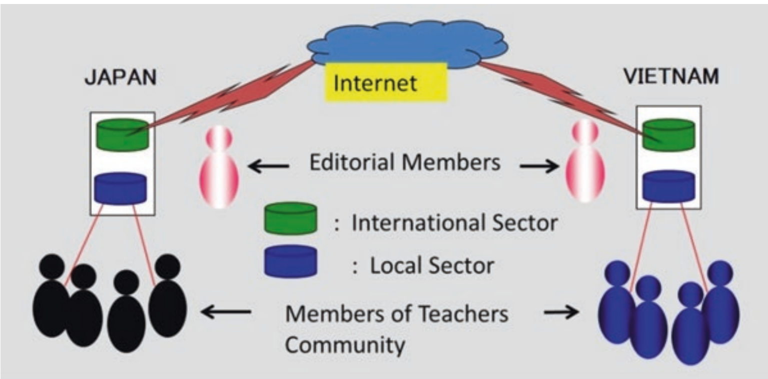

Fig. 27.17 Data sharing between teachers’ communities by using

the servers. The details of this function and the performance of KISSEL have been described elsewhere (Dassanayake 2008; Warnajith et al. 2010, 2011, 2013). Each KISSEL server is managed by the teachers' community of that country.

The local sector of the KISSEL server is used freely for any domestic purposes. Some of the local content which is worth sharing between the member countries is translated into English and put into the international sector, which is then automatically copied to any KISSEL servers of the different countries. In such ways, the local (domestic) activities of teachers producing teaching materials is extended and integrated into the international cooperation on the KISSEL platform. That is, teachers' daily activities using domestic language are the seeds of international cooperation to improve their education method. As the result of the data sharing, the networks between teacher's communities in Asian Pacific countries are naturally produced. Through this cooperative activity, new technologies are digested locally and optimised to the region.

Another advantage of the KISSEL servers is that they work as "cache servers". The contents in the international sector of KISSEL servers in different countries mirror each other. For the mirroring, a sophisticated content synchronisation method has been adopted. The synchronisation is carried out in such a way that when new content is uploaded to the international sector of one local KISSEL server, it is firstly copied to the KISSEL server in Japan, and then it is further copied to all the other local KISSEL servers of the member countries. Namely, the KISSEL server in Japan works as a "hub" server. In order to make the synchronisation process efficient, we must have optimization of the timing of the mirroring. Figure 27.18 shows an example of traffic data of the campus LAN as function of time in the case of the Open University in Sri Lanka. In any universities, there are time slots in which the campus LAN is almost quiet. The mirroring data transfers between KISSEL servers are carried out in such quiet time slots of the campus network. For example, the suitable time slot for the mirroring between Japan and Sri Lanka is between 19:00 and 22:00 (GMT) and that for Japan and Vietnam is between 15:00 and 18:00 (GMT). By selecting suitable periods for the timing of the synchronisation, the best synchronisation speed is obtained without causing harmful effects on the performance of the campus LAN. This "cache server" character of KISSEL is useful for distributing heavy content to people whose network bandwidth is narrow and is usually very busy. Good mobile learning content sometimes includes many videos, and they are naturally very heavy. A proper method must be taken for distributing mobile learning contents to users by caring about the available capacity of the network.

27.4.4 Administrative Leadership

In order to do implement change, there are always two ways: the top-down method and the bottom-up method which is discussed in relation to the KISSEL project (Ozawa 2007). The KISSEL project is classified to the bottom-up method. The

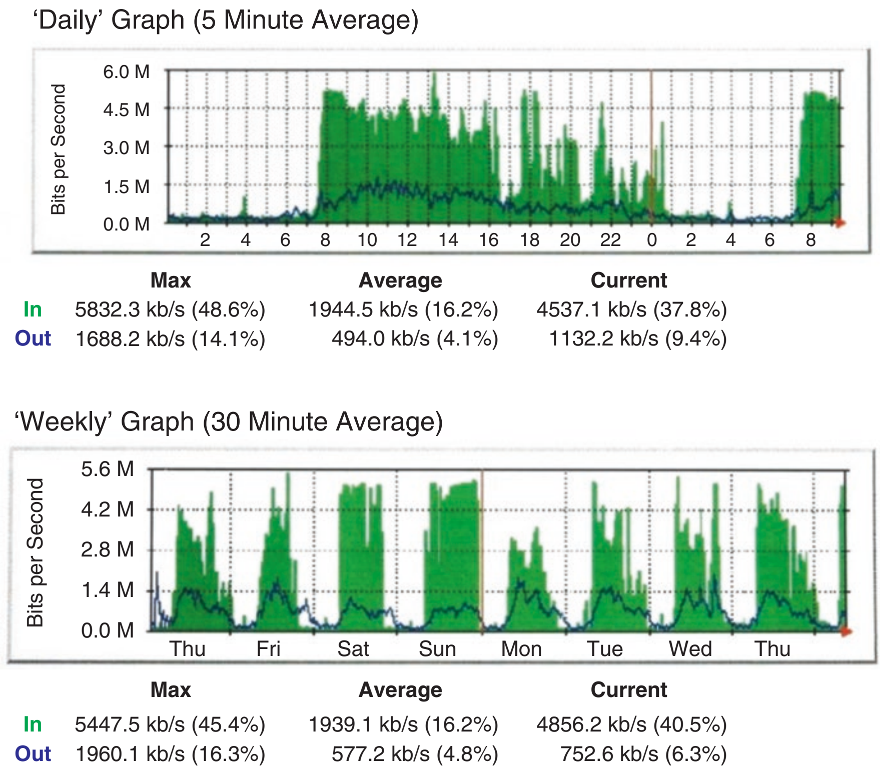

Fig. 27.18 Time variation of campus LAN usage in the case of the Open University in Sri Lanka

present pilot study of mobile learning is the example of the latter. This pilot study aimed at showing the merits of mobile learning to the students, the teachers and the authorities of the university, so that they can understand the importance of mobile learning. It has been successfully carried out; however, to make it sustainable, some kinds of top-down efforts are needed.

By a rule of NUS, it is strictly prohibited for the student to use mobile devices during normal classes. The pilot study was carried out within this limitation. Therefore, the model of mobile learning was supplemental to that of the normal classes and the students used the mobile learning contents after finishing their normal classes. The authorities of the university should have a clear strategy for the future use of mobile devices in higher education. This topic must be discussed in relation to policy of using ICT in general, future plans for installing ICT resources, security policy, network etiquette of the university and also the basic planning of eLearning in higher education. The administrative leadership of the university authorities is quite needed for promoting the mobile learning to the level of real implementation.

Appendix: Code for Main Activity

```
package com.edrina.videotutorialapp;
public class MainActivity extends ActionBarActivity {
@Override
protected void onCreate(Bundle savedInstanceState) {
   super.onCreate(savedInstanceState);
   setContentView(R.layout.activity_main);
   Typeface tf = Typeface.createFromAsset(getAssets(),
     "fonts/ADLER.TTF");
   TextView tv = (TextView) findViewById(R.id.Menu);
   tv.setTypeface(tf);
   Button btnOne = (Button)findViewById(R.id.explorer);
   Button btnTwo =(Button)findViewById(R.id.word);
   Button btnThree =(Button)findViewById(R.id.excel);
   Button btnFour =(Button)findViewById(R.id.access);

   btnOne.setOnClickListener(new OnClickListener(){
   public void onClick(View ar0){
           Intent intent = new Intent (getApplicationContext()
           ,ActivityTwo.class);
           startActivity(intent);
       }
        });
      btnTwo.setOnClickListener(new OnClickListener(){

   public void onClick(View ar0){
           Intent intent = new Intent (getApplicationContext()
           ,ActivityThree.class);
           startActivity(intent);
     }
      });
      btnThree.setOnClickListener(new OnClickListener(){

  public void onClick(View ar0){
          Intent intent = new Intent (getApplicationContext(),
          ActivityFour.class);
          startActivity(intent);
     }
       });
  btnFour.setOnClickListener(new OnClickListener(){

       public void onClick(View ar0){
```

```
                Intent intent = new Intent (getApplicationContext()
                ,ActivityFive.class);
                startActivity(intent);
        }
     });
        }}
```

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Chapter 28
A Mobile Learning Journey in Pacific Education

Bibhya Sharma, Raneel Kumar, Varunesh Rao, Rona Finiasi, Sanjeet Chand, Vineet Singh, and Ravishel Naicker

Abstract This chapter essays an exciting and ambitious journey on mobile devices to support tertiary student learning in the Pacific region. With the Pacific region adapting to the dynamic global "eduscape", new initiatives and pedagogical tools have been adopted by leading tertiary institutions in providing quality education in the region. The University of the South Pacific, owned by 12 member countries, is one such entity which looks into innovative and sustainable approaches to improving the accessibility of higher education in the region, relying on and leveraging heavily on the use of information and communication technologies (ICT) and eLearning. The mobile learning initiative is a branch of this greater ICT adoption which focuses on the use of mobile devices to support learning and teaching. The mobile learning initiative stands on three pillars: just-in-time, just-for-me and just-enough learning. The tool invariably supports learners inside and outside classrooms, in structured and unstructured learning spaces. At the University of the South Pacific, it has been 5 years since the inception of the mobile learning programme and four integrated approaches, namely, Short Message Service, edutainment, mobile course modules and tablet-based learning have been introduced to its education system. These tools have been developed in-house and customised

B. Sharma (✉) • R. Kumar • V. Rao • R. Finiasi • S. Chand • V. Singh • R. Naicker
University of the South Pacific, Suva, Fiji
e-mail: bibhya.sharma@usp.ac.fj; raneel.kumar@usp.ac.fj; varunesh.rao@usp.ac.fj; rona.finiasi@usp.ac.fj; sanjeet.chand@usp.ac.fj; vineet.singh@usp.ac.fj; ravishel.naicker@usp.ac.fj

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to meet the demands of the regional institution. The strengths, challenges and opportunities of the mobile learning tools are highlighted with analytics, interventions and adaptive works from this short journey.

28.1 Introduction

The ICT revolution has dramatically changed how we view and use technology, affecting society in every sector. The demand for evolving technologies has shown growth in certain areas of telecommunications, namely, broadband and mobile telephony (International Telecommunication Union – ITU 2015). Both these areas of telecommunications grew in parallel; the evolution of mobile technology, with the availability of smarter and cheaper devices, has led to increased demand for accessibility to services such as social media, online payments, e-commerce, e-governance and health services. One of the last sectors to be influenced by ICT has been the education sector; however, it seems to be the most influenced sectors at the moment (Aristovnik 2012). There is now increased demand to make education more accessible and flexible and cater for large and heterogeneous learner populations. Suitable online environments can augment the student-centred approach, herald and facilitate increased interaction between students and promote active learning. Social network growth has seen more entrepreneurship and innovations taking place in ICT. Social network sites (SNSs) such as Facebook and Twitter are two platforms that have enabled greater interactions within communities that would otherwise be very isolated (Chui et al. 2012). This has changed the way communities now engage and interact online. More security and privacy of communication concerns have arisen to deal with the growing demand to be mobile and online.

In the Pacific region, there is improved access to technology such as mobile and broadband. Regional connectivity is improving, for example, Tonga and Vanuatu are now connected to the Southern Cross Cable network with the Solomon Islands and Samoa planned to be connected by 2016 (ITU 2015). During the launch of the Economic and Social Impact of ICT in the Pacific report in June 2015, the Tongan Deputy Prime Minister and Minister for Information Communication Technology, Siaosi Sovaleni, said:

> Here in Tonga, where we landed a submarine cable financed by the Asian Development Bank and World Bank in August 2013, we have seen greatly improved access to high-speed Internet (particularly mobile) and falling prices. (PINA 2015)

Notably, regional governments, nongovernmental organisations (NGOs) and the World Bank (2016) have indicated the need for developing countries to embrace and leverage ICT to provide feasible, cost-effective solutions to important issues such as entrepreneurship, shared prosperity, digital divide and sustainable development and economics.

Samoa's ICT Minister, Mr. Tuisugaletaua Sofara Aveau, in his address during the Disaster Risk Reduction and Climate Change Adaption Forum 2014 said:

> Every facet of our development is dependent on ICT now: transport, education health agriculture all of those are dependent on IT. (Budvietas 2014)

The Attorney-General and Minister for Finance, Public Enterprise, Trade and Tourism of the Fijian Government, Mr. Aiyaz Sayed-Khaiyum, during the 6th Asia-Pacific Telecommunity Forum 2013 said:

> In the Pacific, we share the optimism of the rest of the developing world that information and communication technology can revolutionise the lives of our people through empowering them with information and opportunity – that it can break down barriers between those at the centre and those on the margins… (Sayed-Khaiyum 2013)

These invariably show the mammoth role ICT stands to play in the Pacific region.

28.2 Mobile Learning Services in Higher Education

In higher education, the trends in ICT are still evolving with demand for learning materials to be available to students anytime and anywhere. Access to real-time or recorded lectures, videos and multimedia content and virtual communication is increasingly important and attractive to students in their learning journeys and at the same time easier using mobile devices. The use of mobile technologies has grown recently and has overtaken the use of personal computers in modern professional and social contexts (Groff 2013). The authors argue that these changes will create reasonable conditions for the pedagogical and andragogical use of mobile technologies. Mobiles devices are becoming more powerful and are able to support many types of applications and services. With differing screen sizes, connectivity and improving security, mobiles are becoming an integral part of a student's learning experience.

Mobile learning stands on three pillars of learning: just-for-me, just-in-time and just-enough (Sharma et al. 2015). It is defined as the use of mobile devices for learning at anytime and anywhere, basically using "mobility" to differentiate from other types of learning (Corbeil and Valdes-Corbeil 2007; Mehdipour and Zerehkaf 2013; Motiwalla 2007). Mobile learning has gained much interest mainly for its boundless and convenient ways of learning, in both active and passive modes. It is expected to be able to enhance interactivity and engagement in different classroom settings (Dyson et al. 2009; Shen et al. 2008), to progress the learning process by adapting course content presentations to student learning styles in multiplatform environments (Kinshuk 2004) and to help facilitate the changing modalities of programmes in higher education. Distance and flexible learners' demand falls squarely on the three pillars of mobile learning, and mobile technology is fit for purpose. Not only that, but mobile learning has the potential to create new knowledge by modifying and redefining activities hence gravitating to the higher echelons of the Substitution Augmentation Modification Redefinition (SAMR) model (Puentedura n.d.).

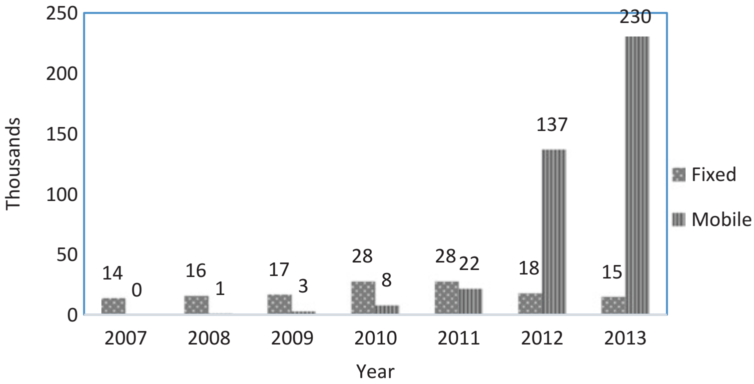


Fig. 28.1 Mobile and fixed broadband subscription in the Pacific region (Source: ITU 2015 fixed broadband subscriptions, ITU 2015 mobile cellular subscriptions)

Developed by Dr. Ruben Puentedura, SAMR model shows how effective use of technology and ICT tools such as mobile devices can facilitate new, redefined and modified activities and tasks which were not possible before.

28.2.1 Mobiles in the Pacific Region

Average monthly mobile broadband prices in developing countries are almost twice as much as those of developed countries. Nevertheless, the mobile broadband penetration level in developing countries has grown to around 39 active subscriptions per 100 inhabitants (ITU 2015). See Fig. 28.1 for the broadband subscriptions in the Pacific region.

In recent years there has been a significant decline (as much as one-third between 2014 and 2015) in the prices of mobile devices, mobile calls and data plans in Pacific countries such as Fiji, Tonga and Samoa, which has contributed to a high level of mobile penetration in the Pacific. Therefore, while the mobile penetration rate in the world currently sits around 97%, the percentage of mobiles in the Pacific households has shot from 49% in 2007 to a record high of 93% in 2014 (Minges and Stork 2015). The past decade has also seen an extraordinary increase in access to mobile phone services in the Pacific region including some of the most remote areas and islands, as significantly improved market conditions have encouraged investment by the private sector and existing operators.

While the Pacific shows social usage of mobile phones as a key benefit, the functional uses, especially in the education sector, are on an exponential rise. With this trend and considering the potential benefits of mobile devices, academic institutes have started to place greater emphasis on, and direct more resources to, the use of mobiles in learning and teaching processes.

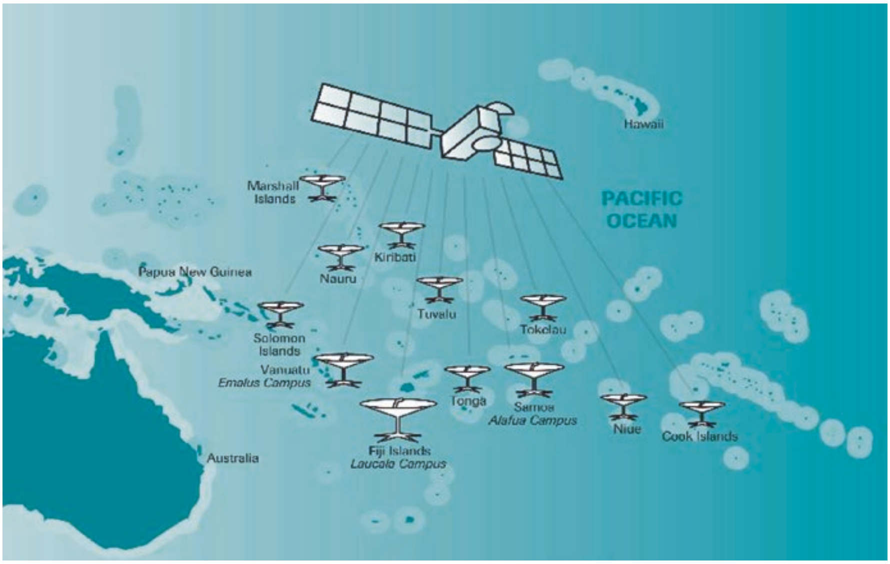


Fig. 28.2 USP member countries connected throughout the Pacific region using the USPNet (Adapted from USP strategic plan 2013–2018)

28.3 University of the South Pacific Background

The University of the South Pacific (USP) has been operational since 1968 as a regional multicampus institution with around 25,104 students over 14 campuses (USP 2015). The university is owned by its 12 member countries – the Cook Islands, Fiji Islands, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu, and each country currently hosts at least one campus. Historically most students would come to Laucala Campus in Fiji for degrees and qualifications in major programmes. However, as the demand for education has grown in recent years, so has the student population of the regional campuses, and this has seen the birth of smaller centres. The smaller centres are part of the larger campuses and are normally spread across remote locations or based on smaller islands of some regional countries. The main campus (Laucala Campus) with the highest headcount is located in Suva (Fiji Islands) and is the hub of the University's administrative, academic and commercial operations (Jokhan and Sharma 2010). All the campuses are linked by the University's own telecommunication system known as USPNet, which uses satellite and links all the regional campuses through the C-Band (see Fig. 28.2). In addition, USP uses Intelsat to link to the Ku Band sites that it has placed in several locations and which do not have good access through the satellite (Sharma et al. 2015). This allows for scalability of intranet services.

28.3.1 Learning Delivery Modes in USP

Due to the shared ownership, the University is expected to provide quality education in all its member countries. However, the geographical spread of the countries and resource constraints make this a difficult and daunting task. USP has multiple learning delivery modes in order to support the learning needs of the students. The students comprise both youths and mature aged students, who enrol at the University on either a full-time or part-time basis. The four learning modes at the University are face-to-face, print, online and blended mode.

The face-to-face learning mode is most common, and a large number of full-time students are supported at the university. This learning mode requires the student to be physically present for lectures, tutorials and laboratory classes. It offers the benefit of spontaneous interactions between the instructors and students, allowing for immediate questions and feedback in classes. However, the face-to-face learning mode is not favourable for part-time and mature aged students who may be occupied with work commitments and may not be physically available to attend classes.

The print mode of study, also known as self-managed learning, is a mode of delivery that is designed to be self-instructional, self-explanatory, interactive and learner friendly (Azizam 2010). This mode which began at the university in 1971 has benefitted many students who have been able to undertake courses and programmes while being remotely situated or being occupied with full-time occupational commitments. However, the print mode has brought some challenges to the university. Inherent problems of irregular delivery of materials, lack of learning support, accessibility of materials and reachability leading to lower pass rates have prompted a pedagogical shift to more flexible modes of delivery such as blended and online, which are predominantly ICT driven.

The online learning mode is based on the incorporation of multimedia courseware, learning objects, online discussion forums, audio and video conferences and online assessments. The online learning mode relies heavily on the use of the university's learning management system: Moodle to support and deliver the learning content. These two modes can also include some form of face-to-face interaction, for example, fortnightly or monthly tutorials. On the other hand, the blended learning mode can be any combination of the aforementioned modes, whereby the actual contributions and weightings may differ for different researchers and education providers. According to Raturi (2010) blended learning combines traditional face-to-face learning and online approaches by integrating appropriate technologies and media into its curriculum and delivery which makes the learning a more robust experience. The blended learning mode seeks to combine the strengths of the other learning modes to be able to provide quality education easily to students. The mode can also incorporate the use of mobile learning and tablet-based learning to support students.

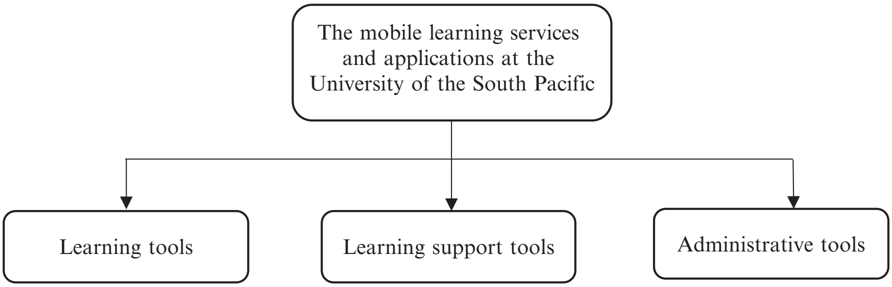


Fig. 28.3 The categories of mobile learning tools designed and implemented at USP

28.3.2 Evolution of Mobile Learning at USP

The University of the South Pacific, the "innovation hub" of the Pacific, has adapted, adopted and designed a number of in-house ICT tools to better support and enhance student learning. Some of these landmark tools include smart classrooms, a Moodle-based early warning system, an online mathematics diagnostic test and remedial activities, eMentoring and eLearning. The recent introduction of mobile learning is seen as the "next big thing" in learning for the Pacific region. USP has explored the benefits of mobile learning in the Pacific region and how it would improve learning skills and make learning easier for students who cannot travel to the campuses daily for classes. With the current trend in technology and the quick adaptation of new technology by the younger generation, mobile learning can be very effective in the region where learners are scattered across the Pacific Ocean. Therefore, the need for mobile learning at USP is fourfold: (1) to access information and knowledge; (2) to establish a vibrant online community of Pacific learners; (3) to empower students to create and share knowledge, essentially transforming them from mobile learning users to mobile learning producers; and (4) to design or deploy mobile learning tools to provide and support learning.

The university first implemented mobile services via Short Message Services (SMS) in semester 2 of 2011. The pilot run of the SMS-based notification services showed an increase in the pass rate from 54 to 73% and the submission rate of assignments from 68 to 83% (Sharma et al. 2011). Since then more SMS-based tools have been added to the university's mobile learning repository. With the subsequent increase in the percentage of students carrying smartphones and tablets, the service was extended to the web and mobile applications, while newer tools continue to be developed in the university. Figure 28.3 illustrates the different categories of mobile learning tools designed and implemented at the University, the specificities of which will be described along with their successes, student feedback and challenges in the following section.

1. *Category A – learning tools*. This includes SMS notification services, SMS Quiz Service, Mobile Course Module and Edutainment.

Table 28.1 Mean and stand deviation of student rating for each of the services

Services	Mean	Standard deviation (sd)
SMS notification	3.85	1.088
SMS exam timetable	3.92	1.103
SMS quiz	3.65	1.090
SMS marksheet	3.62	1.171
SMS library notifications	3.57	1.131
Course finder (android version)	3.64	1.031
Course finder (web version)	3.80	0.974
Go Nuts: English grammar module	3.85	0.988
Go Nuts: learn to use Moodle module	3.95	0.984
Go Nuts: C++ Programming module	3.71	1.033

2. *Category B – learning support tools*. This includes SMS Exam Timetable Service, SMS Marksheet Service, Course Finder App and Tablet learning project.
3. *Category C – administrative tools*. This includes SMS notifications from the administrative, support sections (Library and Campus Life) and the disaster management committee.

28.4 Student Feedback on Mobile Learning Tools

An online survey was conducted to rate each mobile learning service offered in USP in 2015. A positive mean rating was received from a total of 369 responses $\bar{x} = 3.76;\ sd = 0.86$ for mobile learning services on a 5-point Likert scale [very poor (1), poor (2), average (3), good (4), excellent (5)], meaning the students rated the services above average and close to good. Table 28.1 shows the mean and standard deviation of student ratings for each of the mobile leaning services.

28.5 SMS-Based Services at USP

The mobile learning committee which was set up in 2011 has produced a number of innovative mobile learning tools in the context of the Pacific region. Its technical team carried out numerous surveys in the 2011–2015 period and obtained university-wide information regarding the types of mobile devices students had and the mobile services they preferred to use. In 2013, USP ventured into the implementation of SMS-based tools because a majority of its students (58%) still owned only basic mobile phones (see Fig. 28.4). Although the percentage of students with smartphones increased significantly in 2014–2015, to ensure all students benefitted from this new tool, the university initially concentrated on SMS-based tools. All SMS-based tools are freely available to all the students of USP.

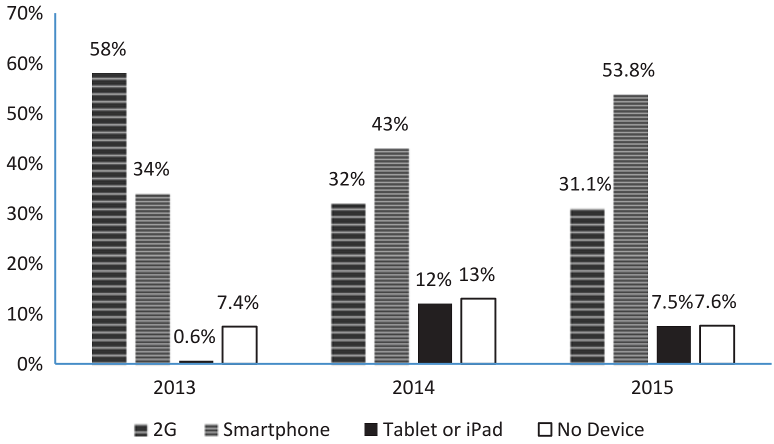


Fig. 28.4 Student mobile devices in the University of the South Pacific from 2013 to 2015 university-wide run online surveys

SMS has its own advantages over other learning tools and technologies. As SMS messages are generally limited to 160 characters, users construct concise yet effective messages (Barati and Zolhavarieh 2012; Lominé and Buckhingham 2009); the cost of services is significantly lower than postal services, no technological training is required, reaching underprivileged students and those studying from geographically remote areas (Talbott 2012), timely reminders, motivating and inspiring students, there is familiarity with the messaging service in all quarters, and it has the inherent ability to deliver instant messaging at any time. The literature shows a plethora of new SMS-based applications which either facilitate learning or deliver learning support. For example, Goh and Hooper in 2007 designed an SMS puzzle system for interactive learning at the Victoria University of Wellington; Naismith (2007) successfully used the SMS platform as part of an experiment to send important messages to students which included messages related to academic pursuits; Bollen et al. (2004) discuss how SMS messages were used to initiate discussions and collaboration amongst students which eventually resulted in improved collaborative work in literature courses; and Cavus and Ibrahim (2009) developed an SMS-based system to support students learning technical vocabulary by sending the same messages repeatedly on different days.

The interaction of the SMS applications through the students' mobiles is made possible by having an SMS gateway situated on the University premises. Figure 28.5 shows an architectural framework of this SMS gateway built in-house in the university using open source software. The two-way communication applications allow the user to send SMS requests to the application and then the application appropriately sends an SMS response to the user. This tool is ideal in the education ecosystem where information is warranted on a frequent basis while keeping within the shoestring budgets. An open source SMS gateway known as Kannel was set up by the technical team at the cost of just buying a server. The SMS gateway connects to two

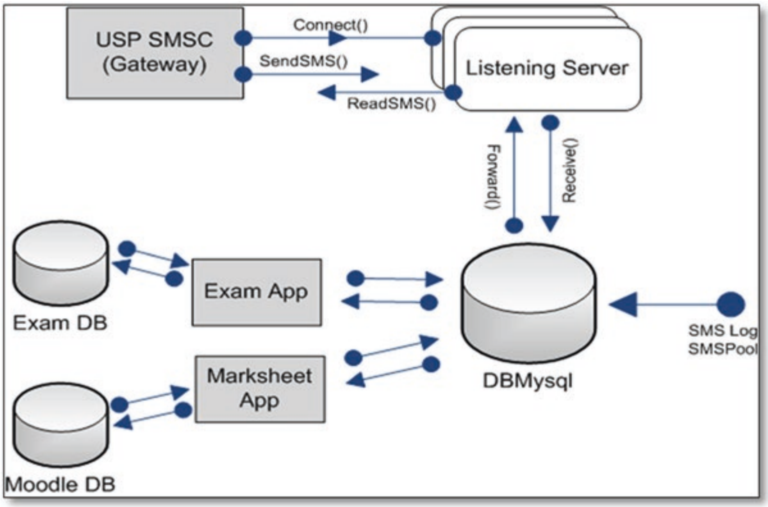


Fig. 28.5 USP SMS gateway application architecture

major mobile carriers: Digicel and Vodafone and through them USP is able to send SMS to students in the region. Through this gateway, USP began delivery of content to students through projects that are detailed hereafter. The university has entered into contractual agreements with the two local mobile service providers securing lower rates and has a common short code assigned by the mobile providers that students use to send out SMS.

This initiative enables:

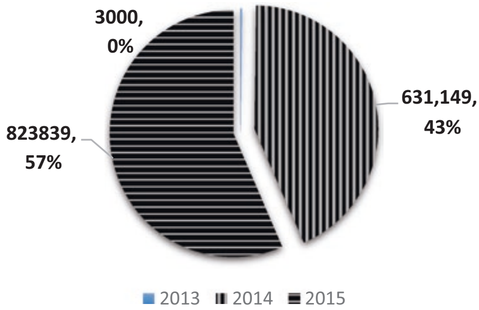
1. Accessibility of quality education to all students in the region
2. Accessibility of learning support provided equitably to all the campuses and centres
3. Overcoming the digital divide amongst regional countries
4. Provision of just-in-time, just-enough and just-for-me learning to the users
5. Establishment of an online community of learning in the Pacific

28.5.1 SMS Notification Service

The SMS notification application was the first mobile learning application to be developed in USP. This application is a feature of Moodle which is available to the instructors through course shells residing on Moodle. The instructors can send an SMS notification by typing out a 160 character or less SMS on the web interface of Moodle and send it to all or a group of students registered in the course.

The SMS notifications are used to send important announcements, instructions and study points to students. An instructor sends out an SMS to the students as a reminder for upcoming tests, release and due dates for assignments, cancellation of

Fig. 28.6 Number of SMS notifications sent in USP



tutorials and lectures, changes to class times, exam study tips, hints on assignments and many other informative learning points.

In 2013, the SMS notification was used by selected courses, but in 2014 the service was opened to all courses throughout the university. Figure 28.6 shows the number of SMS sent out by the SMS notification service in the past 3 years. Awareness programmes and workshops were conducted by the mobile learning team which boosted usage of the notification service, with a total of 823,839 SMS sent to students. The 2015 survey shows that students were pleased to receive instant SMS from their instructors on course information and announcements.

28.5.2 SMS Exam Timetable Service

In the past, there were many cases where students missed their exams because they simply did not know their exam date and time. An SMS exam timetable service was developed to enable students to check their timetable using SMS anytime and anywhere without the need for a computer with internet connection. The SMS exam timetable application is a request-response application. This application was first introduced in semester 1, 2013. The university's final examination each semester runs for a duration of the last 2 weeks of the semester. The application is activated a week before the examination period and can be accessed by sending a specific syntax "Exam STUDENTID" to the university's short code number 6013 as shown in Fig. 28.7. Over the years, the usage of this service has increased significantly as shown in Fig. 28.8.

28.5.3 SMS Quiz Service

The SMS quiz application is a two-way communication system designed and developed to provide quizzes in a form of questions with explicit answers. There are no open answer questions in the quizzes. To access the SMS quiz service, students send an SMS with quiz code ("Quiz QUIZCODE") to the University' shortcode 6013. Figure 28.9 shows a screenshot of the SMS quiz application.

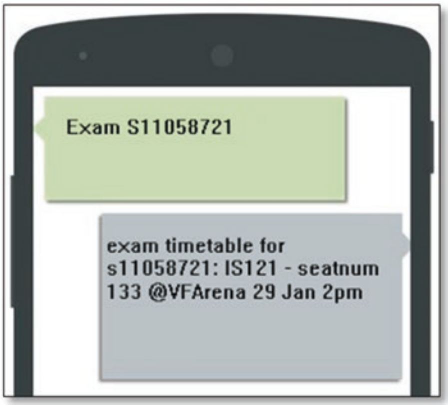


Fig. 28.7 Screenshot of the SMS exam app

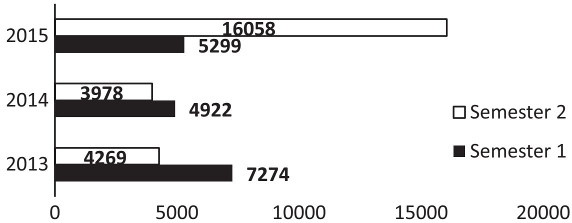


Fig. 28.8 The exam timetable SMS service request count for 2013–2015 at USP

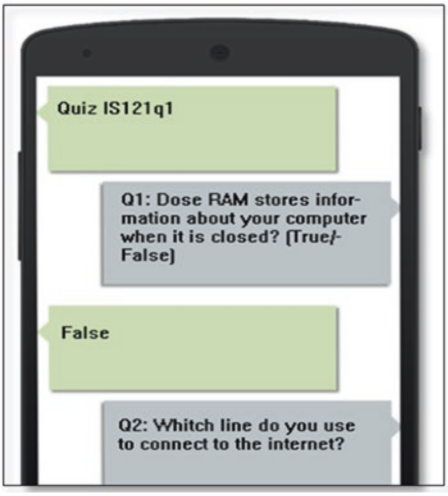


Fig. 28.9 Screenshot of the SMS quiz application

Feedback received from students from 2014 to 2015 online surveys was as follows:

> So far it is all good. I like to use the SMS quiz since it gives me instant feedback
>
> I think USP mobile learning is a cool way to be and have access to updates, school facilities, notifications such as exam timetable, SMS quiz and the marksheet for our courses since we may not always have access to a computer.

The quiz application is used for the following in the university:

1. Short assessments – short SMS quizzes can be conducted either inside or outside of classrooms depending on the need. USP has trialled both in and out of classroom quizzes, and students are also given the choice either to attempt the quiz using SMS or use paper and pen.
2. Receive on-the-spot student feedback in a classroom – the quiz can be opened to a class by the instructor to get just-in-time feedback on a recently taught concept by posting a few questions in class and letting the students attempt the quiz.
3. Promotional activities – the application has also been used during special occasions such as Open Day, orientation and registration week, Parents & Partners event, etc.

28.5.4 SMS Marksheet Service

The SMS marksheet was developed to enable students to easily keep a track of their performance in a course using SMS. The SMS marksheet service is another unique app developed in-house which integrates the marksheet – an electronic repository of marks on Moodle based by course. The SMS marksheet service allows USP students to access marks of assessed tasks contributing towards their continuous assessment of flagged courses, using the SMS feature of their mobile phones. Once the course coordinator feeds the course marks into the Moodle marksheet and activates the retrieval of this information via SMS (along with the access of Moodle marksheet via the web), the students can access their marks using the SMS feature on their phones.

This service was released in 2013 and was opened to all first year and online courses, benefitting a total of approximately 92 courses in total. Three hundred eighty-six SMS requests were sent in semester 2, 2013, but the service has since had to be put on hold due to budget constraints. Figure 28.10 shows a screenshot of the application.

28.6 Web- and Mobile-Based Services and Apps

Based on the percentages of smartphones, tablets and iPads shown in Fig. 28.4, the mobile learning team developed web- and mobile-based applications. All web applications developed are responsive so that they give an optimised look for any mobile device. The following section discusses different web and mobile apps.

Fig. 28.10 Screenshot of the SMS marksheet application

28.6.1 Edutainment

Edutainment is a working marriage of words: education and entertainment. It describes numerous forms of entertainment that are designed to also be educational or contain educational content which is adequately nourished with games. The arterial focus of edutainment is to make learning an exciting and interactive experience for the learners; it is a platform or tool to keep the learners engaged with the learning content. On the other hand, edutainment can be seen as transformational and strategically designed to bring about societal changes, for example, a climate change mobile app *Offset* from NASA.

Anecdotes of informal education integrated with popular yet challenging games from rural communities come to mind. The authors recall the *magical rivers and temple riddle* from villages in the interiors of Fiji. Then there were village folktales with moral messages. In societies which still place great emphasis on their traditions and culture, such forms of edutainment are still the preferred platform for meaningful learning and education.

A USP wide survey conducted at the end of the 2012 academic year showed that 89.55% (852 total respondents) of students liked to use game-based learning applications. This consequentially led to the in-house development of an edutainment module called Go Nuts.

The Go Nuts edutainment module generally adopts the architecture of the *Hangman* game; however, the user has to give the correct words to prevent coconuts falling on the avatar (see Fig. 28.11). The module was designed with the Pacific context in mind to enable the regional students to identify better with the games and the content. Three games were designed to help the new entrants make a smoother transition into university: *English Grammar*, *C++ Programming* and *Get to Know Moodle*, which can be accessed from anywhere via the web on http://mlearn.usp.ac.fj/game/literacy.

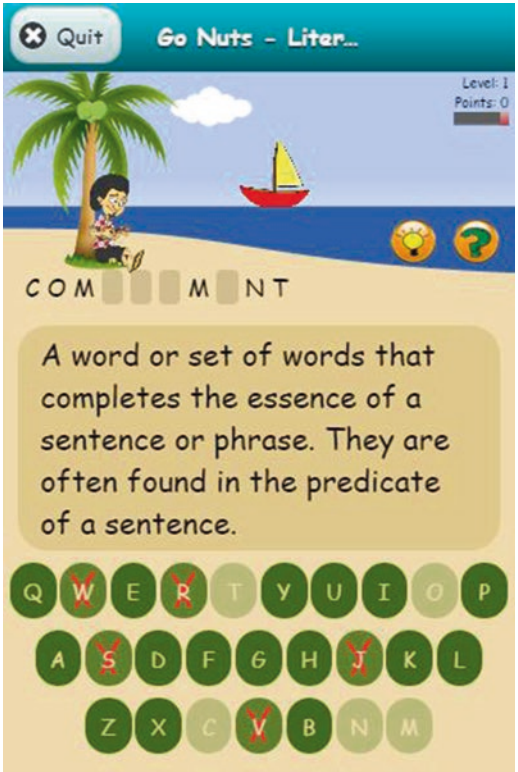


Fig. 28.11 Screenshot of the Go Nuts application

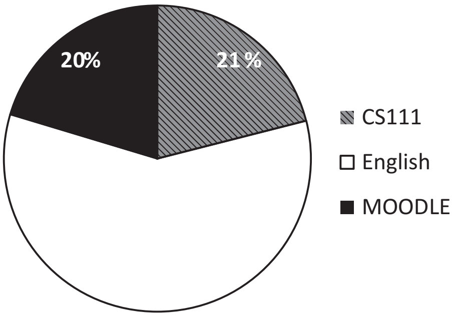


Fig. 28.12 Usage of the edutainment modules in 2013

A total of 2734 students played the Go Nuts games in their first year of implementation, with 59% preferring the edutainment module based on English grammar (Fig. 28.12). This positive response is heavily attributed to the contextualisation and customisation of the games. The students identified with these games that they could play in their own personal space. The mobile learning team is scheduled to introduce more modules with various other gaming concepts to engage new learners.

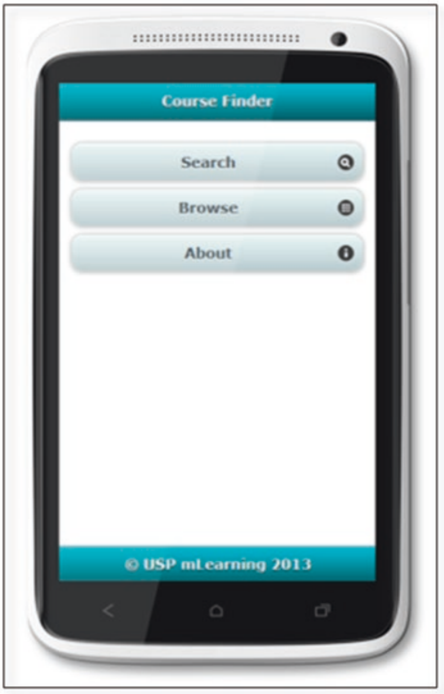


Fig. 28.13 Screenshot of the course finder app

Table 28.2 Usage of course finder application

Services	Number of hits (2014)	Number of hits (2015)
Course finder	682	8627

28.6.2 Course Finder

The course finder application is created to search for information about courses offered by the university. The search feature allows the user to search for courses based on the course code, subject code, course title or keywords of the course. Students can also browse courses based on the faculty and disciplines. A screenshot of this app is provided in Fig. 28.13. Table 28.2 shows the number of times the app was accessed.

This web-based responsive application can be assessed from anywhere in the world provided the user has an internet connection. Students can also use the wireless services offered by the University to access this application on their phones. The URL of the application is http://mlearn.usp.ac.fj/coursefinder.

There is also an offline version of the same application on the Android platform. This is the more preferred version keeping in mind the slow and intermittent Internet services in the Pacific. The mobile app can be downloaded from http://goo.gl/86BVWw

28.6.3 Mobile Course Modules

One of the main benefits of mobile learning is that learners who are always on the go can access materials from anywhere and anytime (Corbeil and Valdes-Corbeil 2007; Motiwalla 2007). In addition, with larger screen sizes, easier connectivity to the internet and steadily declining costs of the devices and data mean that mobiles devices now have the capacity to present course content more tailored to the learners' needs. However, Motiwalla (2007) and Dyson et al. (2009) suggest that a flipside of mobile learning is the lack of customised systems and pedagogies, and when used as a mere extension from the PCs and laptops with ineffective features such as podcasts, it is neither appropriate nor beneficial to students. One of the redefined mobile learning tools consists of course modules on mobile devices. Mobile course modules benefit both learners and instructors in ways such as:

1. Students learn at their own pace and interact and engage personally with learning materials without being forced by time or continuously observed.
2. Facilitators are able to focus on smaller topics, go into more depth and detail and provide bite-sized learning.
3. Facilitators are able to modify and redefine activities.
4. Built-in assessments and student feedback.
5. Tracking students' interactivity and engagement is made easier.
6. Access to responsive content and media is made easier with new eLearning authorising tools and technology.

The mobile learning team undertook the development of mobile modules for selected courses in 2014 with the use of mobile learning/eLearning tools such as the Adobe eLearning Suite. Mobile course modules are interactive web-based mobile applications which are designed on HTML5 to be used on any mobile platform. The selection of course modules was made with the aim to help at-risk students. For this pilot, first-year courses with low pass rates and in particular their at-risk topics were chosen. The mobile course module presents the difficult topics by using a storyline combination of audio, video and interactive mobile animations so students are able to visualise and better understand the concepts. Students can access it anytime and anywhere as long as they can connect to the internet. Al-Khanjari et al. (2014) also suggest that a mobile course module approach has the chance to be more effective and gain wider acceptance by mobile learners in higher education.

During the trial period, the mobile learning team piloted the modules in Mathematics and Computing Science courses. Figure 28.14 shows screenshots of the mobile course module which can be accessed on any mobile device or even from a laptop or PC.

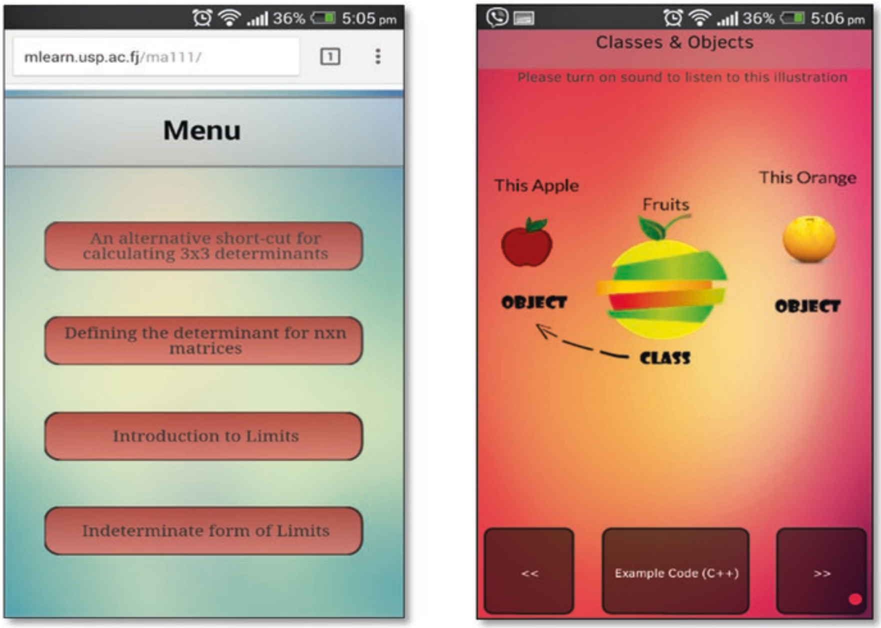


Fig. 28.14 Screenshots of the Mathematics and Computer Science course modules

28.7 Tablet-Based Learning

Using tablet computers for learning falls in the broader mobile learning scope as tablets can be used in providing learning content anytime and anywhere to the learner. Tablets are regarded as a new generation of educational tool that affords creative use and instant access to a wealth of online resources, and they have been touted as revolutionary devices that hold great potential for transforming learning (Goodwin 2012). Since tablets are a relatively new advancement in technology, existing research of their use in the education sector is limited yet sprouting freely with the recent inundation of interest and resourcing from stakeholders (Dundar and Akcayir 2012; Pennington 2014; Pilkington 2014; Rahmani 2013).

A review of the literature shows that tablets are being piloted and used in primary, secondary and higher education as they are perceived to have benefits to students and the learning process. A tablet can give a student the ability to explore digital personalised curricula, to access supplementary web content tailored to their field of study and to read searchable, annotatable and more cost-effective digital textbooks, which would enhance the overall learning experience (Fischer et al. 2013). Specific learning skills such as reading have also been analysed by Dundar and Akcayir (2012) when they compared primary school 5th-class students' electronic text reading performance, reading speed and reading comprehension with tablets and printed books. Pennington (2014), Pilkington (2014), and Rahmani

Fig. 28.15 The campus directors distributing tablets to the distance students (*left*: Tonga Campus; *right*: Kiribati Campus)

(2013) provide good literature from various parts of the world on tablet implementation in education. Tablets are becoming increasingly important as we move along the facets of the SAMR model (Puentedura n.d.). Students are reinventing their learning through online group discussions, hence creating new knowledge and sharing, using the tablets. There is a general promise in the education world that the teacher's role will change from a "sage on the stage" to a "guide on the side" (Van Dusen 2000), with students taking command of their personal learning spaces. The acceptance of these ICT-related initiatives and innovations has been captured well in the "Unified Theory of Acceptance and Use of Technology" model by Venkatesh et al. (2003).

USP introduced tablets into its mobile learning initiatives in 2013. The aim of the Tablet Learning Project (TLP) was to make distance learning easier for students based in the regional campuses. TLP was carried out in campuses situated in Fiji, Tonga, Samoa, Vanuatu and Kiribati with around 600 students studying selected programmes via distance learning modes benefitting from the initiative. The tablets lent to distance students were primarily set up as electronic repositories of course materials and educational applications required for the different disciplines. Beyond the TLP, the role of tablets in the university has grown strong in recent years with learning through online group discussions, the creation of new knowledge, searching and sharing, uploading and downloading, watching and making videos and listening and making audio clips, amongst other interesting functionalities available to students (Fig. 28.15).

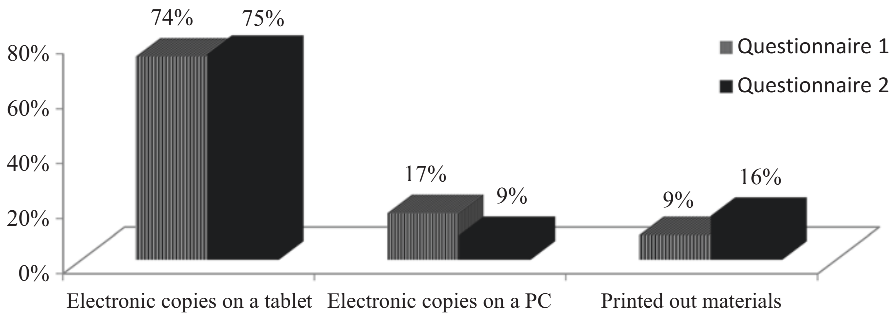


Fig. 28.16 The students' preference for reading materials from distance and flexible learning courses

28.7.1 Tablet Preferences

The introduction of the TLP was dovetailed with an evaluation process to gauge its effectiveness. A questionnaire was distributed online in semesters 1 and 2 to students, and a total of 59 and 68 students responded, respectively. As seen in Fig. 28.16, one interesting area of feedback obtained was the students' preference of using tablets $\bar{x} = 74.5\%$ for reading the course materials over electronic copies on PCs and as printed materials (Kumar et al. 2013).

28.7.2 Student Testimonials from TLP

The following is a sample of testimonials from students participating in the TLP. The positive feedback and sincere uptake of the tablet devices do indicate the potential of their wide implementation in the university.

> The Tablet learning project has been really helpful for me this semester. It is easy and portable making it ideal to use at all times. I am so thankful for being part of this project and I would recommend it to anyone else.
>
> It helps me to avoid booking the computer lab each day for 2 hours to access my Moodle and find information for my courses. It saves my time from stressing around with my work. My tablet helps me to do my work regularly because I can access the internet, Moodle and I enjoy it a lot.
>
> It is very useful in a sense that I don't have to carry my books in school. I just carry the tablet with me to school, and as I get free time I just read it. I also at the same time learn how to use it.

28.7.3 Recommendations from TLP

28.7.3.1 Security

One concern of the TLP was the security of the tablet devices. The security concern arises from the fact that students possessing these devices have access to the university network via Wi-Fi (and the Internet) and this can result in them using the tablets for malicious activity, causing harm to the university network services. A possible solution is a Network Access Control (NAC) system. A Network Access Control (NAC) system delivers a comprehensive system for identifying, controlling and securing access to critical network communication and institution services (Enterasys Networks Inc. 2014). By having this system in place, all tablets and smartphones require some form of systematic registration and authorization by the users before they can be used in the university network.

28.7.3.2 Wi-Fi and Bandwidth

The deployment of tablets in the institution calls for proper information technology infrastructure such as broad coverage of Wi-Fi in all areas of the campus. This is achievable by setting up a sufficient number of wireless access points in the network infrastructure. Together with having proper Wi-Fi on the campus, the university also has to ensure that it can serve the many and increased number of tablet users on campus by having high-speed bandwidth. It would not be logical to have many tablets connected to the university network via W-Fi if the devices are slow or unable to be accessed through the university Intranet and Internet.

28.8 Challenges in Adoption of Mobile Learning

The success and sustainability of mobile learning tools in the Pacific region face strong technical, educational, social and economic challenges. While many challenges are prevalent worldwide, there are some challenges which are unique to the Pacific.

Worldwide the challenges pertaining to mobile learning include, amongst others, short battery life, smaller screen size, the risk of obsolescence, limited memory and maintenance of the mobile devices. These provide a greater challenge to applications developed for learning purposes. Careful consideration needs to be given to the memory, storage, mobile data, and battery consumption available on devices provided by the university. In addition, there are device limitations since some types of mobile devices do not support viewing of different document formats. Reworking the current eLearning materials to make them responsive on mobile devices is a huge challenge in itself (Mehdipour and Zerehkaf 2013). Conversion of learning content fit for eLearning to content fit for mLearning requires time and expertise in doing so.

Poor network reception and the high costs associated with mobile data are also challenges, especially in the Pacific region. Mobile phone ownership and usage are still prohibitively expensive in the region. Although the numbers of mobile subscribers are steeply increasing, not all people have mobile phones, and fewer have access to smartphones and broadband connections that make mobile learning successful. Across the Pacific and within the regional countries, an inequity exists in terms of types of handsets, purchasing power of users, literacy levels of users and mobile infrastructure. This further deepens the digital divide and digital inequality which invariably affects the uptake and usefulness of mobile learning in the Pacific.

28.9 Implications of the Study

The study heralds the growing potential of mobile learning in the Pacific region. The results from the last 5 years of implementation of mobile learning services and apps in USP clearly show that the uptake from learners, facilitators and higher education institutions is pleasing yet inspiring and motivating. It is a clear mandate to expand mobile learning in the Pacific region.

Of course, there is a clear mention of issues such as infrastructure, diversity of mobile devices, training needs for facilitators and students, Internet costs and availability, amongst a few others which need to be addressed, if there has to be a wide acceptance and usage of the tool in the Pacific region. It has been established in this survey as well as from other sources that there is a high percentage of Pacific islanders who use mobile devices for social purposes and connect to family members residing in the outside world; however, the rate at which the mobile devices are introduced as a learning tool in the education sector indicates that there is a huge market in the future. The market is booming with online games and edutainment modules; Pacific is no different. Another recommendation from this survey is to have learning tools available for the Pacific students nourished with exciting games.

28.10 Conclusion

Mobile learning supplements the overall use of ICT in higher education in the Pacific region. By utilising the mobile learning system as a support service, higher education institutions reach out to the learners who are either situated on campus or are distance learners. Along with addressing the most fundamental problems of accessibility to education, mobile learning provides redesigned learning content enabling learners to easily grasp concepts and skills, hence tapping into the higher echelons of the SAMR model of the ICT continuum.

USP, being an "innovation hub" of the Pacific, has adopted the mobile learning system as an ICT support system for instructors and students. By setting up its own SMS gateway, it has developed and will continue to develop different in-house learning and supporting applications. The SMS notification service is the most widely used SMS service by instructors and students and serves its purpose of notifying students of urgent course and university matters as well as motivating and inspiring students.

Due to the increasing usage of mobile devices by students, the mobile learning initiative has ventured into application development for these devices. The development and usage of applications such as the edutainment modules, mobile course finder and mobile course modules are aimed at instilling interactivity and engagement with the learning process. A number of suggestions pertaining to logistical and technical considerations of using mobile devices for learning have been provided in this chapter.

By starting a mobile learning system at USP, the university has provided an opportunity to undertake a number of projects with regard to SMS, mobile application development and tablet-based learning. These projects collectively contribute to providing access to quality education to USP students in the Pacific region and fit in with our student-centric approach, which underpins the support services we provide from orientation to graduation for our students. It also provides the university with a competitive edge to attract students to its programmes. The university is currently working on addressing the mobile conundrums that have been captured in the previous section.

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Chapter 29
Usability Study of Mobile Learning Application in Higher Education Context: An Example from Fiji National University

Bimal Aklesh Kumar and Priya Mohite

Abstract Mobile learning is transforming the delivery of education and training in the higher education sector by providing students with the opportunity to learn anywhere and anytime. Mobile devices have small screen sizes, little input capability and processing power that make designing and using mobile learning applications a challenging task. MLearn was a pilot project undertaken at Fiji National University (FNU) to provide a mobile learning facility for its distance and flexible learning students. In response to the dissatisfaction expressed by these students, an in-depth usability evaluation of the MLearn application was conducted. The study was conducted using 30 students studying through a distance or flexible learning mode who were recruited to examine the system for ease of use, usefulness and satisfaction. The sample included a wide variety of experienced and inexperienced students across the university. Data was collected using questionnaires and group interviews. The data gathered was subjected to reliability analysis followed by a comprehensive evaluation based on the specified usability criteria. Data analysis was performed on the whole sample, as well as on each of the groupings (experienced and inexperienced users). The results highlighted minor usability problems, and recommendations were derived to further improve the application. Findings from this research will be applied to develop a set of guideline to support the future design of mobile learning applications.

B.A. Kumar (✉) • P. Mohite
Department of Computer Science and Information Systems, Fiji National University, Lautoka, Fiji
e-mail: bimal.kumar@fnu.ac.fj; priya.mohite@fnu.ac.fj

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29.1 Introduction

Mobile applications (apps) are becoming increasingly important tools in the delivery of education and training in colleges and universities. In addition to voice communication, mobile phones also allow the transfer of data that is useful for delivery of educational content (Valk et al. 2010) and broaden the availability of quality educational materials through decreased cost and increased flexibility. Mobile learning is the point at which mobile computing and electronic learning intersect to provide anytime, anywhere learning experiences for the students (Majumder and Basu 2010). Mobile learning is widely being adopted by colleges and universities to support digital learning initiatives (Seppälä and Alamäki 2003). At Fiji National University (FNU), as students continue to adopt smartphones and tablet devices at an increasing rate, the university is exploring opportunities to develop applications to serve the needs of these students.

FNU is one of the largest universities in the South Pacific region with campuses and centres located all over Fiji. There are a few courses in management, education and information systems offered through distance and flexible learning (DFL) mode to those students who are either working full time or cannot attend classes due to distance constraints. Many of the students studying through DFL modes are staying in remote locations and consequently can't travel to campus and access the required facilities for learning. Given that the cost of bandwidth is high and there is a lack of infrastructure to facilitate distance and flexible learning, mobile learning sounds potentially a very viable and promising solution for the accessibility constraints experienced by remote students. Fiji has a mature mobile market with a high penetration rate of mobile phones; hence, most students already own mobile devices. At the beginning of 2015, the MLearn pilot project was trialled to support teaching and learning in DFL mode. The project team developed a mobile app known as MLearn that provides students with access to lecture notes, tutorials and other important information about their courses.

While mobile devices are becoming more sophisticated, applications developed to support teaching and learning in colleges, and universities are facing several challenges (Kim et al. 2006). Usability is one of these challenges. After launching the MLearn app, the development team started receiving number of complaints from the students such as that the app was difficult to use or that it was difficult to find certain features in the app. In response to the dissatisfaction expressed by the students and their reluctance to adopt the MLearn application, an in-depth usability evaluation of the mobile learning application at FNU was carried out to provide recommendations for improving the application. The term usability is not new in today's system development. The traditional view of usability that is popular among software developers is the attributes of the software that make a product easy to be used. Usability has been recognised in the literature as an important factor that significantly affects the success or failure of any application (Bevan 2009). Usability testing of software applications developed for mobile devices is an emerging research area that faces a variety of challenges due to the unique features of mobile devices such as small screen size, limited input capability and changing user context (Harrison et al. 2013). Usability studies have been recognised as a fundamental tool in evaluating mobile apps (Zhang and Adipat 2005). However, very few usability tests have been developed for mobile learning applications.

This study aims to elicit user perceptions and overall attitude towards the mobile learning application at FNU. A review of the literature indicated that three elements are relevant to assessing the MLearn application, ease of use, usefulness and satisfaction (Ali 2013). A usability evaluation framework was established for assessing the MLearn application. The test was conducted using 30 students studying in DFL mode. The findings presented are based on an analysis of their response to questionnaires and in group interviews. This chapter commences with a systematic literature review on the usability of mobile apps. This is followed by the details of results from the usability experiment and recommendations for improving the system. Finally, the chapter concludes with future research work to be done in this area.

29.2 Literature Review

29.2.1 Mobile Learning

In the past few decades, mobile devices and related technologies have grown tremendously and are now prominently being used in many fields such as entertainment (Leong et al. 2011), health (Ducut and Fontelo 2008), and finance (Donner and Tellez 2008). Mobile phones have also found their way into learning and the education sector. Mobile learning is a rapidly growing technology which is available anytime, anywhere according to the convenience of learners (Traxler 2009). Educational institutions in the Asia-Pacific region and around the world have started to use mobile technology to facilitate learning in new and innovative ways. Some of the examples from the pacific region include mobile learning at the University of the South Pacific, mobile learning organiser at Massey University and SimPharm at the University of Otago. Mobile learning is specifically relevant to students at Fiji National University who need to study primarily from a distance, as it provides flexible access to learning opportunities for those who are distant and bound to time constraints (Rosli et al. 2010). For the purposes of this project, we define mobile learning as any sort of learning supported by mobile and other handheld devices that is not dependent on location. The learner benefits from the opportunities offered by mobile technologies such as learning anytime as there are no constraints imposed by the location of the student.

While initiative is being taken to implement mobile learning across FNU, it is necessary to understand the potential benefits and drawbacks of using these technologies for enabling access to learning to ensure that mobile learning initiatives are being implemented effectively. Asabere (2013) and Chandhok and Babbar (2011) discussed some of the benefits of using mobile learning technologies which include reducing the barriers imposed by geographical constraints, enabling learning at any place and at any time and helping students develop a self-centred learning pedagogy. Asabere (2013) and Sharples et al. (2009) highlighted the potential challenges for learners and instructors of mobile learning including;

- Mobile learning a gap between technically sound students and non-technically efficient students.
- It is highly dependent on a platform of network resources.
- It can create a sense of isolation among students and instructors.

Notably, much research is occurring in the field of mobile learning around the development of innovative applications that can enhance teaching and learning. For example, Shuib et al. (2015) designed a simple Intelligent Mobile Learning Tool for Grammar Learning (i-MoL) which could help to facilitate English learning among students in non-English speaking countries; Boyinbode and Ng'ambi (2013) built a mobile lecturing tool named MOBILect that enabled students to efficiently use educational resources as lecture podcasts, while Bartel and Hagel (2014) presented a game-based mobile learning tool called eMgage. In contrast, Wishart and Green (2010) discussed lecturers' use of Edutxt to provide feedback to students. The future prospects of mobile learning are astonishing and can be taken up by universities and higher education institutes to enable students to foster knowledge at their convenience. As a result, distance may become less of a hindrance for the provision of education. Providing personalised knowledge, network access, and infrastructure, as well as dealing with technologically naïve students, however, remains a huge challenge (Yousef et al. 2015).

29.2.2 Usability

The term usability was first used in the 1980s and is used to evaluate the performance and acceptance of products and systems (Wei et al. 2015). ISO 92411 (1998), The International Standard Organisation (ISO), defined usability as "Ongoing product generally specified by users which aim to achieve a set of precise goals in a context of use pertaining to effectiveness, efficiency and satisfaction". Nayebi et al. (2012) defined usability as "the capability of a software system to be understood, learned, used and liked by the user under specified conditions". Human computer interaction (HCI) researchers have recognised that to produce computer systems with good usability, it is important to understand physiological factors on how humans operate (Harrison et al. 2013). Usability attributes help assess the user-friendliness and quality of certain products. Nielsen (1994) identified five generic attributes of usability: efficiency, satisfaction, learnability, memorability and errors, which are widely used in usability evaluation. Efficiency refers to resources expanded in relation to accuracy and completeness with the user to achieve goals. Satisfaction refers to freedom from discomfort and positive attitudes towards the use of the product. Learnability states that a system should be easy to learn so that the user can rapidly start getting work done using the system. Memorability is that the system should be easy to remember so that the user is able to return to the systems after some time. Errors indicate that the system should have low error rate or that the users make few errors, while using the system, and if they make errors, they can easily recover from them.

Mobile usability is regarded as an emerging specialisation within the field of usability (Wei et al. 2015). The study of HCI for mobile devices started more than a decade ago, but there is still an opportunity for technology-driven research due to recent developments in mobile devices such as iPhones and smartphone. Achieving high-level user satisfaction is critical to the success of mobile apps; hence usability testing of mobile apps is a mandatory process to ensure that mobile apps are practical, effective and easy to use (Ali 2013; Kumar and Hussein 2014;). The advent of mobile devices has presented new usability challenges that are difficult to model using traditional methods of usability. Some of these challenges include:

- Mobile context: the user is not tied to single location thus simulating the actual environment for testing is a daunting task.
- Small screen: mobile devices have very limited screen sizes.
- Data entry methods: the input methods available for mobile devices are different from those for desktop computers.

Mobile usability evaluation consists of methodologies for measuring the usability aspects of a system and identifying specific problems. The commonly used usability evaluation techniques are field evaluation and laboratory evaluation (Kjeldskov et al. 2005). In field evaluation, the product is evaluated in the actual context in which it is used. Using this approach, the dynamic mobile context is taken into consideration, which will be difficult to simulate in laboratory experiments. However, the major challenge for this technique is the lack of control over the participants in the study. For laboratory evaluation, usability testing is completed in the usability laboratory, which is an environment where users are studied interacting with a system in order to evaluate the system's usability. The tester has full control over the experiment, and they can define particular tasks to match the goal of the experiment. It becomes easy to measure the usability attributes and interpret results by controlling other variables in a laboratory environment. Usability is one of the key challenges faced by mobile learning application developers. Several usability studies have been conducted in the past for application redesign and optimisation purposes.

Gebb and Young (2014) compared mobile apps such as DynaMed, Evernote, Epocrates Rx and Mobile Prescribing Reference (MPR). These mobile apps were suggested to students at the Nursing University of Frontier to enhance teaching content for online courses and provide mobile ready clinical reference resources on handheld devices. The survey in this research included a set of questions about students' use of mobile devices and resources. Free response questions asked students to list five apps that assisted students with learning. A list of over 20 apps were examined, and the percentage of total responses shows that almost 50% of students mentioned that having mobile devices provided them an opportunity to study at their convenience, barring time and distance boundaries. The study finally highlighted issues with the interface design of these applications and proposed methods for optimisations.

Nichols et al. (2014) ran a usability test on the Primo discovery tool which is a midsized library research tool to discover patterns in the searching behaviour of users. The researchers tested key aspects of Primo's design and functionality based on specific research questions. A diagnostic usability evaluation was conducted to understand Primo's usability for users. The usability study included nine test subjects within the university community and was administered by a team which included a facilitator, note taker and principal investigator. The outcome of this test helped the researchers analyse screen activity, visual expressions and verbal comments that helped to judge the performance of the tool. The study revealed several problems that users experienced (participants were confused with the Primo search functions and search limiter labels) as well as technical challenges (inconsistent results due to indexing in search tool, collection-level records from in-house digital library were not displayed correctly) which highlight the importance of usability for mobile discovery tools and also how usability can affect user perception of mobile search tools.

Kukulska-Hulme (2007) conducted a usability study on the context of education at the Open University UK in the Institute of Educational Technology's Masters programme in Online and Distance Education (MAODE). The study introduced students to recent progress in mobile usability to make mobile content adaptable to users as well as providing the ability to report usability issues in the field of mobile learning. About 57 alumni students of MAODE were asked to complete an online questionnaire using mobile devices such as phone, smartphone, PDA or iPod. The survey shows that the use of PDAs generated large numbers of both positive and negative comments, which helped the author to address certain usability issues like physical attributes of mobile devices, content and software application, network speed and physical environment. Lu et al. (2011) developed a context-aware educational game-based mobile app, CAMEG. The authors incorporated Management Information System (MIS) course content concepts into a game and set up a virtual science park in three laboratories (Lu et al. 2012). A new version of CAMPRG was developed in 2011 to make learning more attractive to the learners, and the usability was evaluated by observing learner perceptions towards the two games. During the evaluation, about 23 teams with 3–4 students were asked to complete a usability questionnaire for CAMPRG. The questionnaire used in this research contained 11 five-point Likert-scale items (5 for "strongly agree" to 1 for "strongly disagree"). This resulted in the development of methods to improve the usability of the application.

This literature review provided evidence that usability is a well-researched area in the field of mobile apps. Looking at several studies, it is evident that there is no systematic approach to evaluating the usability of mobile apps, or more specifically, mobile learning applications.

29.3 Experimental Setup

This section describes the methods and process employed to carry out the usability study. The study was conducted in two phases which included a laboratory experiment and a qualitative group interview with research participants. Three categories of usability criteria were identified, ease of use, usefulness and satisfaction. Ease of use measured how easily the users can use the application, satisfaction measured the extent to which users believed that the application meets their requirements and usefulness measured how worthwhile the users felt the application was.

The users were categorised into two groups, experienced and inexperienced users. For the lab experiment, tasks were prescribed to the participants which were carried out using virtual mobile devices that included a logging mechanism. The evaluation lasted for 2 h and the average duration of participation was 30 min. The participants were advised that their task was to evaluate a mobile learning application, rather than testing their skills. The pretest questionnaire was designed to examine the experience of participants. The participants completed the prescribed tasks on their own, and no assistance was provided unless an error occurred. At the end of the session, the participants were asked if they encountered any problem during the test. For the group interview, participants were encouraged to express additional comments about the mobile apps that were not addressed in the questionnaire.

29.3.1 Participants

A large number of participants are required to test the usability of mobile apps. Thus, the researchers recruited 30 students studying at FNU in the distance and flexible learning mode. The participants were recruited by advertising on the university notice board, and it was voluntary for students to take part. This sample included 15 experienced users (students who have already used the application) and 15 inexperienced users (students who tried out the application for the very first time), and their participation was on a voluntary basis. The students' age varied and it was distributed over different age groups. Table 29.1 shows the participant age distribution.

Table 29.1 Participant age distribution

Age group	Experienced users	Inexperienced users
15–24	6	6
25–39	5	4
40–54	4	4

Table 29.2 Task list

1. Log into mobile learning app
1.1 Enter username (provided in the task sheet)
1.2 Enter password (provided in the task sheet)
2. Navigate the MLearn application
2.1 Check units information
2.2 Check news information
3. View the lecture notes in your mobile
3.1 Click on units
3.2 Select lecture notes
3.3 View week 1 information systems
4. Download the assignments in your mobile
4.1 Click on assignments
4.2 Select assignment 1
4.3 Click download
5. Attempt the weekly quiz
5.1 Click on units
5.2 Select quiz
5.3 Select week 1
5.4 Enter the answers provided in task sheet
5.5 Click submit

29.3.2 Task and Procedure

The tasks included each user going through the application and performing a number of subtasks. The completion time for each task was recorded, and the entire operation was captured using the logging mechanism in the computer. The tasks are detailed in Table 29.2. MLearn sample interfaces are presented in Fig. 29.1.

29.3.3 Documentation and Design

The documentation for the usability testing was prepared, and instructions were given to participants to read prior to testing. The instructions outlined the aim of the research and the steps the participants needed to complete as part of the testing session. There were 12 close-ended questions in total that the users had to complete for the evaluation. Four questions were derived from each of the given usability criteria, and each of the questions was rated on the scale 1–5, (1) very poor, (2) poor, (3) neutral, (4) good and (5) very good. Table 29.3 provides details of each of the

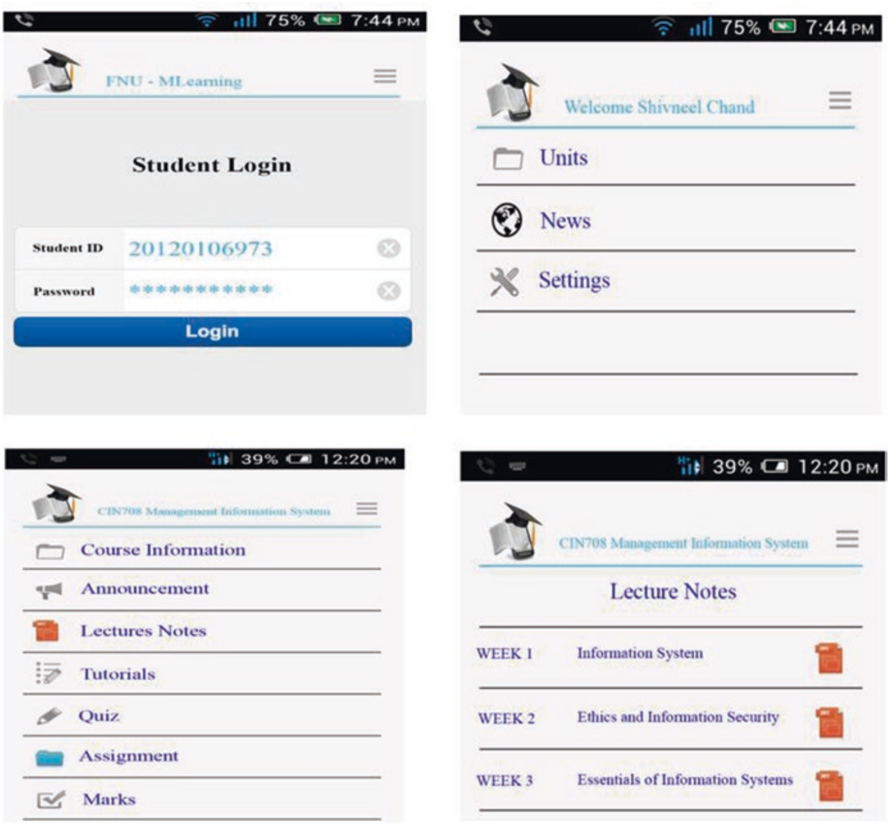

Fig. 29.1 MLearn sample user interfaces

Table 29.3 Usability criteria

Criteria	Key concepts	Explanation
Ease of use	User-friendliness	The application displays correct error messages
	Distinguishing icons	Icons are conceptually distinct
	Easy to learn	Users can easily navigate across the application
	Navigation	
Satisfaction	Application appearance	Colour and information organisation
	Screen organisation	The menu is familiar and descriptive
	Consistency and standards	Menu and submenu correctly structured
	User control and freedom	
Usefulness	Functionality	All required functions are provided
	Flexibility	User tutorial is provided
	Efficiency of use	The application provides user status updates
	Help and documentation	

usability criteria with key concepts and explanations. Questionnaires were derived using the key concepts.

29.3.4 Testing

The testing was conducted in two phases. For the first phase, the testing was carried out in the lab with students going over the tasks independently. Since there were a number of tasks to be performed, the users were prescribed with different task orders so that the learning curve is evenly distributed. The students went over the tasks a number of times before completing the questionnaire. For the second phase, group interviews were conducted. Discussions were held separately with each of the groups to ascertain their views for each of the criteria and key concepts. Students were given an opportunity to provide feedback on what they felt should be improved in the application.

29.3.5 Group Interview

This is an informal method for collecting in-depth information regarding the needs, judgements and feelings of typical users about an application (Dumas and Redish 1999; Nielsen 1994; Rubin 1994). In group interview users discuss selected topics, such as the different functions and features, with the assistance of a moderator, and then identify issues during their interaction in their respective groups. After the participants completed the laboratory test, they were invited to the group interview. In this group interview, the research team had discussions with experienced and inexperienced users separately. Each of the usability criteria was discussed and the group's opinions were noted.

29.3.6 Data Reliability

Cronbach's alpha is a measure of the intercorrelation of items (Cronbach 1951). Cronbach's alpha is the most common form of internal consistency reliability coefficient (DeVellis 2012). If alpha is greater than or equal to 0.6, then the items are considered unidimensional and may be combined in an index or scale. Alpha equals zero when the true score is not measured at all, and there is only an error component. A Cronbach's alpha test was conducted using the data obtained from the 30 students to assess the dimensionality of the measurement scale. Scale reliability was assessed in term of items to total correlation, and Cronbach's alpha was used to determine the internal consistency of the measurement scale. The results confirm that all measurements exhibited high reliability with coefficient alpha ranging from 0.83 to 0.95 exceeding or approaching the acceptable level of 0.70.

29.4 Analysis of Results

The study sample consisted of 30 students who successfully completed the survey. For the closed questions, the mean and the standard deviation were calculated for each of the groups, and then a chi-square test (X^2) was carried out to identify potential differences between the user groups. The analysis focused on the following aspects of the usability criteria: ease of use, user satisfaction and usefulness. The data gathered is summarised in Table 29.4.

Ease of Use Measures how simple or easy it is to use the system. Table 29.4 shows the statistical analysis of results for each of the groups: overall we can see that Group 2 with a mean of 2.47 has a lower score than Group 1 which means that the experienced users find the system easy to use, compared to new users. In addition, the standard deviation for Group 1 is 0.19 which illustrates that evaluation in Group 1 was more consistent and less variable than Group 2. These were expected as experienced users have used the system before and are familiar with the application. In addition, we analysed the closed-ended questions. Users from both the groups agreed that the system was user-friendly and very similar to other mobile apps. The difference is not statistically significant ($X^2(2) = 3.81$, $p = 0.14$). Both groups of users are satisfied that meaningful icons have been used by the application with 67% for inexperienced and 73% of experienced users selecting good and very good. For the question on navigation, 80% users from both groups rated it from poor to neutral. In group interviews, for the question regarding navigation, the users pointed out that the app should have a button to move the screen back and forth rather than relying on the device feature to move the application back. New users pointed out that it is difficult to attempt the tutorial for the first time, and they suggested that some help should be provided. Users in both groups generally raised concerns about navigation and offered recommendations for improving this.

Satisfaction Measures the extent to which the users believe the application meets their requirements. As illustrated in Table 29.4, the descriptive statistics indicate that Group 2 has the lower mean score of 2.23, which suggests that inexperienced students are less satisfied with using the application. To the question regarding application appearance, both groups of users were satisfied overall with screen colour and font. Most (85 %) of the experienced and 78% of the inexperienced users selected good to very good, and there was no statistically significant difference between them ($X^2(2) = 2.43$, $p = 0.11$). A third (33 %) of experienced users selected between good and very good for whether terminologies, fields and labels are used

Table 29.4 Statistical analysis of data

Criteria	Group 1 (Experienced students)		Group 2 (Inexperienced students)	
	Mean	Standard deviation	Mean	Standard deviation
Ease of use	3.81	0.19	2.47	0.61
User satisfaction	2.80	0.27	2.23	0.42
Usefulness	3.10	0.15	2.90	0.21

consistently or not, while 54% of inexperienced users selected neutral. While the inexperienced users provided differing views on the question about information provided on the different screens, 66% of the experienced users rated this between poor and neutral. In group interviews, the users from both groups raised concerns that the system should show the status of the download while downloading files using this application. From this analysis, we can assume that experienced users have higher expectations from the app as compared to inexperienced users. There were few concerns raised by experienced users, and they mostly requested new features such as messaging between lecturers and students, which highlights the need for making the application more interactive.

Usefulness Measures how useful the users feel the application is. As illustrated in Table 29.4, the descriptive statistics for Group 1 and Group 2 indicate that both the groups have a close mean score ranging from 2.9 to 3.1. This suggests that both groups have rated the app between neutral and good. The users in both groups were happy with the features provided by the system and believed that most of what is needed is available to them. Approximately 40% of users in both groups selected good or very good and no low statistical differences between them ($X^2(2) = 2.41$, $p = 0.09$). Both groups also suggested that the system is efficient, and the tasks can be easily established. The inexperienced users have not used some of the functions, and there was a consensus among both groups that there is a need for help functions that would have basic documentation on how to use the system. In the group discussion, the users pointed out that while they attempted using the tutorial, they should be able to review what they input before the final submission. Users also suggested that there is a need to incorporate help and documentation that provides brief instructions on certain important features (Fig. 29.2).

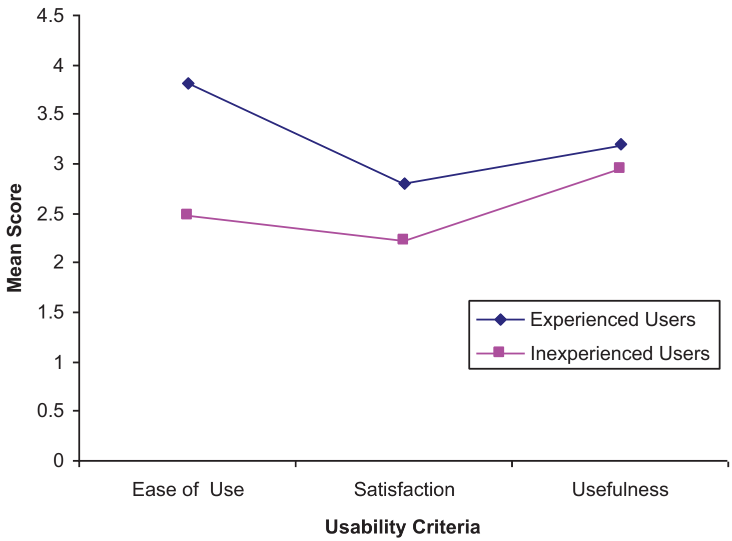

Fig. 29.2 Graphical representation of mean score

29.5 Discussion

Mobile usability is a new area of research, and there is very little published literature on the usability studies of mobile learning applications; the relevant journals and conferences are not more than a decade old. Mobile learning has overlapping concepts with eLearning and mobile human-computer interaction (HCI); thus borrowing techniques and frameworks from these fields have been the starting point for usability studies of many mobile learning applications. As development in mobile learning progresses, these borrowed tools and frameworks are no longer adequate. There were several challenges faced during this research, including those inherent to usability studies of mobile learning applications such as small screen sizes, intermittent connectivity and other associated human factors that could not be addressed using the previously mentioned techniques. As users move across different devices with different configurations, several challenges arise due to the changing environments and device capabilities. Current usability techniques are suited for static and well-defined contexts. Mobile learning contexts are, however, often impromptu and difficult to observe, predict and simulate. Users often use different devices and different patterns of assessing the application, thus making it difficult to carry out usability studies. The physical constraints of mobile devices, especially small screen size and resolution, significantly affect the usability of mobile apps. Reading from small screens is aesthetically unpleasant. Small buttons and touchscreens limit the input capability and increase human errors. The result of usability assessment is largely dependent on the use of different input and output methods. Reliability of the data collected was another issue that the evaluation team encountered. The team decided to apply the Cronbach's alpha, which is one of the most popular reliability statistics in use, and we, therefore, believe it is well suited to the needs of this research.

The results obtained are very useful in improving the system; all the users applied themselves diligently to the prescribed tasks and provided excellent feedback documenting their experiences and opinion on many aspects of usability as they interacted with the MLearn application. The analysis was conducted on closed-ended questions and group interviews. The research team measured the divergence between experienced and inexperienced users. Mean and standard deviation were computed as an indicative measure of user's consensus towards the usability of the application. Chi-square was used to determine the association between the two sets of data. The usability test results show that usability problems are few and minor, and there were also differences in consensus between experienced and inexperienced users. Based on the usability problems highlighted, the research team provided the following recommendations to MLearn development team to improve the application in terms of ease of use, satisfaction and usefulness.

Navigation	The MLearn application should include buttons to move from one interface to another. Currently, the system relies on the feature provided by mobile devices which is largely dependent on different brands of mobile devices
Help feature	Although mobile apps are rarely seen with help features built in, the research team believes that it is important for new users to have this option available while using this application
Chat feature	The application should provide a chat feature for students to interact with their lecturers and also for group discussion as this would make learning more interactive
Student involvement	MLearn development team should seek avenues to have the student voice heard by the MLearn team to influence the future development of this application
Collaboration	Researchers should collaborate to develop additional usability testing protocols for mobile learning and publish results in journals and avenues that can be easily accessible for researchers working in this area

29.6 Conclusion

Growing popularity of mobile devices has led to a number of mobile learning applications being developed and used. However, the inherent nature of mobile devices such as small screen size and limited input capability require special attention to the usability aspect of these applications. The case study presented here demonstrates that usability is an important tool for improving the user perception of a mobile learning application. The usability criteria used in this study included ease of use, satisfaction and usefulness. As part of the study, an evaluation of usability was conducted using 30 students studying through a distance or flexible learning mode, which included experienced and inexperienced users. Comprehensive analysis was conducted on the results obtained. Based on the results of the evaluation, ways to improve the application usability were proposed. Future research is needed to further refine the usability evaluation methodologies for mobile learning applications; however, this study serves as an incremental step in the right direction.

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Chapter 30
SMS Story: A Case Study of a Controlled Trial in Papua New Guinea

Nasiib Kaleebu, Alison Gee, Amanda H.A. Watson, Richard Jones, and Marshall Jauk

Abstract The reading proficiency of elementary and primary school children in Papua New Guinea is low, and, while many factors contribute to this, the lack of reading materials in elementary classrooms is a key contributing factor. The SMS Story research project aimed to determine the effectiveness of daily mobile phone text message stories and lesson plans to teachers on children's reading ability in the early years of schooling in Papua New Guinea. The research was conducted in 2013 and involved an experimental design, with treatment and control schools. At baseline, treatment and control schools had comparable school characteristics and read-

N. Kaleebu
United Nations Development Programme, Kampala, Uganda
e-mail: nkaleebu@gmail.com

A. Gee
VSO, Education, Dhaka, Bangladesh
e-mail: alisonjgee@gmail.com

A.H.A. Watson (✉)
Australian National University, State, Society and Governance in Melanesia Program, Coral Bell School of Asia Pacific Affairs, Canberra, Australia
e-mail: ahawatson@hotmail.com

R. Jones
Miller Jones Consulting, Education and development, Ottawa, Canada
e-mail: rjones@millerjones.ca

M. Jauk
VSO Voluntary Service Overseas, Education, Madang, Papua New Guinea
e-mail: Marshall.Jauk@vsoint.org

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ing levels. At the endpoint reading assessment, there was a statistically significant difference between the results of students in the treatment and control schools, with the treatment group performing better than the control group across four of the five reading skills tested. Teachers in treatment schools were also much more likely to have recently employed best practice teaching methods. Thus, SMS Story was found to have had a positive influence on the teaching and learning of reading. In the context of the largest, most populous country in the Pacific, where only a second-generation (2G) mobile network is currently available in most places, SMS Story provides useful insights regarding the effective use of simple technology.

30.1 Introduction

30.1.1 Mobile Learning Case Study from Papua New Guinea: SMS Story

This chapter presents the SMS Story research project, a controlled trial which determined that daily mobile phone text messages to teachers containing stories and lesson plans had a positive and significant impact on children's reading ability in the early years of schooling in Papua New Guinea (PNG). Teachers in treatment schools were also much more likely to have recently employed best practice methods for the teaching of reading. Thus, SMS Story was found to have had a positive influence on both the teaching and learning of reading. As the first mobile learning project in the education sector in PNG, SMS Story is relevant and important. The Mobile Learning Evaluation Framework (Murphy and Farley 2012) has been used to analyse the findings of the study. The chapter will present teachers' perspectives, as well as technical and organisational issues which have been uncovered through the course of implementing the research project. In addition to providing student learning results, the chapter also presents recommendations for policy-makers.

30.1.2 The Value of Reading from a Young Age

People who can read enjoy better health, earn more money and serve their communities more effectively (Dahya 2016; UNESCO 2006). The ability to read is a skill fundamental to learning. Children can learn to read during the first 3 years of schooling and indeed need to be able to read by this stage to succeed in school (Chall 1983; Gove and Cvelich 2010; USAID 2009). Children who do not learn in those years are likely to fall behind in other subjects as they grow older, repeat grades and eventually drop out (Stanovich 1986). Without basic literacy skills, children have little chance of succeeding in school and beyond (Hopkins et al. 2005).

In low-income countries, many children are not acquiring basic reading skills (Gove and Cvelich 2010). For example, in sub-Saharan Africa close to 61 million children of primary school age or almost half the student population will reach adolescence unable to read or write (Van Fleet et al. 2012). If all children in low-income countries left primary school with basic reading skills, 171 million people could be lifted out of poverty – the equivalent of a 12% drop in world poverty (UNESCO 2011). Consequently, one of the core areas of focus for the first 3 years of schooling in PNG is to 'develop the basis for sound literacy' (National Executive Council 2009, p. ii).

Elementary education in PNG refers to the first 3 years of formal schooling: Preparatory Grade, Grade 1 and Grade 2. The first elementary schools were introduced in PNG during the mid-1990s. Historically, teaching at these grades was undertaken in local vernacular. The language of instruction used in class was chosen by the local community (Department of Education 2004). Reforms by the current government are changing this, and the language of instruction henceforth is to be English (Department of Education 2013). In practice, classes are taught in a mixture of English and other languages. While households would vary, it is likely that the students participating in this study would experience very limited use of English, if any, at home.

Until 2009, elementary teacher training was delivered in mixed mode, consisting of relatively short in-service training, combined with a self-study format. In 2009, the first pre-service residential cohort started at the PNG Education Institute (PNGEI) (Manikuali et al. 2014). The Department of Education's long-term reform plan is to institutionalise elementary teacher training (Czuba 2013; Norman et al. 2012). The mixed-mode training has been found to be below expectations, in terms of the number of graduates (Manikuali et al. 2014), on-time provision of resources for workshops (Manikuali et al. 2014) and other factors (Czuba 2013; Manikuali et al. 2014; Norman et al. 2012). Research has found that for both the residential and mixed-mode courses offered by PNGEI, 'the current course length was not sufficient' (Manikuali et al. 2014, p. 8) for equipping elementary teachers with the required skills.

Elementary schools are located in villages, which is beneficial as it means that they are easy for students to access. On the negative side, these schools typically have no electricity, are a long way from administrative offices and are rarely visited by administrative officers (Manikuali et al. 2014). There are very few books, if any, in these schools (Czuba 2013). Teachers typically teach with just a chalkboard and resources they have created themselves. A review of elementary teachers' English competency found that there is room for considerable improvement, with many teachers being graded as 'extremely limited' or 'limited' users of English (Teaching Service Commission 2014, p. 7). While the context could mean that elementary schools stand to benefit the most from mobile learning initiatives, these factors may also be barriers to the successful implementation of such projects.

Literacy levels in PNG are low (Ambang 2012; ASPBAE Australia Ltd. and PEAN 2011; Department of National Planning and Monitoring 2010; Trucano 2016). The results of a reading assessment conducted in one province in Grades 2, 3 and 4 indicated that most children tested had not yet acquired sufficient reading skills in English (Machuca-Sierra et al. 2011). Furthermore, students' ability to read and comprehend a simple text was low: children showed an average reading comprehension of just 37% of the text (Machuca-Sierra et al. 2011). While many factors contributed to these poor results, lack of reading materials in elementary classrooms was seen as an important contributing factor (Machuca-Sierra et al. 2011).

30.1.3 Mobile Phones in PNG

The telecommunication sector in PNG has experienced rapid change in recent years (Suwamaru and Anderson 2012). Since foreign-owned Digicel commenced operations in 2007 (breaking a state-owned enterprise monopoly), mobile phone coverage expanded substantially, reaching many remote and rural locations (Watson 2011). Responding to concerns about the perceived negative impact of mobile phones on student learning (Watson 2011), a mobile phone policy was prepared to give guidance to schools (Department of Education 2009).

Many teachers now own or use mobile phones. Baseline data for this study revealed that 91.9% of teachers approached owned mobile phones ($n = 114$). The technology had been used by many teachers for some time: the mean length of time that teachers had owned a mobile phone was 2.7 years. While the field of mobile learning has been around for some time in other countries, it is only in recent years in PNG that consideration has been given to the use of mobile phones in teaching and learning (e.g. Suwamaru and Anderson 2012; Watson 2012). This chapter reports on a research project that was concerned with addressing low literacy levels in PNG, particularly in the earliest years of formal education.

30.2 The SMS Story Intervention

The SMS Story research project aimed to determine if daily mobile phone text message stories and lesson plans would improve children's reading and teachers' practices in PNG elementary schools. The intervention was designed based on the findings of an assessment of reading in early grades in Madang Province (Machuca-Sierra et al. 2011). SMS Story was designed and managed by Voluntary Service Overseas (VSO), an international non-government organisation, and funded by the Australian Government.

SMS Story was conducted with Grade 1 and Grade 2 classes in two provinces: Madang and Simbu. The trial tested the effectiveness of the intervention, technology and impact on teacher practice and student reading performance. It also closely examined costs, identified enabling and constraining factors, explored additional potential uses of the technology and assessed the scalability of the intervention at a national level. Participating teachers did not receive mobile phone handsets but used their own handsets. 70.5% of the teachers possessing mobile phones reported having a basic phone, while 23.8% and 5.7% had advanced feature phones (mobile phones that include a camera) and smartphones, respectively. Teachers in the trial did not receive any in-service training, but they did each receive a cartoon poster explaining how to use the text messages (Fig. 30.1).

30.2.1 Stories and Lesson Plans

Stories are fiction narrative texts. In the education context, the use of stories can 'help to focus the reader's attention and build personal connection, resulting in better retention and deeper subject-matter understanding' (Nathanson 2006, p. 1). In SMS Story, the stories exhibited many of the features of young children's literature such as repetition, alliteration, internal rhyme, characters who regularly reappear and humorous situations. Stories were designed to be engaging and culturally relevant to children from the two provinces and were designed to fit into one text message, with a maximum of 160 characters. The stories used in the daily text messages were in English and followed a structured system of phonics and high-frequency words. Phonics has been found to be effective in previous studies in PNG (Cawley et al. 2011) and elsewhere (UK Department of Education 2011). The phonics structure was adapted from Letters and Sounds (UK Department of Education 2007) and Jolly Phonics (Teaching Literacy with Jolly Phonics n.d.). There was a structured introduction of high-frequency, non-decodable words from the most common 100 English words and a sequential approach to the introduction of new phonemes and graphemes. Early stories were highly decodable and very simple. Stories sent out later in the intervention became more complex. Some later stories were sequential and connected as micro-chapters, spread across multiple days. Example stories are in Table 30.1.

The stories were created by a story writer who liaised closely with the elementary education and curriculum sections of the Department of Education in order to ensure that the content was in line with the curriculum and relevant to the local context. To ensure suitability, some of the stories were pretested first with teachers and students at schools in urban and peri-urban areas of Madang Province. The pretest schools had similar characteristics to intervention schools.

The lesson plans were also designed to fit into one standard text message. The text messages reinforced the importance of following the poster sequence and introduced comprehension questions. A limited number of best practice teaching strategies were included. Teachers received a total of 100 stories and 100 related lesson plans for two academic terms. Lesson plans were designed to be relevant to the stories, local context and the grades of the students, teaching specific new words and recommending the use of flash cards to familiarise students with new sounds and letters. Examples of the lesson plans are given in Table 30.1.

The lesson plans were developed by a team with a background in early childhood education. Team members liaised closely with the elementary education, teacher

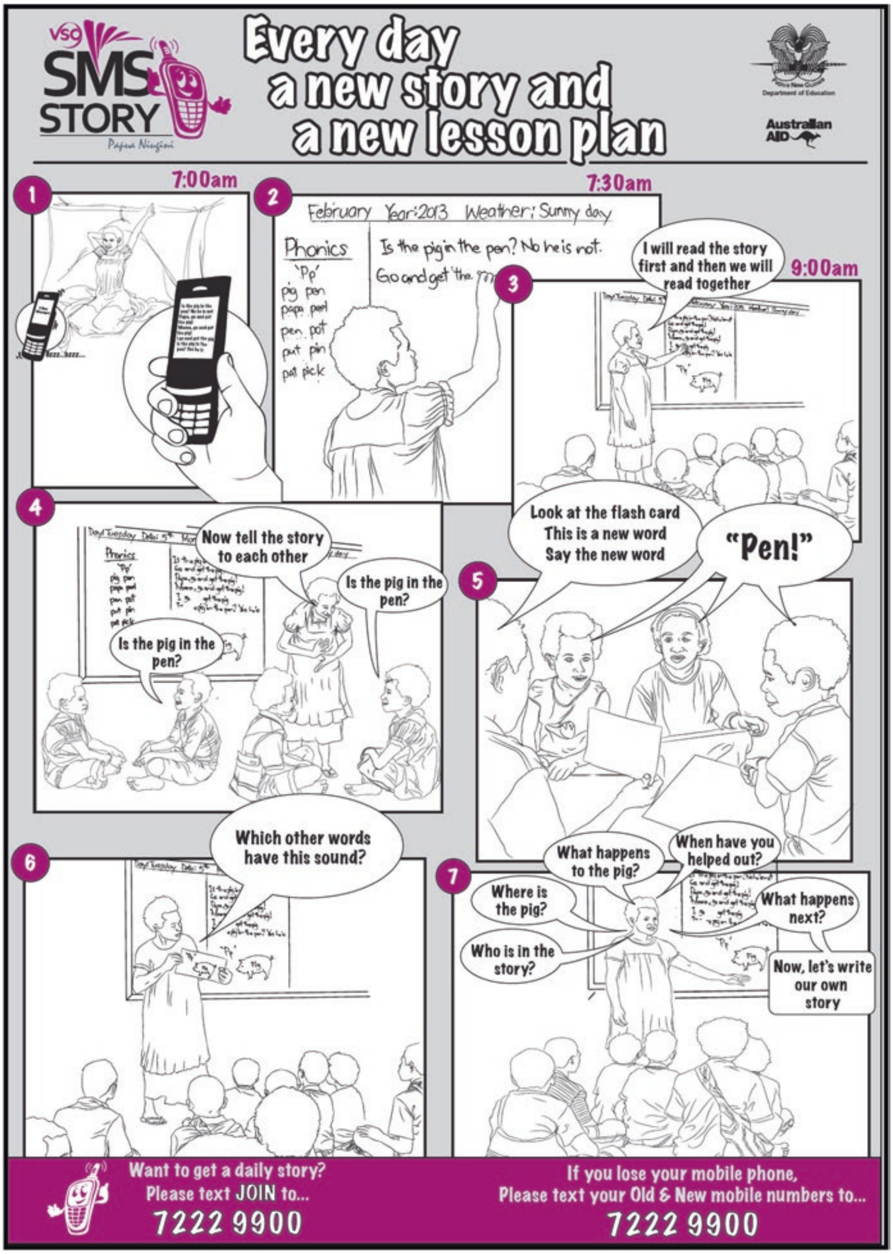

Fig. 30.1 Cartoon poster for teachers explaining how to use the text messages

Table 30.1 Example text messages

	The story	The lesson plan
Sent term 1, week 1, Monday	It is a tap. I go to the tap. I sit at the tap. I sip at the tap. It is a tap	(1) Write today's story on board. (2) Teach sound: 's' (sit, sip). (3) Teach words: I, the, tap, go. (4) Follow lesson instructions on poster. (5) Read with class
	77 characters (1 text message)	158 characters (1 text message)
Sent term 1, week 6, Monday	Ben is a big man. He has a big dog. The dog is dirty Don. Don likes bananas. Ben picks bananas for Don the dirty dog. But bananas make Don sick. Oh Don!	Teach new sound: 'b' (Ben, big). New words: big, man, bananas, sick, but. Practice blending words on board with class using fingers to count sounds in the words
	152 characters (1 text message)	160 characters (1 text message)
Sent term 2, week 8, Tuesday	Roy is a boy. Joy is a girl who plays with Roy. Roy and Joy have coins. They drop the coins in oil. 'Do not play with oil. It will spoil your shirt', said Papa	(1) Follow the poster. (2) Teach new words: coins, oil, spoil, do. (3) Make and use flash cards for new sounds and words. (4) What other things make us dirty?
	157 characters (1 text message)	153 characters (1 text message)
Sent term 2, week 8, Wednesday	Roy and Joy throw a coin. The coin went in the toilet! Roy and Joy want the coin but it is in the toilet. Do not get the coin from the toilet. It is dirty	(1) Follow the poster. (2) Revise long 'a' sound: air, ay, a–e from last week. (3) Class make list on board of words using long 'a' sound. (4) Use words in sentences
	152 characters (1 text message)	160 characters (1 text message)

training and curriculum sections of the Department of Education in order to ensure that the lesson plans were consistent with the existing elementary curriculum. Figure 30.2 shows a teacher at the front of a classroom, teaching reading using a story received via text message.

The theory underpinning the approach to teaching used in the SMS Story project is based on considerable local and international experience. There is an accepted international standard for the teaching of reading in the lowest school grades, based on Early Grade Reading Assessment (EGRA) intervention studies in various countries. The foundation principle is to teach reading by starting from young people's 'oral language foundation' (USAID 2009, p. 2). Learning is catalysed by 'building on prior knowledge with words the child already knows and using print materials with familiar vocabulary and illustrated with familiar objects from daily life' (USAID 2009, p. 3). While the classrooms in this study typically had few illustrated books, if any, the stories sent to teachers via text messaging were designed to be useful in catalysing learning as they contained objects, landscapes and scenarios familiar to teachers and students.

Fig. 30.2 Teacher using story to teach reading

30.3 Research Design

This section of the chapter explains the research methodology employed. Section 30.3.1 outlines the research questions, 30.3.2 introduces the controlled trial design, 30.3.3 presents the research participants and 30.3.4 conveys the data analysis strategy.

30.3.1 Research Questions

The main research question addressed by the SMS Story trial was: Can mobile phone text message lesson plans and stories for teachers improve the reading ability of students in elementary classrooms in PNG? In addition, there were nine sub-questions:

1. Are text message lesson plans and stories an effective way of improving teachers' practice?
2. Do text message lesson plans and stories lead to a significant improvement in student reading ability?
3. How do teachers use the lesson plans and stories?
4. What are the advantages and limitations of this intervention?
5. What are the advantages and limitations of the technology?
6. What are the strengths and weaknesses in the lesson plans and story content?
7. What other education-related uses can the technology be put to?

8. Is the intervention cost-effective and efficient?
9. Is the intervention scalable and sustainable?

30.3.2 Controlled Trial Methodology

Given that the intervention was the first of its kind in the PNG education system, it was decided to initially pilot it in two provinces. An experimental design with a treatment and control group was considered appropriate, in order to rule out any possibility of alternative explanations of the observed changes. The research and intervention design allowed for the comparison of two similar groups. The first was a 'control' group in which children's reading performance was measured but there were no project interventions. The second 'treatment' group consisted of a set of schools where teachers received daily text messages containing lesson plans and stories. The treatment group also received a poster explaining how to use the text messages. A statistically significant difference in reading aptitude scores between the two groups would mean that the text messaging had an influence on the reading ability of students. In other words, it is less likely that the students just naturally improved over time or that another factor led to any observed improvement (Salters-Pedneault 2009). As the mobile learning field is faced with 'the lack of full scale evaluations' (Murphy and Farley 2012, p. 1), such evidence could be highly valuable for generating sector-level support for initiatives.

Research was conducted in rural elementary schools and involved a baseline reading assessment in term 1, 2013; midpoint lesson and classroom observations; an endpoint reading assessment in term 4, 2013; and teacher interviews throughout. The reading assessment instrument used was a modified, shortened version of the EGRA tool used previously in another project in Madang Province (Machuca-Sierra et al. 2011), which was in turn based upon EGRA tools developed in other countries. An EGRA assessment involves one-on-one oral measurement with each participating student and 'has been a welcome innovation for measuring reading outcomes in the formative years' (USAID 2011, p. 33).

The SMS Story trial applied a longitudinal study design, with reading aptitude data being gathered both before and after the intervention. This is because change was a crucial consideration in this research (Bijleveld and van der Kamp 1998; Bouma and Ling 2004). The main method of assessing the impact of the text message stories and lesson plans was by comparing children's reading scores in control and treatment schools at the start and finish of the intervention.

All research was conducted in an ethical manner, and informed consent was received from participating teachers after they had each been given a clear explanation of the purpose of the research (Kaleebu et al. 2013). Informed consent was not received from students because the intervention was a Department of Education exercise involving classroom activities such as learning and student assessments, which were considered accepted aspects of participation in the education setting. However, researchers clearly explained to each student prior to assessment the purpose of the assessment, that participation was not compulsory and that the student was free to withdraw from the exercise. To confirm the reliability of the reading assessment instrument, both Pearson's bivariate correlations and a Cronbach's alpha reliability test were employed (Kaleebu et al. 2013). Formal inter-rater reliability assessments were also used during training and selection, to ensure maximum standardisation in techniques amongst the researchers.

30.3.3 Participating Schools, Teachers and Students

The elementary schools selected had to meet several selection criteria, including being in remote and rural locations, already teaching English, and with only limited access to reading books. In addition, treatment schools were located within mobile phone network coverage, teachers in treatment schools had to own or have access to a mobile phone and schools had to have a minimum of two teachers. Schools meeting the selection criteria (ascertained after baseline assessment) were assigned to either treatment or control groups. Note that while the random selection of participants is a sampling method that is suitable for some research, in this case, random sampling was neither desirable nor practicable. In order to gain useful, meaningful results, schools that were comparable at baseline regarding a number of characteristics (e.g. size, location, teacher characteristics and so on) were categorised as either control or treatment schools. Thus, the sampling process involved a non-probability design, rather than a random sample. By contrast, the sampling procedure for student assessments was random (Kaleebu et al. 2013). Note that individual children in elementary schools were the unit of randomisation and analysis. Table 30.2 shows the sample of schools, teachers and children involved in the study.

Table 30.2 shows that the analysis was based on 2478 children at baseline and 1986 children at final assessment. Note that 81% (1607 out of 1986) of the children in the final assessment were the same children assessed at baseline and 19% (379 out of 1986) were new children randomly selected to fill the gaps of children tested at baseline but absent at the time of the final assessment. Generally, the final assessment sample had fewer children than the baseline sample due to high rates of absenteeism in term 4.

This chapter presents data collected in terms 1, 2, 3 and 4 from student assessments, teacher interviews and random lesson observations. Table 30.3 outlines the

Table 30.2 Sample size of schools, teachers and children

	Schools		Teachers		Children	
	Baseline	Endpoint	Baseline	Endpoint	Baseline	Endpoint
Treatment	26	26	56	51	1209	982
Control	26	25	58	51	1269	1004
Total	52	51	114	102	2478	1986

Table 30.3 Research data included in the chapter

Time period	Data category	Quantity
Term 1	Student reading assessment	2478
Term 1	Teacher interview	114
Term 2	Teacher phone interview	37
Term 2	Random observations	38 classrooms/lessons
Term 2	Teacher interview	42 teachers
Term 3	Random observations	44 classrooms/lessons
Term 3	Teacher interview	44
Term 4	Student reading assessment	1986
Term 4	Teacher interview	102

data included in this chapter. The number of participating teachers reduced in term 4, due to teachers being absent from schools at the time of the term 4 visits.

Data were collected on school and teacher characteristics in the two groups at the outset of the trial. Overall, there were no significant differences between the two groups of teachers, when considering a range of variables, such as qualifications, teaching experience, classroom resources and age. Both control and treatment schools were equally disadvantaged in terms of reading resources available in classrooms. There was a majority of male teachers. The mean teacher age was 36.8, with no statistically significant difference between the treatment and control groups. The average number of years of teaching was the same between the two groups. The highest qualification level was similar between the two groups.

Teachers were also asked whether they had received any training on teaching reading and/or phonics in the last 6 months. Of the teachers who had received training, 17 were in treatment schools and 10 in control schools. Results were correlated across teachers who reported receiving training. However, this additional training did not lead to any significant difference in the reading assessments of their students, which would suggest the training had a relatively low impact on the trial itself. Thus, treatment and control schools were comparable in the pre-intervention period.

30.3.4 Data Analysis

Quantitative data from reading assessments were central and were analysed using SPSS statistical package (version 18) to determine if there was a statistically significant difference between the treatment and control groups. Table 30.4 shows analysis undertaken by reading subtests (see Kaleebu et al. 2013), while this chapter focuses on the percentage of children scoring zero. Some quantitative data were also generated from interviews with teachers and observations made during school visits. Qualitative data generated from teacher interviews were not included in this chapter, nor were classroom observations the focus of this chapter (see Kaleebu et al. 2013).

Table 30.4 Analysis of results by subtest

Reading assessment	
Subtest	Data analysed
1. Decodable words	Mean number of words correct in 1 min, disaggregated by groups (grade, gender and treatment group)
2. Sight words	Percentage of children scoring zero
3. Correct invented words	Number and percentage of words answered correctly
	Percentage of children scoring zero
4. Oral reading fluency	Mean number of connected text words per minute
	Percentage of children scoring zero
5. Comprehension	Percentage of questions answered correctly

Table 30.5 Term 4 self-reported data: examples of teaching strategies related to reading

	Teachers in the control group ($n = 51$)	Teachers in the treatment group ($n = 51$)
Reading stories to class daily	12	42
Asking students to orally answer questions about a story daily	10	35
Writing stories on the chalkboard daily	7	38
Daily guided reading	8	15

30.4 Results

30.4.1 Summary of Key Results

At baseline, there was no statistically significant difference between the treatment and control groups, with respect to school characteristics and children's reading assessment results. The baseline results showed that many children had limited or no reading (e.g. half of the children could not read any high-frequency English words). At the time of enrolment, all participating schools had very few reading books, if any, available in the classroom. On average, across both sets of schools, children's reading did improve over the two terms, with children at SMS Story schools improving significantly more (see Sect. 30.4.3 for details).

Random visits to treatment schools during the intervention period showed that most teachers were actively engaging with the content sent to them as text messages. This demonstrated that the SMS technology was effective in reaching teachers. SMS Story had a beneficial impact on treatment teachers' self-reported classroom activities, based on comparing self-reported data from term 1 and term 4, regarding frequency of employing various best practice teaching modes. At endpoint, teachers in the treatment group were more likely to report regular use of best practice teaching modes or strategies, such as those promoted by the SMS Story lesson plans and poster, compared to teachers in the control group. Table 30.5 shows differences in self-reported use of teaching strategies considered valuable in reading

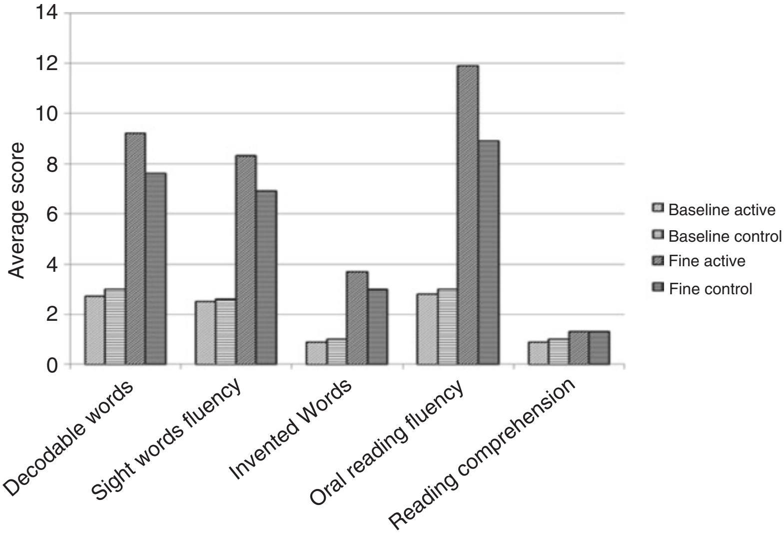

Fig. 30.3 Comparison of student reading scores before and after SMS Story in treatment and control schools

Table 30.6 Progression in students' reading

Reading section	Group	Baseline March–April 2013				Final Oct–Nov 2013			
		N	Mean	Std deviation	*p* – value	*N*	Mean	Std deviation	*p* – value
Decodable words	Treatment	1208	2.7	4.4	0.111	982	9.2	9.8	0.001**
	Control	1270	3	5.1		1004	7.6	10.9	
Sight words fluency	Treatment	1208	2.5	4	0.666	982	8.3	8.8	0.002**
	Control	1270	2.6	4.5		1004	6.9	10.7	
Invented words	Treatment	1208	0.9	1.9	0.6	982	3.7	3.4	0.000**
	Control	1270	1	2		1004	3	3.3	
Oral reading fluency	Treatment	1208	2.8	6.3	0.494	982	11.9	12.5	0.000**
	Control	1270	3	7.3		1004	8.9	13.6	
Reading comprehension	Treatment	278	0.9	0.9	1.2	772	1.3	1.2	0.971
	Control	279	1	1.1		557	1.3	1.4	

**Significant at 5% level ($p < 0.05$)

instruction. Teachers' self-reported data were triangulated with work in children's exercise books, on the chalkboard and on charts in the classroom.

At the endpoint reading assessment, there was a statistically significant difference (Fig. 30.3 and Table 30.6) between the results of the control and treatment groups, with the treatment group performing better than the control group across four of the five reading skills tested. This improvement was seen in both Grade 1 and Grade 2 and with girls and boys.

Children who did not receive the SMS Story intervention were approximately twice as likely to be unable to read a single word of three subtests (decodable words, sight words and oral reading). In other words, the intervention almost halved the number of children who could not read anything compared with the control schools. Therefore, the text messages to teachers and the ways in which teachers used them resulted in the improvement in students' reading ability in decoding, fluency, reading familiar high-frequency words and reading phonetically correct nonsense words. The research did not find a statistically significant improvement in reading comprehension, and generally, children showed low reading comprehension skills in both grades and little progression between Grades 1 and 2.

The estimated cost of delivering the text messages and subsequent reading improvement was approximately two PGK (roughly one USD) per child (excluding costs of distributing the poster, enrolling schools and one-off costs developing the lessons and stories). It is highly likely these unit costs could be reduced by scale. In addition, it should be possible to automate the opt-in and teacher database management. In the absence of reading materials and scripted lessons in elementary schools, SMS Story provides a simple and cheap strategy for raising reading standards.

30.4.2 Teachers and Their Classrooms

Visits to treatment schools in term 2 found that the mobile technology was effective in delivering text messages to teachers, with 100% of the teachers ($n = 42$) at schools visited (20 schools) receiving the lesson plans and stories on time and with no difficulties. Random school visits in term 3 further verified these results with 91% of the teachers (40 out of 44) interviewed saying they received the lesson plans and stories on time. Regarding children's reaction to the SMS stories and lesson activities, 96% ($n = 44$) of the teachers stated that students enjoyed reading the SMS stories.

Data on school characteristics revealed that by the end of the intervention period, treatment and control schools still did not differ significantly in terms of resource books, teacher's experience level and other variables. Overall, 96% ($n = 49$) of teachers in treatment schools confirmed that they received SMS stories and lesson plans every day with no difficulties. Eighty-six percent ($n = 50$) of the teachers said that the lesson plans and stories helped them in planning classroom and lesson activities.

SMS Story seemed to have had a beneficial impact on treatment teachers' self-reported classroom activities, based on comparing self-reported data from term 1 and term 4, regarding the frequency of employing various best practice teaching modes. At endpoint, teachers in the treatment group were more likely to report regular use of best practice teaching modes (see Table 30.5).

30.4.3 Reading Assessments and Zero Scores

During the baseline assessment, 2478 students were tested on five reading subtests. Each assessment was conducted individually, with a researcher working one-on-one with a child to provide instructions and assess the child's performance. The baseline results showed that many children had limited or no reading. Of particular note were the very low numbers of children able to decode unfamiliar words. The baseline assessment established that the treatment and control schools were comparable with respect to the reading performance of students.

In the reading assessment instrument used, a subtest was discontinued when a child reached an early stop rule. This aspect of the test was designed so that a child was not completely overwhelmed by a task and also so that researchers did not spend too long a time with each child. In the first four reading subtests, the early stop rule applied when a child answered every item in the first line incorrectly. The discontinued subtests showed the subset of children who could be characterised as non-readers. A large percentage of children scored zero across the first four reading subtests in the baseline assessment. In the fifth and final subtest, the early stop rule did not apply.

At endpoint, reading assessments were conducted with 1986 students. The percentage of children who discontinued in control schools was significantly higher than for those in treatment schools for all four reading sections. In the case of gender, there were some differences between boys and girls, with boys performing more poorly on three subtests and girls performing more poorly on one subtest. Comparing the grades, in all four subtests, Grade 1 students made up over two-thirds of the students for whom the early stop rule applied. This means that Grade 1 students generally performed more poorly than Grade 2 students, indicating progression in reading skills from Grade 1 to Grade 2.

A Pearson chi-square test was performed, to test for evidence of dependence between the school status variable (control or treatment) and application of the early stop rule. The test found that there was reasonable evidence of dependence in the case of all four subtests. The calculated chi-square statistic for one degree of freedom showed that in all subtests, the significance value (0.000) was less than the usual threshold value of 0.05 ($n = 1986$). This suggested that there was good reason to believe that a student's position in either a control or treatment school did have some impact on the student's performance in the reading assessment, with the early stop rule more likely to apply to students in control schools.

Figure 30.4 presents the percentage of children who scored zero on the four reading sections in the final assessment. It shows that in each reading subtest, early stops were significantly lower for children in treatment schools compared to children in control schools. This provided strong evidence of project impact on students in intervention schools.

There was a significant improvement in reading outcomes in the first four reading subtests over the baseline. There was a noticeable and statistically significant difference between treatment and control schools, with students in treatment schools

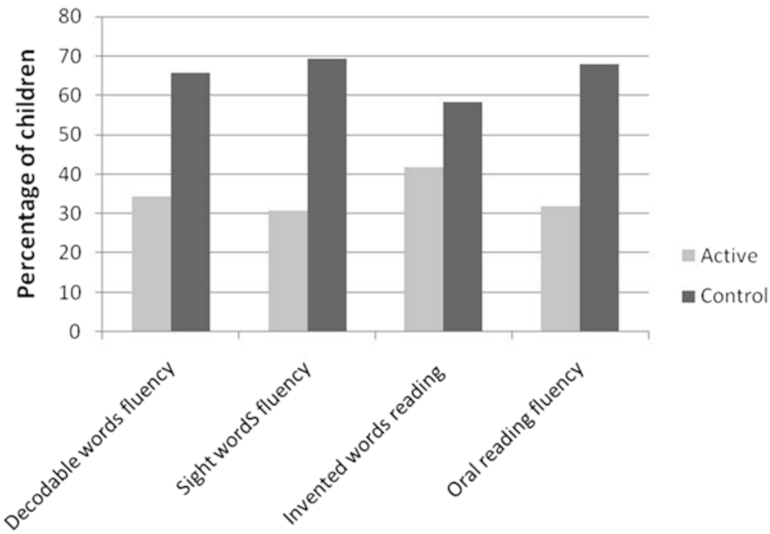

Fig. 30.4 Zero scores for final assessment, by treatment group and reading subtest

performing better than their counterparts, even though all students started at a similar level. Both control and treatment schools showed improvements in reading scores, with treatment schools showing greater improvement in four of the five subtests. In the reading comprehension subtest, there was no statistically significant difference between the treatment and control groups at endpoint.

30.5 Discussion

While scholars predict that mobile phones and other mobile devices could motivate learners and thus enable lifelong learning and improvement in literacy (UNESCO 2016), there remains 'a lack of research and evidence on the impact of mobile learning on literacy skills' (UNESCO 2016, p. 7). The research that is available tends to 'come from high-income contexts and environments' (Trucano 2016, p. 146) and often focuses on adult learning (e.g. UNESCO 2016). Thus, it is valuable to discuss the findings of the SMS Story project and its implications for mobile learning policies and practices. This section of the chapter contains nine subsections, reflecting the nine research questions in turn. There will also be a discussion of the limitations of the research project.

30.5.1 Teachers' Practice

There were no significant differences between teachers in the treatment and control groups at the outset of the research. There is evidence to suggest that text message lesson plans and stories increased the use of appropriate teaching strategies, with treatment teachers being more likely than control teachers to regularly use best practice teaching modes, as indicated by self-reported data from teachers (see Table 30.5), as well as classroom observations and materials evident in classrooms.

30.5.2 Student Reading Ability

Based on the reading assessments conducted before and after the intervention and the comparison of reading scores between treatment and control schools at endpoint, there is clear evidence to conclude that text messages to teachers significantly improved students' reading ability. In four reading subtests at endpoint, reading scores for children in treatment schools were significantly higher. There was a high degree of relationship, through the Pearson chi-square test, between school status and application of the early stop rule, meaning that the observed difference in reading performance in treatment schools was due to the intervention. It can be 'difficult to gather data on the impact of mobile learning projects' (UNESCO 2016, p. 10), but the controlled trial design employed in this case has shown a clear positive outcome across four of the five reading subtests employed.

30.5.3 Teachers' Roles in the Intervention

Teachers in treatment schools used the SMS stories and lesson plans in a variety of ways. Many teachers reported and were observed using the lesson plans and stories following the steps on the SMS Story poster. In addition, teachers made flash cards to teach new English words and sounds used in the stories, asked children oral comprehension questions about the stories and made picture books for children to read. Many teachers were observed writing the stories and lesson plans they had received into exercise books.

In a technology-based education intervention, the central role of teachers needs to be maintained (Dahya 2016; Trucano 2016; UNESCO 2016). In the case of SMS Story, elementary teachers' engagement with the content received and their incorporation of stories into classroom activities was crucial. As has been measured and observed, teachers used stories received via text messaging in their teaching and there was an increase in the use of suggested teaching strategies amongst teachers in the treatment group.

30.5.4 Advantages and Limitations of the Intervention

The intervention involved sending two text messages per day to teachers, on the afternoon before the scheduled lesson. This had numerous advantages, including speedy distribution of resources and the provision of daily reminders to teach using best practices. It was also possible to adapt resources to fit in with calendar events, for example, national and religious holidays, whereas printed texts containing structured lesson plans would not have this flexibility. The intervention did not result in any absences of teachers from classrooms to attend training, which was beneficial, as teacher absenteeism clearly plays a negative role: ‘a teacher in the classroom is an important prerequisite for learning to take place’ (Guerrero et al. 2013, p. 466). Teacher absenteeism ‘adversely affects the quality of education’ (Suryahadi and Sambodho 2013, p. 13). Limitations of the intervention included the one-way nature of the intervention, meaning that local activities are not taken into account in the schedule and the lack of opportunity for teachers to listen to sounds and therefore pronounce words correctly.

30.5.5 Advantages and Limitations of the Technology

The technology used in this trial was text messaging. Bulk messages were sent daily using the Frontline SMS platform. Text messages can be received on any mobile phone. If a teacher’s handset is turned off or has run out of battery, text messages may reach the recipient if the phone is turned on within roughly 24 hours. Receipt of text messages does not cost the user any money and does not use a great deal of battery power, which is important in contexts where teachers have limited access to electricity. A limitation is that delivery of resources to the school relies on the mobile phone network. If there is a network failure, resources will not reach the school as planned.

30.5.6 The Text Message Content

In term 4, 51 teachers in treatment schools were interviewed. The majority of the teachers interviewed did not cite any weaknesses in the lesson plans and story content. Nonetheless, some words and sounds were not familiar to teachers and needed more explanation (mentioned by 20 teachers out of 51, or 39%). Many teachers appreciated that the lesson plans and stories were brief, clear and sequenced. The stories were very interesting for both teachers and children, containing locally relevant material and village life scenes, for example, common animals, such as pigs, and familiar objects such as fishing canoes. Stories also used humour and included characters that children could relate to. The material encouraged teachers to teach new words and sounds and aroused active participation of children and teachers in lesson activities.

30.5.7 Other Educational Uses of Technology

SMS Story has illustrated the potential of mobile phone technology to play a part in the PNG education system. The strength of the project is in the use of a simple, robust and cheap delivery mechanism, text messaging, which has numerous advantages. There may be opportunities for mobile phones to support teaching and learning in other ways, for example, using free phone numbers to allow teachers to hear stories, songs, new words and sounds, collecting and reporting basic education data and use of similar daily stories and activities for adult literacy. Mobile phones may also play a role in helping learners with disabilities (Cornford et al. 2009), for example, with deaf people being able to communicate using text messaging (Goggin 2004).

30.5.8 Cost-Effectiveness

As the SMS Story project involved the distribution of stories to teachers, it is tempting to compare the cost of the project to the cost of distributing books to schools. In addition, the project involved sending lesson plans to teachers, and therefore it could be possible to compare the cost of the project to the cost of running training courses for teachers. Each of these comparisons is an overly simplistic view of the project. While not suggesting that SMSs can replace books, the project has addressed an urgent need for reading materials in rural schools. While teachers can create their own books, and indeed are encouraged to do so, they can lack inspiration, knowledge, resources, such as paper, and motivation, and thus the daily text messages resulted in an increase in the availability of reading materials in classrooms. Similarly, SMS Story has addressed a need for relevant, easy-to-use lesson plans.

For accurate cost-effectiveness comparison to be possible, equivalent trials with different interventions would need to be run with similar cohorts in which the baseline reading level and the degree of improvement in reading are measured using a standardised reading assessment tool. However, it is clear that the per-child cost of reading improvement from SMS Story was very low. The approximate cost per child of the text messages was PGK2 (roughly USD1). Other costs associated with sending SMSs have not been included in the estimate but would include personnel, office equipment and so on, as well as teachers' costs, for example, the cost of materials for making flash cards and chalk for writing on the chalkboard. Another way to consider the project's effectiveness is to consider whether it was efficient in terms of time. As has been shown, in just a short period of time, SMS Story resulted in changes in teaching practice and statistically significant improvements in student reading outcomes.

30.5.9 Scaling-Up and Sustainability

The SMS Story intervention is both scalable and sustainable. It is scalable because it is relatively easy to add more phone numbers to the list of numbers receiving text messages. Teacher opt-in (via a free SMS service) could be automated. It is also scalable in the sense that more stories and lesson plans for elementary teachers can be written. The technology used in the project is sustainable as mobile phones will continue to be capable of receiving text messages. Institutional capacity will be required: the organisation sending out SMSs would need to have staffing and technical capacity to send out daily SMSs and monitor and evaluate teacher enrolment and impact. There would also be costs, including story development costs. Higher education students could develop stories and lesson plans as part of a competition or assignment, thus potentially reducing development costs.

30.5.10 Limitations

While the findings of this study are robust and the intervention is rigorous, there are important limitations to the intervention and data. First, the trial was limited to two provinces of PNG and the sample was relatively small in comparison to the total number of elementary schools in PNG and therefore caution should be applied when generalising the findings to provinces across PNG. Second, whereas it was intended to have ‘surprise’ visits to treatment schools during term 2 and term 3, it was very hard to make a visit to a school without teachers knowing beforehand, which may have affected classroom observations. Third, teachers self-reported their use of teaching strategies, and while every effort was made to observe or triangulate this data, there was a risk of teachers favourably presenting their practices when reporting.

30.6 Conclusion

As a controlled trial, this research project demonstrated that daily text messages to teachers of short stories and lesson plans following an underlying phonics structure can have a positive impact on students’ reading ability in the early years of schooling. The research also showed an improvement in classroom teaching practices. Further research could be conducted to determine whether the SMS Story intervention is applicable at other levels in the education system, or in other contexts, for example, in other developing countries experiencing similar challenges within the education system. Research could compare the SMS Story intervention with other approaches, such as in-service training for teachers or delivery of reading books to schools, for the purposes of establishing cost-effectiveness.

For educational institutions at any level (from lowest grades through to higher education), the controlled trial design is valuable for determining efficacy in relation to educational outcomes and pedagogical practices. The controlled trial methodology can be an effective, valuable way of evaluating mobile learning initiatives in the education sector in the region.

In this case, the control design of the research has enabled demonstration of the effectiveness of the mobile learning intervention, in terms of improvements in children's reading proficiency. With regard to sustainability, the research presented a case for the Department of Education and donors to move forward with confidence towards scaling-up the service. At the time of writing, the scaling-up has been funded and planning is well advanced. The SMS Story concept has also been taken up in other countries, with SMS Story in India yielding similar results, while SMS Story in Bangladesh is commencing at the time of writing.

One of the key contextual issues to be highlighted here is that, at the time when the study was conducted, only a second-generation (2G) mobile network was available in most places across PNG, meaning that the network was not suitable for use of the Internet, social media and email. While mobile network providers are increasing the availability of third-generation (3G) service (Watson 2015), the proportion of basic model handsets in use remains high, compared to more advanced handsets. This means that a key design principle of SMS Story remains true: simple is best. In places with only 2G signal, SMS is an ideal option. Text messages can be sent and received on any handset and there is no requirement for 3G service or better. In the context of the largest, most populous country in the Pacific, SMS Story provides useful insights regarding the effective use of simple technology. In 'low-resource communities, the best technology is the one that people already have, know how to use, and can afford' (Trucano 2016, p. 146). In this case, the project was able to utilise the mobile phones belonging to elementary school teachers to good effect.

The Mobile Learning Evaluation Framework (Murphy and Farley 2012) is a useful tool for analysing and reflecting upon SMS Story. Although student perspectives were not canvassed, all other levels of the framework were directly addressed by the project. The same text messages that were used in the SMS Story project could be used to support student teachers. The student teachers could use the text message content to assist them in their studies and lesson preparations.

There are presently no policies regarding mobile learning at early education level in PNG. There are significant barriers to the use of mobile learning in early education in PNG, including the predominantly 2G network coverage across most of the country and the lack of electricity access in many places. Nonetheless, SMS Story has shown that a simple intervention can have positive results in terms of both teaching and learning. Given that classrooms have very few books and teachers rarely receive support or supervision visits, mobile learning initiatives like SMS Story can have a positive impact and would generally be welcomed by teachers.

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