Education Innovation

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Innovating Education in Technology-Supported Environments

Springer

Education Innovation Series

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ISSN 2211-4874 ISSN 2211-4882 (electronic)
Education Innovation Series
ISBN 978-981-15-6590-8 ISBN 978-981-15-6591-5 (eBook)
https://doi.org/10.1007/978-981-15-6591-5

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Series Editors' Foreword

Following the publication of *Innovations in Open and Flexible Education*, we are pleased to present this second volume, entitled *Innovating Education in Technology-Supported Environments*. It continues and extends the innovation spirit of the first volume to move into the laying out and discussing the significant role played by technologies when applied to teaching and learning. Comprising 26 chapters, this volume provides a good elaboration of efforts to adopt and apply technology in teaching, with empirical findings and analysis. Particular focus is placed on how to make use of social media services such as Facebook, Twitter, and instant messaging for teaching purposes. The collection of chapters has a strong focus on making use of these media technologies to achieve more effective teaching, addressing questions such as how to convert Facebook to a learning management system, how to make use of instant messaging to enhance learning experience, how to make use of the student response system (SRS) to enhance active learning in higher education, and how to utilize game-making to provide an inclusive, creative, and dynamic classroom environment.

This book is also an international exchange between contributors from a variety of regions, including:

- Various teaching projects at the Open University of Hong Kong, e.g., the development of Open Educational Resources (OER), mobile app that features a 3D hand model with acupoints for nursing students, etc.
- The experience of the University of the Philippines Open University in producing web streaming video lectures and tutorials
- The challenges of using Corpus for English language learning in a Japanese university
- The emergence of mobile and online learning environment for flexible and personalized learning in China as one of the six most important areas for educational researchers
- A report on e-learning and learning experiences as two major factors affecting learning outcomes in distance learning based on the experience of the Open University Malaysia

- A comparative study on the talking comic strip for nursing students in the Philippines and Thailand
- A comparative study on students' attitudes and perception towards ICT for learning geography in secondary schools in Japan and New Zealand
- A comparative study on utilizing computer game-making in the classroom across three European countries, namely Spain, Austria, and the UK, employing Create@School as the game-making mechanics and dynamics
- A report on the recent educational emphasis of the European Union towards framing an inclusive and innovative Europe

The above list shows the wealth of studies in applying technologies to teaching from diverse regional settings, in diverse university and school settings, and for different subjects. Yet, what is worthwhile to note is that most contributors are working towards making technology easy and useable for application both in the classroom and distance/online learning.

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Introduction to the Book

Innovation has been widely recognised as one of the major trends in contemporary education. 'Newness', as an essential ingredient of innovation, occurs in different aspects of education – time, space, curriculum, organisation, pedagogy, content, infrastructure and requirements. Education institutions across the globe have been facing a pressing need to find new and better ways to improve their learning and teaching in order to get learners well prepared for their future development. The pressure to innovate in education has become even greater with the imperatives of increasing equity, making education more flexible and enhancing educational outcomes.

Many educational innovations cannot be implemented without being supported by technological advances and breakthroughs. Educational technologies cover tangible devices, software systems or platforms, and web-based resources. They serve both as a driving force and instrument for educational innovations and are bringing about paradigm shifts in education. For example, the accelerating developments of information and communications technology (ICT) have reshaped various forms of learning – be it online, mobile, blended or conventional face-to-face — and have allowed education to become more flexible and personalised for learners and teachers in terms of content, design and delivery. The increasing penetration of mobile devices and open-access online learning resources have largely removed the barriers to participating in education for learners previously discouraged by factors such as remoteness or work commitments.

Educational institutions must keep themselves abreast of the latest technological developments and be 'change-resilient'. Recent years have witnessed a broad range of research activities, novel ideas and emerging practices. They range from new forms of media and presentation to the use of education technologies for tackling the challenges and achieving the desirable outcomes – such as personalisation, accessibility, flexibility, engagement and interaction – that have been advocated in contemporary education. Traditional means of education have been challenged, or even displaced, by these new developments which have emerged with accelerating technological changes. However, simply changing existing practices with the use of technology does not necessarily help learning and lead to better learning outcomes.

Rather, the changes should be informed by research findings and experiences of best practices which show how innovations can be effectively established in a technology-supported environment.

This book – *Innovating Education in Technology-Supported Environments* – provides a wide range of ideas, research results and new practices. It includes 26 chapters from authors worldwide with unique experiences and perspectives, which present the latest developments in innovative education in various areas. In particular, the book offers empirical evidences of technology-supported educational advances in a range of contexts involving various groups of participants, subject disciplines, locations, learning modes and technologies. It contributes to advancing research and teaching for the benefit of educators worldwide.

The chapters in this book are grouped according to four sub-themes:

I. Online, mobile and blended learning
II. Educational resources
III. Learning design and student engagement and support
IV. Pedagogy and curriculum development

The chapters cover a broad range of topics related to educational innovation, such as blended learning, flipped classrooms, social media, instant messaging communication, mobile learning, augmented reality, educational resources, educational use of machine learning techniques, and technological support for students in specific contexts such as open and distance learning and career planning. This book also provides reviews of research in educational technology and identifies many areas for possible development and application of theories as well as innovative pedagogies and technologies in education. It also includes rigorous quantitative and qualitative studies, experimental and empirical cases, descriptive surveys, interviews and quizzes, which illustrate the theoretical frameworks and the effectiveness of the innovative practices.

Overall, *Innovating Education in Technology-Supported Environments* is intended to provide readers from diverse backgrounds with the latest scholarly thinking, research and practices in the field of innovative education. The research, case studies and practices reported in the chapters illustrate ways of utilising technologies for effective innovation in education in the global context. The connections between research results and practical experiences, together with the insights and implications presented by the authors, shed light on how technologies can support education in different settings.

Part I of this book covers the sub-theme *online, mobile and blended learning.*

The increasing adoption of technologies in education has largely expanded the possibilities of educational practices, of which online, mobile and blended means have become prevalent. In particular, the ICT devices and applications commonly used in daily life, such as smartphones, instant messaging communication and social media, demonstrate a high potential in educational use. Plenty of initiatives in research and practice have been carried out in recent years.

For example, highlights of recent developments include powering existing learning platforms or approaches with additional features and customising them for specific learner groups. The conventional styles of blended and distance learning have been enriched with mobile learning elements. Mobile instant messaging and social media have been used to enhance communication with students. Mobile applications have been integrated with augmented reality to provide learners with a more interactive and engaging learning experience. The research studies and practices in these areas also show a need to review them to summarise their developments as well as identify trends and opportunities. In this regard, there are eight chapters in this part presenting various findings and experiences.

The first chapter by Norman Vaughan provides an overview of the latest research and practices in blended learning, an area in which there is an increasing number of studies. It describes how blended learning can be delivered in campus-based and online learning environments. The chapter also discusses relevant research trends from the perspectives of students, faculty, and administrative staff and the research sources available. The major conferences and publication venues in the field are also introduced.

Thah and Latif's chapter presents the factors affecting the learning outcomes in distance learning based on the experience of the Open University Malaysia. They identify three key factors – teaching and materials, e-learning and learning experiences – together with their effects on learning outcomes, where e-learning was found to play a mediating role between the other two factors. It was also found that learners' perceptions of these factors were positively correlated with the length of time they spent on the online learning system, implying the significance of engaging learners through these factors for success in online learning.

Almodiel and Lacaste explore the use of social media – Facebook – as a learning management system and learners' acceptance in relation to their learning styles. Their findings suggest that verbal learners perceive Facebook as easy to use and useful for learning, while active and intuitive learners have a stronger inclination to continue using it for learning. This chapter shows the potential of social media for educational purposes, but its acceptability may depend on the types of learners.

Francis Yue analyses the use of instant messaging in tutoring undergraduate students and the students' learning experience. The students' learning experience on a course was surveyed, and its relationships with the students' use of instant messaging for communication with tutors, and their course results, were examined. Despite a mild positive correlation between the use of instant messaging and learning experience, these two factors were found to be negatively associated with the students' course results. Yue suggests that weaker students tend to benefit more from instant messaging, and its use is not a direct factor in determining study results.

Jiyou Jia adopts a macro perspective to reveal the research trends on ICT in education in mainland China. Based on a keyword frequency analysis and textual data-mining from academic papers published in seven relevant journals in China, the subjects of most interest to researchers in the field were learners, teachers and the learning process. The results reflect six areas of achievement for educational technology research in recent years, covering, for example, the impact of a mobile,

online environment for flexible and personalised learning, as well as a fair and balanced development of education in China. The existing problems and research opportunities in the Chinese contexts are also discussed.

Ng et al. present a case study of mobile learning with augmented reality on nursing students' learning of acupoints in traditional Chinese medicine. Their mobile app features a 3D hand model with acupoints and their details, a quiz for testing a user's knowledge of acupoints, and an application system which introduces the use of acupoints in daily life. Their work demonstrates the potential of augmented reality in mobile learning for enhancing learners' learning experiences and memorisation in some difficult subject areas.

Larry Ka-wai Ching introduces the latest technologies for mobile learning and explains their key functions, covering learning management systems, global positioning systems, augment reality, instant messaging and social networking apps. Despite being widely applied in mobile learning, the possible challenges for users in their applications, which are discussed in detail in the chapter, are not negligible. A list of key factors leading to a well-designed mobile learning application is suggested by the author.

Gwo-Jen Hwang suggests strategies for adding innovation and value to technology-enhanced learning research. The strategies range from using innovative technologies to investigating seldom-discussed issues or subjects, new approaches or tools, and seldom-studied domains. In particular, he emphasised the importance of finding a good research topic and recommends ways of assessing the innovative elements in existing studies, so as to know if a topic remains innovative and contributes to the field at the time being studied.

Part II of the book is devoted to *educational resources*.

The development of educational resources has also benefited from technological advances. Emerging technologies such as augmented reality and web streaming have enabled more possibilities for the presentation, delivery and use of learning materials. The trend of openness in educational resources has also promoted new approaches for their customisation for user needs. Another issue derived from such development is the effective use of the resources, which involves institutional experience and users' feedback on the resources.

There are five chapters in this part to capture the latest research and experience on these areas. They cover the production of learning materials with new approaches and technologies as well as students' feedback on the materials.

Tsang and Choi illustrate the use of instructional design models and emerging technologies in developing textbooks as open educational resources. They also explain how various formats for materials, such as PDF, EPUB(s) and mobile apps, can be used appropriately in pre-class, in-class and after-class learning environments. In their survey of teachers and students' feedback on the textbooks, the significance of allowing users to customise the materials is highlighted.

Pugoy et al. describe their development and use of technology-enhanced learning material – the talking comic strip – for nursing students in the Philippines and Thailand to improve English proficiency. The material allows learners to read the

comic strip and hear its audio at the same time. Pugoy et al. report positive results from their usability evaluation of the material, in particular for younger respondents (i.e. 30–39 years old) who gave the highest mean ratings among all age groups and male respondents whose ratings were about 10% higher than those of the female respondents. The results also show the respondents' preference for technology-enhanced materials over printed materials.

Yoko Hirata's study deals with the challenges faced by Japanese university students in using a corpus (a large electronic database of authentic texts) for English language learning and how these challenges can be handled by instructors. The participants, who had no previous experience in using a corpus prior to the study, showed capability in making use of this language resource for self-learning. However, the students' appreciation of this language learning approach was affected significantly by their educational backgrounds, such as whether they had been trained to memorise individual words and learn grammar rules discretely.

Choi and Tsang introduce an initiative to adapt commercial textbooks for distance learning students in order to address the high cost of developing distance learning materials. In what they called the 'custom-textbook approach', book chapters from textbooks in the market are selected and compiled into a tailor-made edition for a course. In their evaluation, the learning materials developed using this new approach received a positive response from students. A list of criteria for providing quality customised textbooks for distance learners is provided, covering areas such as language, organisation and learning support.

Gelisan, Nunez, Platon and Banasihan share the experience of the University of the Philippines Open University in producing web streaming of video lectures and tutorials. They present the tasks involved in the pre-production, production and post-production phases, covering a broad range of issues on the coordination, technical and instructional aspects. The experiences discussed in this chapter apply also to other provisions of online education such as massive open online courses.

Part III of the book focuses on *student engagement and support*.

The importance of enhancing student engagement in learning and student support services has been recognised by educational institutions. Related work has generally focused on two areas. First, attempts have been made to examine the potentials of emerging technologies and techniques, such as learning analytics and machine learning which have inspired a broad range of innovative applications to collect and utilise learner data. Second, research has been conducted to study students' attitudes and needs on issues such as school subjects and support services.

There are six chapters in this part covering the two areas. They present the development and use of applications to tailor student support services and engage students in learning based on their characteristics and responses. They also show the research findings on student attitudes and needs in various aspects.

Latif, Subramanian and Khatab describe the development of an instrument for building up learner profiles, covering a learner's personality, attitude and motivation. Using this instrument, an overview of the learner profiles for Open University Malaysia shows that the learners were generally open to experiences and

conscientious, but more effort is needed to enhance their autonomy and improve their engagement in learning. The results show the usefulness of learner profiles for facilitating the formulation of strategies for retention and engagement.

Wong and Yau examine the use of a student response system (SRS) for enhancing active learning in higher education. They analyse four aspects of instruction based on SRS – questioning strategy, time interval, rewards and feedback – and identify the factors involved in effective use of SRS for each aspect. Their findings also suggest a lack of empirical evidence for the outcomes of SRS use, particularly on its impact on learners' academic performance, thus highlighting a need for further research in this area.

Hirata and Hirata investigate students' attitudes and their perception of ICT for learning geography in secondary schools in Japan and New Zealand. The findings show observable differences in terms of students' understanding of the subject contents, the perceived usefulness of the subject for the future, attitude towards ICT and reasons for choosing the geography subject, which could be attributed to the differences in learning and curriculum design between the two school contexts.

Wong and Wong address student engagement through exploring learners' needs for support related to their wellness in the distance learning context. Following a six-dimensional framework, which includes the occupational, physical, social, intellectual, spiritual and emotional dimensions of wellness, their findings from a survey and focus group interview highlight career development as the most important aspect for the students among the wellness dimensions. They also identify a number of aspects of learning support which are most desirable for the students, such as the enhancement of the social network and the provision of academic advisory services.

Ng, Lui and Poon present an application for supporting students' career planning, which features the use of machine learning evaluation for identifying the thinking patterns of students and recommending appropriate career choices based on these patterns. It also helps parents to understand better their children's talents and facilitates teachers' central management of student profiles for actions such as class grouping or individualised counselling. Despite finding that the application has an accuracy of 96% for identifying students' thinking patterns, manual checking is still needed for each case. The authors' work demonstrates the potential of machine learning technology for giving suggestions for students' development based on their characteristics.

Wong and Li compare the support needs of face-to-face and distance-learning students. Their findings from a survey and focus group show that both groups of students shared a great concern for their career development. The face-to-face students' expectations focused more on career-related support such as internships and experience-sharing with alumni, while the distance-learning students preferred academic advisory services and social activities. The role of ICT is highlighted to cater for students' diverse needs, such as online provision of learning support services and study-related information.

Part IV of the book addresses the innovations in *pedagogy and curriculum development.*

Although pedagogical innovations and curriculum development do not merely rely on technologies, the affordance, ease of use and adaptability of technologies make them very often a key element in these areas. For example, new developments in computer game-making and simulation technology have made them easier to use in class, following which pedagogical strategies have been devised incorporating their use. On the other hand, major trends in education such as personalisation and inclusiveness have also promoted the innovations in pedagogy and curriculum development as a response to the trends.

There are seven chapters in this part which illustrate various kinds of pedagogical and curriculum innovations. They cover the incorporation of technologies and the relevant experience of educational institutions in these areas as well as discuss the lessons learnt from the experience.

Boulton, Brown, Hughes-Roberts and Beltrán introduce an innovative use of computer game-making in school curricula across three European countries. They present a pedagogical framework for utilising game-making in lessons, covering curriculum adaptation and planning; the teaching and learning process and assessment; a module framework, which supports the pedagogical approach in different curriculum areas; a lesson framework; and a lesson plan template and a game-making template for supporting the implementation. The provision of these resources aims to facilitate an inclusive, creative and dynamic classroom environment.

Tristan Currie presents an innovative way of promoting learners' metacognition via a video-based curriculum for English learning which features tasks involving abductive reasoning. The curriculum was implemented in both formal in-class learning and out-of-the-class mobile learning, and the adult learners responded to the tasks more comfortably in the informal learning settings which allowed more flexibility. As the author states, developing one's English proficiency is not simply a matter of "more practice, more confidence" but rather of building up a learner's confidence in his/her analytical judgement.

Wong, Wu and Suen conducted an integrative review of pedagogical strategies supported by simulation technology to enhance clinical competence in nursing education. In 11 case studies, they compared the pedagogical goals, scenario designs and instructional approaches before, during and after simulation, and how students are assigned the roles of performer, observer and partner in practice. Analysis of the various simulation-based learning practices revealed that no single pedagogy can satisfy all the learning needs of nursing students and further research on the synthesis of pedagogical strategies is needed.

Linda Yin-king Lee's chapter is concerned with the knowledge and skills of academics in teaching and reports on the use of flipped classroom pedagogy for their continuing professional development. The evaluation results show that the use of flipped classroom helped the participants rectify misconceptions about teaching, acquire relevant new knowledge and skills and make changes in their teaching

practice. The chapter also presents the challenges faced in sustaining the changes made in teaching practice and the uncertainty about the benefits for students and institutions.

Li, Wong and Wong present an institution-wide programme for building up the research capacity of a teaching university, which aims to keep its academics active in scholarly activities which, in turn, inform their teaching. The programme covers the areas of developing an institutional research culture, enhancing academics' knowledge of research, delivering efficient administrative support for research, providing a consultation service, and facilitating the university's positioning of research and development in a sustainable research environment. The chapter also illustrates how the design of the programme is informed by a needs analysis and the roles of technology in research capacity-building.

Samson Hau-lung Yuen examines how the experience of school-based curriculum development in Hong Kong informs the planning and implementation of a more personalised curriculum to cater for students' needs. In investigating the association of teachers' mind styles with the delivery of a school-based curriculum, the author found that teachers with the same style shared common features in their lesson activities. While emphasising personalisation, the work presented in this chapter demonstrates how teachers' autonomy can also be respected in curriculum planning.

Finally, Alan Bruce's chapter looks in depth at the values and objectives of the European Union on social inclusion and the creation of sustainable learning communities for promoting excellence in innovative learning and outlines the European policy and funding support for innovative learning. While the global focus on education is on mobility, skills, innovation and equitable participation, Bruce points out that the European experience demonstrates transnational action resting on commitment and passion for community needs as the only viable method for attaining these goals.

Overall, the four sub-themes in this book reflect the diversity of innovative education supported by technology. The authors' diverse perspectives give a comprehensive coverage of state-of-the-art practices as well as the opportunities and challenges in related areas. We hope that they provide insights for unleashing the full potential of technology for generating more innovations in education.

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Part I
Online, Mobile and Blended Learning

Chapter 1
Blended Learning: Approaches, Trends, Research, and Publication Opportunities

Norman D. Vaughan

Abstract This chapter focuses on blended learning approaches, trends, research, and publication opportunities. It begins with a discussion about campus-based and fully-online approaches to blended learning. Research trends are then described from student, faculty, and administrative perspectives. Research opportunities and challenges are presented for each of these three categories. The chapter concludes with an overview of the resources, conferences, and publication venues that are available in the field of blended learning.

Keywords Blended learning · Research trends · Research opportunities and challenges

Introduction

The idea of blending different learning experiences has been in existence ever since humans started thinking about teaching (Williams, 2003). Over the years, new features in blended learning practices have advanced educational delivery in terms of ease of access, cost effectiveness, and learning outcomes (Dziuban, Graham, Moskal, Norberg, & Sicilia, 2018; Smith & Hill, 2019). Higher educational institutions have been identifying the diversity of learning contexts, such as cross-cultural learning and promotion of internationalization, and exploring how blended learning can be effectively implemented (Philipsen, Tondeur, Roblin, Vanslambrouch, & Zhu, 2019). Examples include integrating blended-learning with mobile learning (Suana, Distrik, Herlina, Maharta, & Putri, 2019) and corrective feedback (Chen, Breslow, & DeBoera, 2018). What has recently brought blended learning into the

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_1

limelight is the infusion of web-based technologies into the learning and teaching process (Clark, 2003). These technologies have created new opportunities for students to interact with their peers, faculty, and concepts in online courses and programmes.

The new developments in blended learning have also brought forth new opportunities for research and publication. They cover various potential topics such as the effectiveness, attitudes, and popularity of blended-learning (Clayton, Blumberg, & Anthony, 2018; Ma, Li, & Liang, 2019; Smith & Hill, 2019). At present, blended learning has been mainly deployed on a small-scale basis by individual teachers instead of an institutional basis. Related research has focused mainly on learning outcome, suggesting that many relevant research issues remain to be investigated (Smith & Hill, 2019). This chapter describes research trends in blended learning from student, faculty, and administrative perspectives, as well as providing an international perspective on resource, conference, and publication opportunities in this field.

Blended Learning Approaches

Blended learning is often defined as the combination of face-to-face and online learning (Williams, 2002). Ron Bleed, the former Vice Chancellor of Information Technologies at Maricopa College, argues that this is not a sufficient definition for blended learning as it simply implies "bolting" technology onto a traditional course, using technology as an add-on to teach a difficult concept or adding supplemental information. He suggests that, instead, blended learning should be viewed as an opportunity to redesign the way that courses are developed, scheduled, and delivered in higher education through a combination of physical and virtual instruction, "bricks and clicks" (Bleed, 2001). The goal of these redesigned courses should be to join the best features of in-class teaching with the best features of online learning to promote active, self-directed learning opportunities for students with added flexibility (Garnham & Kaleta, 2002). This sentiment is echoed by Garrison and Vaughan (2008) who state that "blended learning is the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies" (p. 148). A survey of e-learning activity by Arabasz, Boggs, and Baker (2003) found that 80% of all higher education institutions and 93% of doctoral institutions offer hybrid or blended learning courses.

With the development and growth of web-based synchronous communication tools, Power (2008) argues that a campus-based definition of blended learning (Fig. 1.1) needs to be expanded. He has coined the term "blended online learning environments" (BOLE) to describe the simultaneous and complementary integration and implementation of an asynchronous-mode learning environment (i.e. a

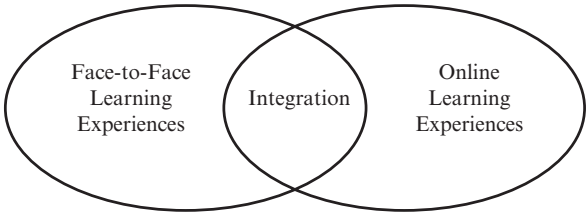

Fig. 1.1 Campus-based blended learning approach

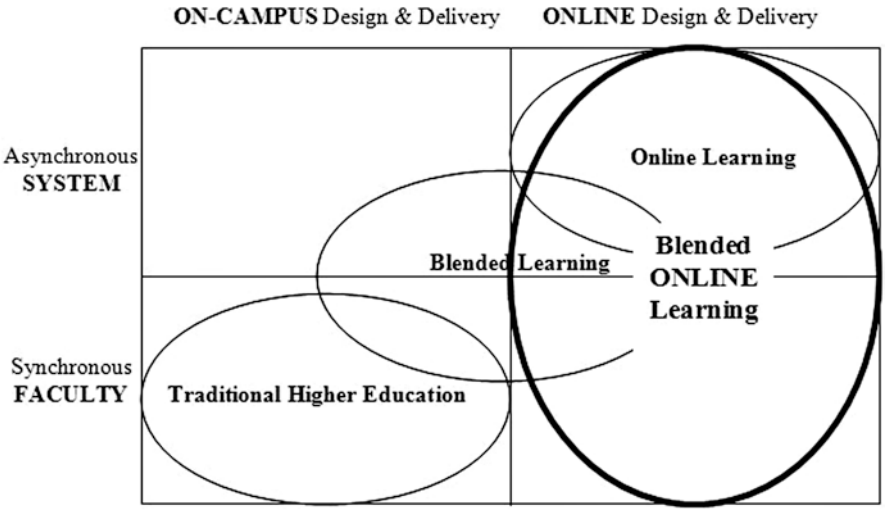

Fig. 1.2 Blended online learning environment (Power, 2008, with permission from Thomas Michael Power)

learning management system, or LMS) and a synchronous desktop conferencing environment (i.e. a virtual classroom) (Power, 2008). Figure 1.2 illustrates the distinction between campus-based and blended online learning environments.

Campus-based environments have their roots in traditional higher education systems where classes have been delivered by faculty in synchronous lecture settings. Initially, blended learning has been used to complement these synchronous lectures through the use of asynchronous discussion forums and learning management systems such as Blackboard and Moodle. With the advent of synchronous tools, such as Adobe Connect, opportunities have been created to provide students at a distance with both synchronous and asynchronous communication possibilities. In this chapter, these educational contexts are referred to as *online* blended learning environments in order to distinguish them from the campus-based versions.

Research Trends

The adoption of blended learning environments in higher education poses a series of research opportunities and challenges from student, faculty and administration perspectives. This section provides an overview of the research opportunities of both campus-based (see Garrison & Vaughan, 2008) and online blended learning (see Power, 2008), from the above perspectives.

Student Perspective

Opportunities

Students who have been involved in campus-based blended learning courses are generally very positive about their experiences. At the University of Wisconsin, Milwaukee campus, 80% of the students who took a blended learning course indicated that they thought the experience was worthwhile and that they would recommend a course offered in a blended format to others (Aycock, Garnham & Kaleta, 2002). The principal reason that students gave for their high level of satisfaction was the time flexibility provided by a blended format (see Table 1.1). Time flexibility was defined as the ability to control the pace of one's learning, the convenience of scheduling coursework, and a decrease in time spent commuting (Garnham & Kaleta, 2002). Table 1.1 summarises the key findings from the University of Wisconsin student survey.

Time Flexibility

The students surveyed indicated that they liked to be able to control the pacing and location of their learning. They appreciated the blended design because it provided them with the flexibility to work from home, which was perceived much more positively than working from other locations, such as campus computer labs or workplaces (Garnham & Kaleta, 2002).

The blended design also provided students with a much greater range of course scheduling options because of the reduction in synchronous meeting sessions. This

Table 1.1 Survey questions administered to students (n = 282) in blended courses at the University of Wisconsin, Milwaukee at the end of the spring 2001 semester (Garnham & Kaleta, 2002)

Statement	Agree	Disagree	No opinion
I could control the pace of my own learning.	69%	19%	12%
I could organise my time better.	77%	11%	12%
The time I spent online would have been better spent in class.	16%	67%	17%
There should be more courses like this.	61%	16%	23%

convenience of scheduling is increasingly important for the growing number of students who have multiple responsibilities such as work and family commitments.

In addition, a study by the National Clearinghouse for Commuter Programs in the United States (1999) found that 87% of all post-secondary students in the United States do not live in institution-owned housing on campus and thus commute to get to the institution. The costs of commuting are steadily increasing, as are the challenges of finding an available parking space at higher education institutions.

Improved Student Learning Outcomes

Several research studies have demonstrated that blended learning designs contribute to improved learning outcomes for students (Dziuban, Hartman, Juge, Moskal, & Sorg, 2005; Garnham & Kaleta, 2002; Twigg, 2003a). In the United States, the Pew Foundation sponsored a study to investigate how large-enrolment introductory courses can be effectively redesigned using a blended format. The programme involved 30 institutions, with 20 of them reporting improved learning outcomes and 10 reporting no significant difference (Twigg, 2003b). In addition, 18 of the study institutions demonstrated a decrease in student drop-failure-withdrawal (DFW) rates compared to the face-to-face only sections (out of 24 institutions which measured DFW changes).

The University of Central Florida has been involved in an ongoing evaluation of web and web-enhanced courses since the inception of its Distributed Learning Initiative in the autumn of 1996 (Dziuban, Hartman, Moskal, Sorg, & Truman, 2004). These evaluation studies indicate that, on average, blended learning courses have higher success rates (percentage of students obtaining an A, B, or C) and lower withdrawal rates than their comparable face-to-face courses. The studies also show that student retention in blended courses was better than in totally online courses and equivalent to that of face-to-face courses.

Qualitative research studies at the University of Wisconsin in Milwaukee (Garnham & Kaleta, 2002) also suggest that students learn more in blended courses than they do in comparable traditional class sections. Teachers responsible for the blended sections report that students write better papers, perform better in exams, produce higher quality projects, and are capable of more meaningful discussions on course material. Sands (2002) states that, because of the text-based nature of web-based discussion forums and email, blended courses become “de facto writing intensive courses when the teachers work carefully to integrate the online and classroom components” (p. 1). Spika (2002) adds that the increased opportunities for self-directed learning in the blended model help students to develop project and time management skills.

Student Challenges

Studies at the University of Central Florida (Dziuban & Moskal, 2001) and the University of Wisconsin, Milwaukee (Garnham & Kaleta, 2002) both indicate that students encounter a number of challenges with blended courses. The four key challenges identified are: the expectation that fewer classes meant less work, inadequate time management skills, problems with accepting responsibility for personal learning, and difficulty with more sophisticated technologies.

Expectations

Students new to blended learning initially equate fewer in-person classes to having less coursework. In addition, a number of these students do not perceive time spent in lectures as "work," but they definitely see time spent online as work, even if it is time they would have spent in class in a traditional course (Aycock, Garnham, & Kaleta, 2002).

Time Management

Time management is a struggle for many higher education students. This can become particularly acute in a blended online course where there is a lack of physical presence.

Responsibility for Learning

Many first-year undergraduate students, who are away from home for the first time, are in the early stages of "learning how to learn." The notion of taking responsibility for one's own learning can be very difficult for students accustomed to being passive learners within a traditional lecture format. Initially, students may be unprepared for the active learning role they must play in a blended course.

Technology

Most technology-related problems that students encounter in blended online courses usually occur within the first weeks of the semester. These problems are usually related to the procedure for accessing the online material and resources (i.e. website address and logon information). Problems that persist throughout the semester

sometimes involve either downloading large files or accessing more sophisticated web-based applications such as video clips (Aycock et al., 2002).

Faculty Perspective

Benefits

Faculty staff who have taught blended courses indicate that their teaching experiences were very positive. At the University of Wisconsin, Milwaukee, 100% of the faculty members involved in a blended learning pilot project recommended using this approach to others and planned to teach a blended course again (Aycock et al., 2002). Reasons for this high level of satisfaction included: enhanced interaction with students, increased student engagement in learning, flexibility of the teaching and learning environment, and opportunities for continuous improvement.

Enhanced Teacher and Student Interaction

Initially, one of the major concerns expressed by faculty members teaching blended courses at the University of Wisconsin was that they would become less connected to their students because of the decrease in face-to-face sessions (Aycock et al., 2002). In contrast, after teaching a blended course, they almost universally reported feeling more connected to their students and knowing them better. The faculty teaching blended courses at the University of Central Florida echoed these comments (Dziuban & Moskal, 2001). They indicated that not only did more interaction occur in their blended courses but they also thought this interaction was of a higher quality than what they typically see in the face-to-face classroom. Aycock et al. (2002) suggest that this increased interaction is often fostered by teachers developing new ways to engage their students online and through the creation of online communities. Bleed (2001) stresses how important this interaction is for restoring the "human moment in the educational process" (p. 18).

Increased Student Engagement in Learning

Faculty staff who have taught blended courses have observed that students do a better job of writing, learning course material, mastering concepts, and applying what they have learned compared to students in their traditional sections (Aycock et al., 2002). They suggest that this improvement is due to students being more engaged in

their learning process. This sentiment is captured in a comment from a faculty member at the University of Wisconsin who teaches blended courses, “My students have done better than I have ever seen; they are motivated, enthused and doing their best work” (Garnham & Kaleta, 2002, p. 3).

More Flexible Teaching and Learning Environment

Faculty at the University of Wisconsin indicate that they can accomplish course learning objectives more successfully within a blended course than within a traditional course because of the flexibility of the blended model (Garnham & Kaleta, 2002). The flexibility of time and the ability to use web-based multimedia allow the faculty to “develop solutions to course problems and to incorporate new types of learning activities that were not possible in traditional courses” (Aycock et al., 2002, p.1).

The Environment Forces Continuous Improvement

The blended model also allows teachers an ongoing opportunity to experiment with new approaches to learning and new types of educational technology. At the University of Central Florida, learning to use technology was cited as one of the outcomes that the faculty liked most about teaching on the web (Dziuban & Moskal, 2001).

Challenges

From a faculty perspective, the key challenges of teaching in a blended format are: time commitment, lack of support for course redesign, difficulty in acquiring new teaching and technology skills, and the risk factors associated with this type of course (Dziuban & Moskal, 2001; Garnham & Kaleta, 2002: Voos, 2003).

Time Commitment

The increased time commitment involved in a blended course is regarded as the biggest challenge by faculty (Dziuban & Moskal, 2001). Johnson (2002) states that planning and developing a large enrolment, blended course takes two to three times

the amount of time required to develop a similar course in a traditional format. At the University of Central Florida, the faculty members who are considered to be "web veterans" indicate overwhelmingly that a course with online components requires more time for both the development and weekly administrative duties than a similar course delivered face-to-face (Dziuban & Moskal, 2001). Despite this increase in workload, all the faculty involved in a blended learning pilot programme at the University of Wisconsin, Milwaukee stated that they would teach these types of courses again, as they believed their time was wisely invested in improving the learning environment for both students and themselves (Garnham & Kaleta, 2002).

Professional Development Support

These faculty members also indicated that blended learning is not a "solo" activity. To ensure a successful blended learning experience for students, there must be faculty support for course redesign and learning new teaching and technology skills. The course redesign support involves assistance in deciding what course objectives can be best achieved through asynchronous online learning activities, what can best be accomplished in synchronous events, and how to integrate these two learning environments (Dziuban et al., 2004). The faculty indicated that they needed to acquire new teaching skills, such as how to foster online learning communities, facilitate online discussion forums, and address and manage students' online learning problems (Aycock et al., 2002).

In terms of technology, many faculty members initially needed to overcome their own fears and resistance through "hands-on" experience with various tools and applications. In addition, they are also challenged to provide "front line" technical support for their students. The faculty staff at both the University of Central Florida (Dziuban & Moskal, 2001) and the University of Wisconsin, Milwaukee (Aycock et al., 2002) were adamant that, in order to overcome these support issues, there must be an institutional professional development programme for the development phase of a blended learning course and ongoing institutional support during the initial delivery phase (Voos, 2003).

Risk Factors

The major risk factors identified by those who have taught blended courses include fear of losing control over the course, lower student evaluations, and an uneasiness about how this type of learning model fits into the university culture of teaching, research, and service (Dziuban & Moskal, 2001; Voos, 2003).

Administrative Perspective

Benefits

From an administrative perspective, blended learning presents the opportunity to enhance an institution's reputation, expand access to its educational offerings, and reduce operating costs.

Enhanced Institutional Reputation

The opportunity to enhance an institution's reputation is often linked to improving the quality of the institutional learning environment for students and increasing student and faculty satisfaction (Garrison, 2017; Twigg, 2003b). Heterick and Twigg (2002) have found that blended learning designs can have a positive impact on student learning when thoughtfully applied to support "active learning pedagogies" and increased student "time on task." Voos (2003) suggests that blended designs can enhance both student and faculty satisfaction with learning when the design, training and development, and systems and support are well organised. Graham Spanier, President of Pennsylvania State University, boldly stated that the ability of blended learning to support the convergence of online and residential instruction is "the single, greatest unrecognised trend in higher education today" (cited in Young, 2002, p. 4). Bleed (2001) has also actively explored how these types of courses can be used to recombine learning and social experiences within the Maricopa Community College District of Arizona.

Expand Access to the Institution's Educational Offerings and Increase Enrolments

As previously mentioned, blended learning provides increased choice and flexibility for students in the way that courses and entire programmes are delivered. Many students are now able to balance family and work commitments with their academic studies as a result of this blended model. Numerous higher educational institutions also hope that this expanded access will translate into increased revenue streams, but the results to date have been mixed (Carr, 2001).

Cost Reduction Strategies

Many in higher education are currently asking the question "How can we best serve our students in today's society in light of increased enrolments and decreased government funding?" (Bates & Poole, 2003, p. 24). Twigg (2003b) suggests that blended learning provides institutions with two principal cost reduction strategies. These options are to either increase student enrolments in courses with little or no change in course expenditures or to keep student enrolments the same while reducing the instructional resource costs for the course.

In the Pew course redesign study, coordinated by Twigg (2003b), the majority of the 30 institutions involved in the study selected the second option. They attempted to keep the same student enrolment numbers and reduce costs while maintaining quality. The predominant technique used to accomplish this objective was to reduce the time faculty staff and other instructional personnel spent on large enrolment courses by transferring a number of tasks to technology. This was achieved through the use of online course management systems, online automated assessments, online tutorials, shared resources and staffing substitutions. These strategies are outlined in Table 1.2 and they allowed the study institutions to reduce course costs by about 40% percent on average, with a range of 20–84% (Twigg, 2003a).

One of the greatest cost savings, which is currently attributed to blended learning, is the reduction in space requirements. Prior to the deployment of blended

Table 1.2 Strategies for using technology to reduce costs in blended courses (Twigg, 2003b)

Technique	Description
Course management systems	The course management systems played a central role in a majority of redesign projects. These systems reduced (and in some cases eliminated) the amount of time that the faculty spent on non-academic tasks, such as grade calculations, photocopying handouts, posting changes to the course schedule, sending out special announcements, and updating course material for subsequent semesters.
Automated assessments	Over half of the projects used automated grading of exercises, quizzes, and tests. This dramatically reduced the amount of time the faculty and/or teaching assistants spent on preparing quizzes as well as grading, recording, and posting results.
Tutorials	Online tutorials were used in a number of the course redesign projects. The faculty involved with these projects reported that students came to the lectures and the face-to-face tutorials more prepared to ask good questions. In addition, the faculty and teaching assistants no longer had to present content in class which was already available online. This created more time for discussion and questions within the face-to-face sessions.
Shared resources	The use of shared resources across multiple sections of the same course allowed for a significant saving of faculty time. This was usually achieved by having one common general resource website for all sections of a particular course.
Staffing substitutions	The substitution of graduate teaching assistants with lower cost undergraduate learning assistants in these blended courses resulted in a substantial cost saving (non-technology).

course sections, the shortage of classroom space was so acute at the University of Central Florida (UCF) that it had to rent space at a nearby multiplex theatre for classrooms during the day (Young, 2002). Through the deployment of blended courses, with a significant or total reduction in class time, the University was able to schedule two or three course sections in the same classroom where only one could be scheduled before. This then allowed the UCF to reduce the amount of rented space through the more efficient utilisation of existing classrooms. Bleed (2001) states that reducing space costs may be the only way colleges and universities in the United States can keep up with the continuing population growth and the demands for lifelong learning.

Challenges

There is an abundance of literature describing the challenges that higher institutions face when attempting to incorporate technology into the teaching and learning environment (Barone, 2001; Cho & Berge, 2002; Twigg, 1999). The following issues can be particularly daunting when institutions attempt to adopt blended learning.

Alignment with Institutional Goals and Priorities

Twigg (1999) suggests that blended learning can only be effectively implemented if an institution is committed to improving the quality of the student learning experience in a cost-effective manner. This implies that technology is viewed as a means of achieving this strategic goal and the institution is committed to fully integrating computing into the campus culture. Barone (2001) adds that this goal can only be realised if an institution's leaders demonstrate affirmative action through proper resource allocation and necessary policy revision. The course redesign study coordinated by Twigg (2003b) demonstrates that this strategic alignment can be a formidable challenge. Senior administrators in many of the study institutions were unable to create policy changes to increase enrolments in the blended sections, and department chairs were unable to reduce seat time in these sections to the projected percentages. Resistance to organisational change was given as one of the main obstacles.

Resistance to Organisational Change

Resistance to organisational change in higher education is a well-documented phenomenon (Barone, 2001; Twigg, 1999). Change in post-secondary education is often compared to the "turning of the Titanic." Institutional bureaucracy and inertia can prevent changes in the curriculum, course structures, and timetables, which are critical for the success of blended learning.

Organisational Structure and Experience with Collaboration and Partnership

Lack of a collaborative organisational structure and internal partnerships can pose a formidable barrier to a blended learning initiative (Dziuban et al., 2005). Decisions must be made in a consultative fashion and communicated widely in order for a blended learning model to be successful (Barone, 2001). There must be significant cooperation through partnerships with students, faculty, instructional technology staff, faculty developers, and administrators in order to succeed (Twigg, 1999). In addition, there needs to be a commitment to assessing and communicating the impact of blended learning on student achievement, success, and satisfaction (Barone, 2001).

The next section describes international publication opportunities in the field of blended learning.

Resources, Conferences, and Publication Opportunities

This section begins with an overview of the blended learning research resources that are available from student, faculty, and institutional perspectives and then concludes with a list of conference and publication opportunities.

Resources

Student Perspective

From a student perspective, blended learning research focuses on student learning, engagement, and threshold concepts or bottlenecks. In terms of resources related to student learning research, case studies and methodologies are available from the National Centre for Academic Transformation (2018) and the University of Central Florida's (2018a, b) Centre for Research into Teaching Effectiveness.

There are various resources related to student engagement research. In North America, there is Indiana University's (2018) *National Survey of Student Engagement* and the *Times Higher Education's* (2017) *Student Experience Survey.*

A threshold concept is defined "as a core idea that's conceptually challenging for students, who struggle to grasp it — but once grasped, it radically transforms the students' perception of the subject. Although this material is difficult to learn, understanding threshold concepts is essential for the mastery of any field of study" (Meyer & Land, 2003, p. 1). The University of Calgary (2017) has created a handbook that describes how blended approaches to learning can potentially be utilised to help students obtain threshold concepts.

Faculty Perspective

With regard to the faculty perspective, blended learning research often examines course design, the scholarship of teaching and learning, and professional development. There are a variety of resources related to blended course design, such as in Concordia University (2018).

Many faculty members are researching their own teaching practices in blended course contexts and the International Society for the Scholarship of Teaching and Learning XE "Teaching and learning" (2018) provides resource, conference, and publication opportunities.

A key research topic is in the area of professional development or support for the design, development, implementation, and evaluation of blended courses and programmes. The University of Central Florida (2018b) has created a *Blended Learning Toolkit* that provides resources and survey instruments for evaluating faculty development initiatives related to blended learning.

Administrative Perspective

Finally, from an administrative perspective, blended learning research usually focuses on programmes, cost savings, and alignment with the institutional mission and mandate. At this level, the research is often conducted as an entire programme rather than on an individual course. In Canada, Royal Roads University (2018) engages in this form of blended programme research. With regard to cost savings research, the National Centre for Academic Transformation (2018) provides case studies and research templates. A number of institutions have conducted research on how a blended approach to learning and teaching aligns with their mission and mandate. One of the most extensive institutional blended learning research studies has taken place at the University of Ottawa (2018) in Canada.

Conferences

The number of conferences related to educational technology are ever growing, and Wright's (2018) conference listing is probably the most extensive. However, there are several international conferences dedicated to blended learning, including the Online Learning XE "Online learning" Consortium's (2018) Innovate Conference and the International Association for Blended Learning XE "Blended learning" (2018) Conference.

Publications

Corresponding to the increase in educational technology conferences, there is a growing number of publication opportunities for blended learning research. One of the most prominent publications is IGI's (2018) *International Journal for Mobile and Blended Learning*. Other highly regarded journals that feature blended learning research include Athabasca University's (2018) *The International Review of Research in Open and Distributed Learning*; Elsevier's (2018) *The Internet and Higher Education*; Wiley's (2018) *British Journal of Educational Technology*; and the Canadian Journal of Learning and Technology (2018).

Conclusions

This chapter has described and discussed research trends and publication opportunities in the field of blended learning. As regards research, blended learning trends have been identified from student, faculty, and administrative perspectives in higher education. From a student perspective, the key research topics include student learning, engagement, and ability to grasp and obtain threshold concepts. Blended learning research from a faculty perspective often focuses on course design, the scholarship of teaching and learning, and professional development. At the administrative level, research on blended learning usually involves the investigation of cost savings, alignment with the institutional mission and vision, and a focus on entire programmes rather than individual courses.

Resources, conferences, and publications related to blended learning research are ever increasing. This chapter has attempted to identify the most prominent and useful ones for the reader.

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Chapter 2
Learning Outcomes in Distance Learning: A Study of Learners' Experience

Soon Seng Thah and Latifah Abdol Latif

Abstract Online and distance learning (ODL) institutions have often been seen as possessing an innovative and technology-driven delivery approach in teaching and learning practices—the key to which lies in the online delivery of instruction for working learners. Online delivery requires e-tutoring and the use of teaching and learning materials to facilitate instruction across diverse groups of learners in a ubiquitous learning environment. This chapter focuses on Open University Malaysia's (OUM) approach in leveraging online learning for its stakeholders. This study attempts to confirm the factors which affect the learning outcomes in ODL and was conducted via a web survey of 397 learners enrolled at OUM. Three key constructs emerged from factor analysis, viz. (i) teaching and learning materials; (ii) e-learning; and (iii) learning experiences. As ODL institutions enrol learners from various demographic groups, this study attempted to examine whether learners' demographic differences, such as gender, age, experience in online learning, study results, and the time spent on online learning, had a significant bearing on learning outcomes. An interesting finding was that the time learners spent in logging-in to online sessions had a significant effect on the learning outcomes. Based on the empirical evidence in the study, this chapter concludes that ODL can guide working learners towards the acquisition of the desired knowledge and skills needed to excel in academic pursuits.

Keywords Learning outcomes · Online and distance learning · Programme evaluation

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_2

Introduction

Online and distance learning (ODL) is an important component of higher education development. It caters for the needs of working learners who want an informal but quality education at the tertiary level. In the context of Malaysia as an example, ODL has been identified as one of the major shifts in developing human resources under the Malaysia Education Blueprint (Higher Education), 2015–2025. This Blueprint, together with the Malaysia Education Blueprint (Preschool to Post-Secondary Education), 2013–2025 charted the education development plans from preschool to higher education until 2025. Both these blueprints provide comprehensive strategic plans for the future development of Malaysia's education system. For the higher education sector, ten major shifts were planned covering all aspects of higher education development from infrastructure to the quality of instruction, including ODL programmes delivered via open universities in Malaysia. It is expected that these comprehensive blueprints will result in a technology-enabled delivery system tailored to the education needs of all students under both the conventional and ODL modes. All in all, the output of the higher education system will result in the development of graduates with high employability skills suitable for the needs of the job market.

Technological advances have opened up diverse ways to implement ODL, such as gamification for enhancement of student motivation and collaboration (Otto, 2015), assessment (Rogerson-Revell, 2015), and group self-evaluation (Ajunwa, 2010), to name a few. Various levels of technological integration have also been proposed for the implementation of ODL (Fresen, 2018).

This chapter presents the experience of the Open University Malaysia (OUM) in adopting a blended learning approach to deliver ODL which combines face-to-face and online instruction. Online instruction has been offered through a learning management system for teaching, learning, and communication. In the next section, the provision of ODL by OUM will be introduced, followed by a study on the factors affecting learning outcomes in the ODL mode.

OUM as an ODL Institution

OUM is a part of the Malaysian higher education system and is involved in developing the human resource needs of the future industries, including preschool to post-secondary schools and institutions of higher learning. In this respect, OUM is entrusted with the role of human capital development for workers. Therefore, OUM's target clientele comprises mostly adult learners who are studying to upgrade themselves with the higher academic qualifications needed to excel in the work environment. As a result of this emphasis, OUM's role must be multi-pronged and cater for the needs of adult learners who are already established in their vocation and who would like to upgrade their knowledge and skills to a higher level. To meet

these challenges, OUM has to deliver a flexible, adult-friendly and open academic system which allows working learners the opportunity to pursue lifelong education.

Since its first intake of learners in 2002, OUM has played a remarkable role in providing quality online and distance learning programmes to a cumulative enrolment of 150,000 learners. In addition, OUM is also entrusted with upgrading the qualifications of teachers from certificate/diploma level to a bachelor's degree. Many of these learners are sponsored by the Ministry of Education. OUM has graduated more than 50,000 teachers since its establishment. As this involves a very large number of teachers and need to train them within a relatively short period of time, the conventional approach may have its limitations. The modus operandi of OUM focuses on the adoption of the ODL mode of delivery whereby learners study at their own pace using good learning materials delivered through the e-learning or online mode without sacrificing the quality of their education. To ensure its success, the proximity of learning is a major consideration. OUM has established 34 learning centres spread across the country from urban to rural areas to provide access to education to those who want quality education near their homes or workplaces.

The ODL approach undertaken by OUM needs to be evaluated from time to time to ensure that its programmes are fulfilling their learning outcomes. The findings of such studies provide inputs to decision-makers for programme improvement. This study involves an attempt to determine, from multiple perspectives, the outcomes of OUM's learners' experiences which have contributed to the success of such an approach. The uniqueness of OUM's ODL has won many awards, both locally and internationally, and has ensured recognition of its programmes from diploma to doctoral levels. The extent to which OUM's study programmes have been successful from their learners' perspective is the subject of this study.

The OUM Learners' Experience

As a private ODL institution, OUM has to reinvent itself to compete with the more established and conventional higher education institutions in Malaysia. In working towards this goal, it has developed myVLE (now called myINSPIRE), a learning management system for teaching, learning, and communication. OUM's learners undertake their studies through a blended learning approach (face-to-face and online) or a fully online learning mode. To complement teaching and learning through myINSPIRE, OUM has also developed numerous modules and video lectures for both undergraduate and postgraduate programmes, which serve as guides to learners and facilitators. Learners choose what and when they want to learn according to their own schedules. Face-to-face seminars are held on weekends to better serve learners. Learners can study printed modules, e-modules, video lectures, and reference books which have been uploaded onto myINSPIRE.

There is a need for continual improvement to the delivery of teaching and learning. This includes upgrading the learning management system with new technologies and features, especially making ubiquitous learning more accessible and better

leveraged on collaborative learning. Through this, learners are able to collaborate better by interacting with their peers, tutors, and facilitators, as well as access e-learning materials from the digital library. They can also access key information, such as academic records and timetables, and obtain the latest information on their study programmes using mobile devices.

OUM's learning centres are located near learners' workplaces and homes, and so they provide easy access for face-to-face interaction in regular seminar sessions. The 34 learning centres are well-equipped with high-speed broadband connectivity, computer labs, tutorial rooms, physical libraries, meeting rooms, and reading areas.

Learners can also build on their prior learning experience to gain admission to OUM's programmes by taking the Accreditation of Prior Experience Learning (APEL) evaluation to be admitted into the master's level programmes without having a first degree. Being linked to the first 11 Malaysian public universities, OUM has access to renowned subject matter experts to develop learning materials, supervise learners, and, where appropriate, serve as tutors and facilitators.

The delivery of teaching and learning materials is carried out by experienced staff who understand the needs of working learners. A helpdesk during normal office hours and an online support service through e-CRM support learners as queries must be responded to within 48 h. OUM has a digital library collection of close to 100,000 e-books and an extensive collection of academic journals. All in all, the management of teaching and learning must also fulfil the requirements of MS-ISO 9001 accreditation.

Related Studies on Online Learning Outcomes

Studies related to online learning outcomes mainly addressed effective delivery of instruction and the differences between online and conventional approaches. The results on the learning outcomes of online and conventional face-to-face approaches vary. For example, Riffell and Sibley (2005) found that online learning allowed learners to better develop reflective thinking and gain better study performance as compared to the conventional face-to-face approach due to its flexibility in terms of time manangement. These findings were substantiated by the work of Navarro and Shoemaker (2000) and Rovai and Jordan (2004). In their experimental study, Bowen and Ithaka (2012) noted comparable outcomes between conventional and hybrid interactive online modes of learning; but the hybrid mode resulted in cost-savings and productivity gains. It was also shown in Feeley and Parris (2012) that the use of online teaching tool resulted in better learning outcomes in terms of learners' writing ability, sharing and discussion. In a meta-analysis of 45 studies, Means, Toyama, Murphy, Bakia, and Jones (2010) found that students performed modestly better in online as compared to the conventional mode and, in addition, the outcomes were even better in blended modes. In another meta-analysis study, however, Bernard et al. (2004) found no significant differences in terms of achievement, attitude, and retention outcomes between the online mode and the conventional face-to-face mode.

The Research Problem

Despite many research studies conducted on online and distance education, few of them focus on the impact of the perspectives of students (Jahng, Krug, & Zhang, 2007; Kirtman, 2009; Tallent-Runnels et al., 2006). Research is therefore needed on the learning outcomes of ODL, as this would improve our understanding of the pedagogical processes which affect learners' experience, particularly in the delivery of instruction. Learning outcomes can be defined as the knowledge and skills obtained by learners in the pursuit of an online and distance education programme. They are the results of learning experience, i.e. how learners interact and gain knowledge and skills through the online learning management system of the university. This study is concerned with learners' experience based on the modus operandi of OUM's ODL programmes.

The overall goal of ODL is learning effectiveness, i.e. the ability of learners to acquire knowledge and skills needed for the intended programmes based on the desired learning objectives. According to Swan (2003), learning effectiveness must be the primary factor on which quality in education is measured or judged. This is very pertinent as ODL's underlying aim is to ensure that learners optimise their learning experience so that they get the same quality of education as would have been obtained through the conventional delivery system. A study of this nature is important as it exposes the fundamental issues of this delivery system from the perspectives of OUM's customised blended and online learning programmes. Using factor analysis and structural equation modelling (SEM), a deterministic approach was undertaken to explore and then confirm factors which ascertain learning outcomes in this study. The findings can then be used by decision-makers to leverage further on this type of delivery approach for instructional development and improvement.

This study was designed to address three research questions, viz. (i) To what extent do socio-demographic indicators affect OUM's learning outcomes? (ii) What are the factors which determine the effectiveness of OUM's learning outcomes? (iii) How do these factors mediate learners' experience in OUM's academic programmes?

OUM's Approach to Teaching and Learning

Learning outcomes have their roots in learning theories. Of relevance is Vygotsky's social constructivist theory, which is related to constructivism, an important aspect of technology-based learning mediation. Social constructivism considers learners' acquisition of knowledge and skills as socially situated, which can be "constructed" through interaction with other learners. Learners construct knowledge from one another, thereby collaboratively creating a shared learning culture. The collaboration within this shared learning culture promotes the acquisition of knowledge and skills through peer-to-peer interaction and learner-to-facilitator interaction. In the case of OUM, this is carried out using the learning management system.

Many ODL programmes emphasise constructivist learning. An important principle related to constructivist learning is connectivism, which was introduced by McHaney (2011) and Siemens (2004) to leverage on the use of the Internet as a medium of delivery. With the rapid development of technology, ODL has developed at a very fast pace, which has brought the concept of ubiquitous learning which can be undertaken through mobile devices such as notebooks and mobile phones. In ubiquitous learning, students learn at their own pace and at any time. Learning can take place synchronously or asynchronously. To complement ubiquitous learning, OUM provides digital search engines which provide access to a host of e-journals, e-books, and other resources from the web.

In ODL programmes, students tend to be more motivated for self-study (Phipps & Merisotis, 1999) and have better control over their learning strategies (McMahon & Oliver, 2001). As Hannafin, Oliver, Hill, Glazer, and Sharma (2003) indicate, attitudes towards web-based instruction have an impact on students' abilities to learn in that medium, so student data related to distance learning are needed. Based on their academic background, students who routinely use computers are said to be better able to learn via computer lessons. This study examines the role of e-learning as mediation to learners' experience through OUM's approach.

OUM's facilitators comprise experienced and highly qualified academics from both public and private universities in Malaysia, but their approach in the delivery of instruction does vary and this has a bearing on learners' experience. However, ultimately, the aim is to ensure effective instruction. Shelton and Saltsman (2005) found the most common complaints from faculty members about online education was a lack of understanding of this method of teaching, a lack of institutional support, and fear that the quality of education in the online environment suffers. Relevant research has consistently shown that online courses that utilise tools to augment interaction (student-to-student and student-to-instructor) and engagement lead to a quality online learning experience and enhance students' learning outcomes and overall satisfaction (Dykman & Davis, 2008; McFarland & Hamilton, 2005; Palmer & Holt, 2008).

Research Methodology

This study was undertaken by OUM's Institute of Quality, Research and Innovation (IQRI) to study various aspects of learning outcomes prevalent in OUM's e-learning programmes. Data were collected through a web-based questionnaire. The survey instrument included demographic information, rating scale items using a 5-point Likert scale and open-ended questions on learners' perceptions regarding their studies. The sample comprised 397 learners from all the faculties in OUM's learning centres encompassing (i) education and language, (ii) applied social sciences, (iii) business, (iv) science and technology, and (v) nursing and health science.

The analysis process involved the following steps:

1. The principal component method was used to factor analyse the rating scale items, which resulted in the extraction of three factors.
2. The items nested within the three factors were then summed up to obtain the composite mean scores of individual responses.
3. Reliability tests were undertaken to test the internal consistency of items which made up the three factors.
4. Statistical measures – t-test, one-way ANOVA, and regression – were used to determine the differences within and between variables.
5. SEM using SPSS AMOS (Arbuckle, 2011) was used to build up the path diagram consisting of the observed variables and latent constructs; and this was checked for overall fit using goodness-of-fit statistics.
6. The significant predictors and highly correlated variables were then used to construct the mediation framework derived from the path diagram.
7. Inferences and conclusions were made from the empirical evidence derived from Step 1 to Step 6 above.

The factor analysis extracted three factors, which can be labelled as (i) "teaching and learning materials," (ii) "e-learning," and (iii) "learning experiences." The reliability coefficients for these three factors were high, with their Cronbach alpha values being .944, .964, and .882, respectively.

Findings from the Study

Descriptive Statistics of Demographic Information

Of the 397 respondents who participated in the survey, a large majority were female learners, i.e. 72.0% (n = 286) as compared to male students who made up only 28.0% (n = 111) (Table 2.1). In terms of age, the majority belonged to the age group of 25–34 years old, i.e. 177 (44.6%). This was followed by those in the age group of 35–44 years old, i.e. 106 respondents (27.7%). The smallest group, with only eight (2.0%), came from those aged between 55 and 64 years old. Most of the respondents belonged to the "mature" age groups due to OUM being a university for working adults. A total of 214 (53.9%) of the learners indicated that they were on the "fully online course," while 183 (46.1%) were not on the blended mode (online and face-to-face). This was because OUM's niche area is in lifelong, open, and online learning where learners can access its learning management system through the Internet.

As far as the profile of Cumulative Grade Points Average (CGPA) is concerned, 85.9% (n = 341) of the learners belonged to the higher achieving group, i.e. with CGPA scores higher than 2.0, and so belonged to the group who were doing relatively well in their studies at OUM. When comparing gender with age groups, the findings showed that a greater percentage of female respondents belonged to most

Table 2.1 Descriptive statistics by age group and gender

	Gender		
Age group	Female	Male	Total
18–24	59	17	76
	77.6%	22.4%	100.0%
25–34	126	51	177
	71.2%	28.8%	100.0%
35–44	78	28	106
	73.6%	26.4%	100.0%
45–54	20	10	30
	66.7%	33.3%	100.0%
55–64	3	5	8
	37.5%	62.5%	100.0%
Total	286	111	397
	72.0%	28.0%	100.0%

age groups. There were more male learners among those aged 75 years and above, but this particular group was very small (n = 8). As in most universities, female students outnumbered male students in all disciplines in the study.

Differences in Learning Outcomes

From the gender perspectives, there were no significant differences between the rating of male and female students on their learning outcomes (t = .914; df = 162.6; p > .05) for the three factors: "teaching and learning materials," "e-learning," and "learning experiences." The mean rating for the female learners on teaching and learning materials was 3.71 (SD = .563; n = 286) as compared to the male group with a mean rating of 3.64 (SD = .735; n = 111). For the e-learning factor, again there was no significant difference (t = 1.130; df = 166.9; p > .05), with the mean rating for female learners having a value of 3.64 (SD = .807; n = 286) and the mean for male learners being 3.49 (SD = 1.01; n = 111). For the learning experiences factor, there was also no significant difference (t = .563; df = 395; p > .05) with female learners' rating having a slightly higher mean (mean = 3.25; SD = .754) than that of the male learners (mean = 3.21; SD = 869).

Analysis of the three factors by separating the fully online mode and blended mode showed no significant differences (p > .05). The findings also indicated that learners in the blended mode tended to rate higher. For teaching and learning materials, those in the blended mode had a mean of 3.71 (SD = .671; n = 183) as compared to those in the fully online mode (mean = 3.67; SD = .565; n = 214). For e-learning, those in the blended mode had a mean of 3.61 (SD = .900; n = 183), while those in the fully online mode had a mean of 3.58 (SD = .847; n = 214). For

learning experiences, those in the blended mode had a mean of 3.26 (SD = .749; n = 183) compared with 3.22 (SD = .820; n = 214) for those in the fully online mode.

From the perspectives of log-in time categories, the findings showed a general tendency for high usage of log-in time to be associated with higher perceptions on the three factors. For example, learners who logged-in for "less than 30 minutes" tended to rate lower than those who logged-in for 20–60 min, and the 1–2 h and 2–4 h categories. There were significant differences in the log-in time and how learners rated based on the three factors ($p < .05$).

Predictors of Learning Experiences

For determining predictors, the learning experiences factor was used as the dependent variable, while the teaching and learning materials and e-learning factors were used as the independent variables. Table 2.2 shows the results of stepwise regression analysis.

The regression analysis shows that both teaching and learning materials and e-learning significantly predicted learning experiences. As shown in Table 2.2, teaching and learning materials contributed 50.2% to the variance of learning experiences. When e-learning was included in the regression model, the change was minimal with the contribution increasing marginally to 50.9%.

Factors Affecting Learning Experiences

The principal component method in factor analysis was used to extract salient factors from the data. Assumptions for factor analysis were checked and the Barlett's test of sphericity indicated the presence of sufficient correlations in the dataset (chi-square = 6471.362; df = 276; $p < .05$). This fulfilled a key assumption in factor analysis. In addition, the Kaiser-Meyer-Olkin measure of sampling adequacy was very high at .954 and, according to Hair, Black, Babin, Anderson, and Tatham (2010), this could be classified as "meritorious."

For the extraction of factors, the results showed congruence in the percentage of the variance method, latent root method, and scree plot method. Using the percentage of variance method, the findings revealed the presence of the three factors or

Table 2.2 Predictors of learning experiences

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.708[a]	.502	.500	.55266
2	.714[b]	.509	.506	.54926

[a]Predictors: (Constant), Teaching and learning materials
[b]Predictors: (Constant), Teaching and learning materials, e-Learning

principal components noted above, i.e. (i) Teaching and learning materials; (ii) e-Learning; and (iii) Learning experiences. The first factor extracted was teaching and learning materials, which contributed 56.03% to the variance, while the second factor (i.e. e-learning) contributed 7.69% and the third factor, learning experiences, contributed 6.43%.

The three factors derived in the factor analysis were then disaggregated and analysed using SEM via SPSS AMOS to confirm the extraction of factors. The SEM analysis for this study used the approach of Hair et al. (2010), which stipulated a six-stage process comprising:

1. Defining and operationalising the constructs
2. Defining the measured variables via a path diagram for the measurement model
3. Designing the study to produce empirical results with sample size assessed and the estimation and missing data addressed
4. Assessing the goodness-of-fit and construct validity of the measurement model
5. Specifying the structural model and assigning indicator variables to the constructs
6. Assessing the structural model's validity

Kline (2005) and Schumacker and Lomax (2010) proposed three levels of assessment for the fit of a model: (i) the use of several fit indices and their recommended thresholds; (ii) a detailed fit assessment of standardised regression weights, squared multiple correlations, covariances, and model indices, suggesting model revision to improve the fit; and (iii) cross-validation of a model. In their opinion, the following fit indices could be used for interpreting the output: the ratio of minimum discrepancy divided by the degrees of freedom or CMIN/DF; a goodness-of-fit index (GFI); an adjusted goodness-of-fit index (AGFI); a comparative fit index (CFI); the root mean square error of approximation (RMSEA); and a parsimonious goodness-of-fit index (PGFI). Blunch (2008) argued that individual parameters of the model could also be examined within the estimated model in order to see how well the proposed model fitted the driving theory.

Byrne (2010) is of the opinion that SEM conveys two important aspects: (i) the causal process under study is represented by a series of structural (i.e. regression) equations, and (ii) these structural relations can be modelled pictorially to enable a clearer conceptualisation of the theory under study. Byrne further elaborated, arguing that the hypothesised model can be tested to determine the extent to which it is consistent with the data. Hence, if the goodness-of-fit is adequate, the model argues for the plausibility of postulated relations among the variables; and if it is inadequate, the tenability of such relations is rejected. In this study, confirmatory factor analysis (CFA) via a path diagram was used to evaluate the best model fit.

The purpose in using SEM was to test for the factorial validity of learners' experience on a representative sample of OUM's online and blended programmes. This would determine the extent to which the items which had been designed for this purpose actually measured a particular factor (i.e. latent construct). The first-order CFA model was used; and this model hypothesised a priori that the responses could be explained by the three factors: teaching and learning materials, e-learning, and

learning experiences. Figure 2.1 shows the path diagram based on standardised estimates.

The SEM analysis showed the emergence of an over-identified model and this fulfilled statistical requirements. When running SEM, the modification indices indicated that a number of observed constructs had some degree of overlap and, if not rectified, could result in model misspecification. These overlapping items were then corrected by connecting a covariance line between the error terms to obtain a better model fit. Covariance lines were drawn linking Err21 and Err22, Err26 and Err27, and Err27 and Err28 as shown in Fig. 2.1.

The study showed a relatively high fit in terms of the constructs modelled after modification indices were taken into account. The findings showed a high goodness-of-fit (GFI) value of .820 and a RMS (CFI) value of .911 for the default model. The RMSEA value was within an acceptable value of .091, indicating a suitable fit.

Figure 2.1 shows the path diagram representing latent and observed constructs. The measurement values were computed in standardised estimates for better comparison. The regression weights (beta coefficients) among the three latent constructs (i.e. teaching and learning materials, e-learning, and learning experiences) were relatively high. For example, the path diagram shows a weight of .82 between teaching and learning materials and e-learning; a regression weight of .65 between teaching and learning materials and learning experiences; and the weight between e-learning and learning experience had a value of .61. The loadings, as indicated by the one-way arrows linking the latent factors and the observed variables, were high, meaning that they loaded well between these variables, for example, the loading for observed variable Item 21 to teaching and learning materials was .75. The same conclusions could be applied to the other observed variables and latent constructs.

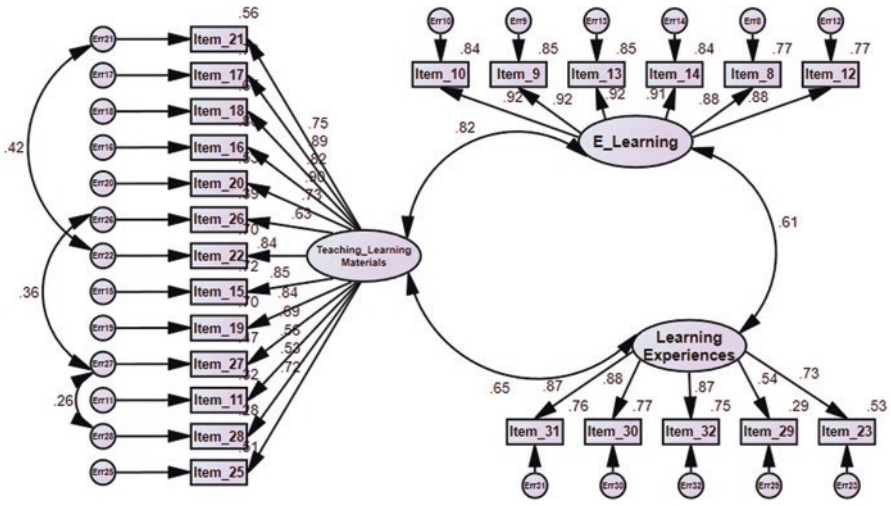

Fig. 2.1 Path diagram of the hypothesised model

Mediation Factors in Learning Outcomes

To determine the effect of mediating factors in learning outcomes, the validity of these factors must first be ascertained. The SEM had shown that there was an acceptable goodness-of-fit in the three factors or latent constructs. These factors were then used to see the mediation effects within an independent-dependent relationship. In this study, e-learning was used as the mediating variable in a causal relationship between teaching and learning materials and learning experiences. The issue at hand was whether e-learning had a direct mediation effect on learning experiences when a direct path was created between teaching and learning materials and learning experiences. In a mediational framework, interaction must exist between independent and mediator variables with the dependent variable. Figure 2.2 shows the conceptual basis for mediation. In mediation, Baron and Kenny (1986) stated three conditions that must be met in order to claim that mediation is occurring: (i) X is significantly related to M; (ii) M is significantly related to Y; and (iii) the relationship of X and Y diminishes when M is in the model.

Applying the conceptual basis of mediation as shown in Fig. 2.2, the role of e-learning as a mediator variable can be represented as in Fig. 2.3. In Fig. 2.3, the path between teaching and learning materials (T_L_Materials) and learning experiences (Learning_Exp) is direct and another path was constructed between teaching and learning materials to the mediating variable e-learning. Similarly, a path was constructed linking e-learning with learning experiences.

From the computations shown in Fig. 2.3, there is evidence of the existence of partial mediation in the role of e-learning, i.e. e-learning mediated against learning experiences. According to Baron and Kenny (1986), partial mediation happens if the direct effect of the mediator construct M (see Fig. 2.2) accounts for a significant amount of variance in Y but c remains significant. If c remains significant, but differs in sign from the 0-order correlation between X and Y, then mediation with suppression is evident. The standardised coefficients or beta regression weights in Fig. 2.3 indicate that, when e-learning is present, the weight between teaching and learning materials and e-learning is .78, while the weight between e-learning and learning experiences is .18. On the other hand, the weight between teaching and learning materials and learning experiences is .56. This implies that, when

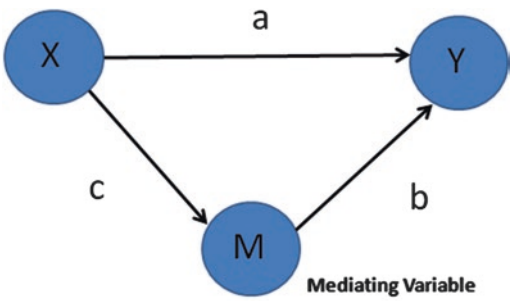

Fig. 2.2 Conceptual basis of mediation

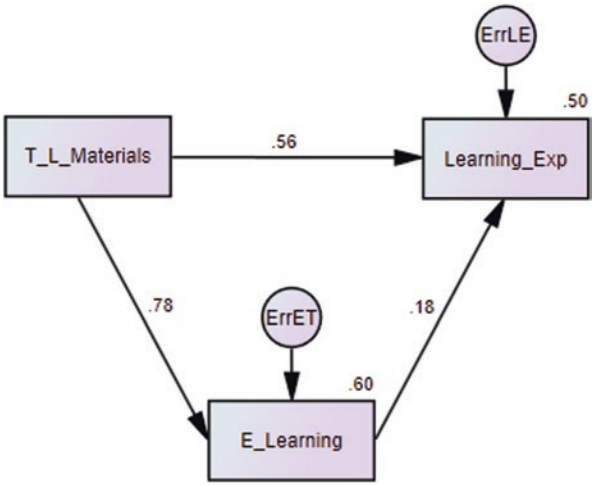

Fig. 2.3 Mediating variables in the study

e-learning was present, the regression weight was lessened between teaching and learning materials and learning experiences. Hence, it can be concluded that e-learning partially mediated between teaching and learning materials and learning experiences.

Discussion

This research shows no significant differences between male and female learners in terms of their rating on teaching and learning materials, e-learning delivery, and learning experiences. This suggests that there would be no need to emphasise tailor-made online instruction for different genders of adult learners. There are also no significant differences for the three factors between the blended mode and the fully online mode, but learners seemed to prefer, albeit slightly, the blended mode more than the online fully online mode. This may be due to the nature of face-to-face interaction in the blended mode with the facilitators that allowed learners to gain a better experience.

Learners who logged-in more frequently to the learning management system had higher perceptions for all the three factors, showing that the online delivery system could result in better student satisfaction in an open learning environment. The strong predictive role of teaching and learning materials shows the importance of resources used by learners as a means for knowledge acquisition. The results also show that e-learning had an effect of partial mediation between teaching and learning materials and learning experiences. This suggests that e-learning was imperative and the e-learning system must be well-developed, fully utilised, and user-friendly to effectively deliver instruction.

Conclusion

This study identified the factors contributing to the learning outcomes of ODL learners, based on an exploratory-confirmatory paradigm. The findings indicated that the hypothesised model fitted well with the data structure. Since the data showed a generally successful implementation of ODL outcomes, it can therefore be concluded that OUM's ODL teaching and learning materials, e-learning system, and learners' learning experiences had resulted in effective and significant learning outcomes from the learners' perspectives. This study was undertaken using a single level analysis covering only the learners' perspective. Future research should adopt a multi-level analysis approach to investigate into the mechanics of interaction of teaching and learning in an open learning environment covering both the facilitators and the learners.

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Chapter 3
Relationship Between Learning Style and the Use of Social Media as a Learning Management System for Online Learners

Myra C. Almodiel and Aurora V. Lacaste

Abstract Social media such as Facebook have emerged and are becoming popular in academe as a learning management system (LMS). The capabilities of Facebook groups to augment online learning show that Facebook can become an effective LMS. However, students' acceptance of Facebook as a learning environment may vary depending on their individual learning styles. This study aimed to describe how the students' acceptance of Facebook groups as an LMS is linked to their learning styles. To determine the students' learning styles, a survey using Felder's Index of Learning Styles (ILS) was administered. Online students' attitude, intent to use, perceptions of the usefulness, and ease of using a Facebook group as an LMS were observed using the Technology Acceptance Model (TAM). The differences in students' acceptance of a Facebook group according to learning styles were then determined. The results suggest that students found a Facebook group easy to use and a good idea for an LMS. Verbal learners perceived Facebook groups as easy to use and useful for learning, while active and intuitive learners intended to continue to use a Facebook group for learning. The findings contribute to the growing literature on the use of Facebook groups as an LMS in the Asian setting.

Keywords Learning management system (LMS) · Index of Learning Styles (ILS) · Technology Acceptance Model (TAM) · Learning style · Social media · Facebook group

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_3

Introduction

The use of social media as a learning management system (LMS) has emerged and is becoming popular in the academe. Students are spending significant amounts of time in social networking sites such as Facebook. If one considers the number of university students who have Facebook accounts and the affordances of Facebook that allow sharing of resources and connecting with other people, he/she cannot overlook the fact that it can be potentially tapped as an educational tool.

There have been many research studies on the use of Facebook in education, although most of them are based on Western case studies and blended learning modes. These studies include the use of Facebook as a supplementary learning tool in blended learning environments for learning in general (Chou & Pi, 2015; Irwin, Ball, Desbrow, & Leveritt, 2012; Sclater, 2008; Wang, Woo, Quek, Yang, & Liu, 2012) and specific subject disciplines such as mathematics (Hsu, Chen, Huang, & Huang, 2012) and English language (Tananuraksakil, 2014). Most studies suggest that Facebook has the potential to promote collaborative and cooperative learning, affect satisfaction among online learners, and promote the development of educational micro-communities (Bosch, 2009; Irwin et al., 2012; Kalelioğlu, 2017; Meishar-Tal, Kurtz, & Pieterse, 2012; Niu, 2019), while other studies identify challenges such as literacy on information and communication technology and uneven access (Bosch, 2009), and privacy and ownership (Conole & Alevizou, 2010).

In the past, research on the educational use of social media, the distinction between students engaging in conventional face-to-face learning and distance-learning students who mainly engage in online learning was not very often made. These two groups of learners have different backgrounds as well as learning needs and learning styles. Niu (2019) reviews the use of Facebook for academic purposes and suggests that the effects of using Facebook as an LMS are mixed and understudied. Irwin et al. (2012) recommend conducting more research on how Facebook can enhance learning outcomes. However, only a few studies have explored how Facebook can be properly integrated into online courses to meet the needs of individual learners (Chen, 2015). One way to address this gap is to examine the relationship between online learning environments and students' learning styles. For example, Hsu et al. (2012) propose a personalised system using Facebook for recommending supplementary materials for learners based on their learning styles. Chen (2015) investigates how learners of different learning styles benefitted from the use of Facebook in their learning. However, these attempts did not specifically focus on distance-learning students.

Students have different ways and preferences for taking in and processing information. Their preferences on how to learn are referred to as their "learning styles." It is important for educators to consider the issues of the online learning environments and learning styles if they want to improve student participation in their courses. These courses must not only have the elements necessary to engage students with content but must also appeal to their learning styles.

One of the more accessible frameworks for characterising differences in learning style is the dimensions of learning styles in science, developed by Richard Felder and Barbara Silverman. They suggested four dimensions of student learning styles,

each of which relates to students' preferred mode for receiving information. The four dimensions are: (1) the type of information students receive (sensory or intuitive), (2) the modality in which they receive it (visual or verbal), (3) the process by which they receive it (actively or reflectively), and (4) the order in which they receive it (sequentially or globally) (Tanner & Allen, 2004).

In terms of the type of information received, sensory students prefer to receive straight facts or details, dislike complications, and like clear expectations. Intuitive students prefer to receive concepts, dislike memorisation, and welcome innovative and diverse approaches to problems. As regards the modality in which information is received, visual learners prefer learning from pictures, diagrams, and demonstrations, while verbal students prefer language-based processes such as talking, explaining, and discussing. In terms of the process by which information is received, active students prefer to learn while doing and being actively engaged, while reflective students prefer opportunities for reflecting and learning on their own. Finally, in terms of the manner by which students build new knowledge, sequential learners prefer a well-ordered, linear path to learning, while global learners prefer an overview and interconnectedness of the concepts before proceeding to the smaller ideas (Tanner & Allen, 2004).

In the University of the Philippines Open University (UPOU), where courses are offered in full online mode, Web 2.0 technologies are being explored to complement its main LMS, which is Moodle. This research study on Facebook groups as a supplementary LMS is based on the assumption that Facebook is being used by people of diverse backgrounds, including students with different learning styles. This study aimed to determine how learning style is linked to the students' acceptance of a Facebook group as an LMS. Survey tools were used to find out how students with different learning styles perceive a Facebook group as a learning environment.

Methodology

A total of 59 undergraduate students (37 females and 22 males) from UPOU's Faculty of Education (FEd) and Faculty of Information and Communication Studies (FICS) participated in the research study. The majority (66.10%) were between 16 and 29 years old and more than half (62.71%) were female.

The students came from three online courses that used Facebook groups as a supplementary LMS during the second trimester of 2015–2016. They were requested to take Felder's Index of Learning Styles (ILS), an online tool used to assess their preferences on the four dimensions of Felder and Silverman's learning style model. After completing the ILS, they were asked to submit a screenshot of their results.

To determine the students' perceptions of the use of a Facebook group as a supplementary LMS, they were asked to answer an online survey questionnaire based on the Technology Acceptance Model (TAM). The questionnaire was used to measure the online learners' attitude, intent to use, and perceptions of using the Facebook group as an LMS in terms of its usefulness and ease of use (see Fig. 3.1).

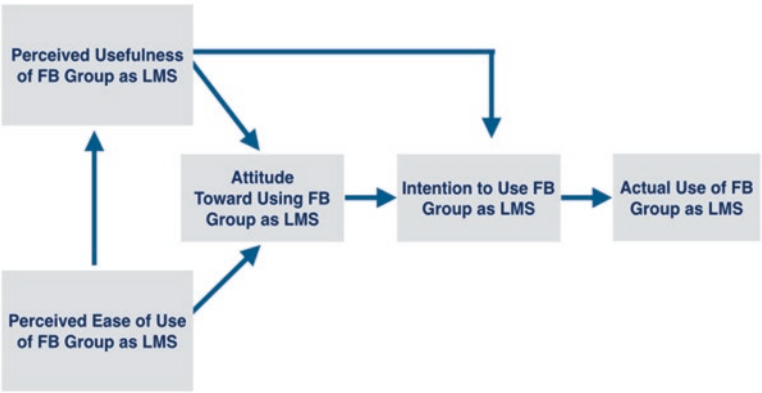

Fig. 3.1 Theoretical framework on the use of a Facebook (FB) group as an LMS

The user acceptance is often the pivotal factor determining the success or failure of an information system project (Davis, 1993). TAM is an information systems theory that "provides an informative representation of the mechanisms by which design choices influences user acceptance, and should therefore be helpful in applied contexts for forecasting and evaluating user acceptance of information technology" (Davis, 1993).

In the questionnaire, respondents were asked to rate 23 statements on a five-point Likert scale (1 for "Strongly Disagree" and 5 for "Strongly Agree"). Statements 1 to 9 (Q1 to Q9) are used to determine the "perceived usefulness"; Q10 to Q15 to determine the "perceived ease of use"; Q16 to Q19 to determine the students' "attitude" towards the use of the Facebook group as a supplementary LMS; and Q20 to Q23 to determine the students' "intent to use" the Facebook group as a supplementary LMS.

Descriptive analysis was used to describe the relationship of the variables using frequencies, percentages, and means, while t-test was conducted to find out if there are significant statistical differences between learners of different learning styles and their use of Facebook as LMS. The data collected were analysed using the Statistical Package for the Social Sciences (SPSS). A Cronbach's alpha was also used to measure the internal consistencies and reliability of the survey instrument.

Results

Demographics

A total of 59 undergraduate students (37 females and 22 males) from the UPOU FEd and FICS answered the online questionnaire and submitted their ILS results. The demographic profile of the students is presented in Table 3.1 below. Majority (66.10%) are between 16 and 29 years old and more than half (62.71%) are female.

Table 3.1 Demographic profile of respondents

	Number of students (N = 59)	Percentage (%)
Age		
16–19	17	28.80
20–29	22	37.29
30–39	16	27.12
Above 40	4	6.78
Gender		
Female	37	62.71
Male	22	37.29

Table 3.2 Students' use of social media and Facebook group as an LMS

	Number of students (N = 59)	Percentage (%)
Social media used as a learning tool[a]		
Facebook	59	100.00
YouTube	54	91.53
Google+	27	45.76
Dropbox	23	38.98
Instagram	17	28.81
Twitter	16	27.12
Pinterest	11	18.64
Device used to access Facebook group as an LMS[a]		
Laptop/desktop	59	100.00
Cellphone/smartphone	47	79.66
Tablet/iPad	26	44.07
Average daily use of social media		
High (over 6 h)	22	37.29
Medium (3–6 h)	27	45.76
Low (less than 3 h)	10	16.95
Average daily use Facebook group as an LMS		
High (over 6 h)	5	8.47
Medium (3–6 h)	14	23.73
Low (less than 3 h)	40	67.80

[a]Multiple responses

Use of Social Media and the Facebook Group as an LMS

Table 3.2 presents the students' use of social media as a learning tool and Facebook group as a supplementary LMS. The results revealed that, aside from Facebook, most of the students also used YouTube (91.53%) and Google+ (45.76%) as learning tools. All the students (100%) used a laptop or desktop in accessing the Facebook

group, while the majority used cell phones or smartphones (79.66%). The findings also showed that almost half (45.75%) of the students spent 3–6 h daily in accessing social media, and the majority (67.8%) spent 3 h or less daily in accessing the Facebook group as an LMS.

Learning Style Preference

Table 3.3 presents the students' learning style preferences based on the result of their ILS test. A majority of the students were found to be sequential learners (52.54%), reflective learners (66.10%), sensing learners (69.49%), and visual learners (84.75%).

Overall Acceptance of Facebook as an LMS

Construct 1: Perceived Usefulness

Table 3.4 shows that most of the students (58–85%) gave a rating of 4 or 5 ("Agree" or "Strongly Agree") to all statements on the "perceived usefulness" construct. It can be seen that the following statements had the highest mean scores for, or agreement on, the "perceived usefulness" construct:

- Q4: "I think that using the Facebook group as a supplementary LMS is useful in our studies" (mean Score = 3.97).
- Q7: "Overall, I think that using the Facebook group as a supplementary LMS is advantageous to our online classes" (mean score = 3.95).

Table 3.3 Students' learning preference

Learning style	Number of students (N = 59)	Percentage (%)
Active/reflective		
Active	20	33.90
Reflective	39	66.10
Sensing/intuitive		
Sensing	41	69.49
Intuitive	18	30.51
Visual/verbal		
Visual	50	84.75
Verbal	9	15.25
Sequential/verbal		
Sequential	31	52.54
Verbal	28	47.46

Table 3.4 Perceived usefulness

	Usefulness	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean rating
Q1	I think that using the Facebook group as a supplementary LMS improves learning skills.	3.39%	1.69%	20.34%	61.02%	13.56%	3.80
Q2	I think that using the Facebook group as a supplementary LMS increases productivity in doing my course activities.	3.39%	1.69%	25.42%	54.24%	15.25%	3.76
Q3	I think that using the Facebook group as a supplementary LMS enhances our effectiveness in doing course exercises.	3.39%	3.39%	13.56%	64.41%	15.25%	3.85
Q4	I think that using the Facebook group as a supplementary LMS is useful in our studies.	3.39%	3.39%	8.47%	62.71%	22.03%	3.97
Q5	I think that using the Facebook group as a supplementary LMS raises our chances of having higher grades.	3.39%	8.47%	30.51%	45.76%	11.86%	3.54
Q6	I think that the advantages of using the Facebook group as a supplementary LMS outweigh the disadvantages.	3.39%	6.78%	23.73%	47.46%	18.64%	3.71
Q7	Overall, I think that using the Facebook group as a supplementary LMS is advantageous to our online classes.	3.39%	6.78%	23.73%	47.46%	18.64%	3.95
Q8	I think that using the Facebook group as a supplementary LMS enables us to access a lot of information.	3.39%	8.47%	8.47%	54.24%	25.42%	3.90
Q9	I think that using the Facebook group as a supplementary LMS provides us with information that helps us make better decisions.	3.39%	5.08%	23.73%	49.15%	18.64%	3.75

Construct 2: Perceived Ease of Use

Table 3.5 shows that most of the students (51–86%) gave a rating of 4 or 5 ("Agree" or "Strongly Agree") to all statements for the "perceived ease of use" construct. The following statements had the highest mean scores for, or agreement on, the "perceived ease of use" construct:

Table 3.5 Perceived ease of use

	Ease of use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean rating
Q10	I think that learning to use the Facebook group as a supplementary LMS is easy.	3.39%	3.39%	8.47%	45.76%	38.98%	4.14
Q11	I think that it is easy to get the Facebook group to do what we want it to do.	3.39%	5.08%	22.03%	50.85%	18.64%	3.76
Q12	I think that interacting with fellow learners and teachers through the Facebook group is clear and understandable.	1.69%	3.39%	8.47%	57.63%	28.81%	4.08
Q13	I think that it is easy for us to become skilful at using the Facebook group as a supplementary LMS.	3.39%	3.39%	15.25%	57.63%	20.34%	3.88
Q14	I think that it is possible to use the Facebook group as a supplementary LMS without the teacher's help.	5.08%	15.25%	28.81%	35.59%	15.25%	3.4
Q15	Overall, I think that social media are easy to use as learning tools.	3.39%	6.78%	8.47%	55.93%	25.42%	3.93

- Q10: "I think that learning to use the Facebook group as a supplementary LMS is easy" (mean score = 4.14).
- Q12: "I think that interacting with fellow learners and teachers through the Facebook group is clear and understandable" (mean score = 4.08). This statement also generated the highest agreement percentage (combined "Agree" and "Strongly Agree" responses) of 86% among all the statements in the four TAM constructs.

Compared to the other five statements on the ease of use construct, the students gave relatively higher disagreement and lower agreement ratings on the statement "I think that it is possible to use the Facebook group as a supplementary LMS without the teacher's help" (Q14).

Construct 3: Attitude

Table 3.6 shows that the majority of the respondents (69–80%) gave a rating of 4 or 5 ("Agree" or "Strongly Agree") to all statements for the "attitude" construct. The following statements have the highest mean scores for, or agreement on, the "attitude towards the Facebook group" construct:

- Q16: "I think that using the Facebook group as a supplementary LMS is a good idea" (mean score = 3.93).

Table 3.6 Attitude

	Attitude	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean rating
Q16	I think that using the Facebook group as a supplementary LMS is a good idea.	3.39%	1.69%	15.25%	57.63%	22.03%	3.93
Q17	I think that using the Facebook group as a supplementary LMS is a wise idea.	3.39%	5.08%	22.03%	50.85%	18.64%	3.76
Q18	I think that using the Facebook group as a supplementary LMS is a positive idea.	3.39%	5.08%	22.03%	50.85%	18.64%	3.93
Q19	I like the idea of using the Facebook group as a supplementary LMS.	3.39%	3.39%	18.64%	50.85%	23.73%	3.88

- Q18: "I think that using the Facebook group as a supplementary LMS is a positive idea" (mean score = 3.93).

Construct 4: Intent to Use

A representation of the responses in Table 3.7 and Fig. 3.2 showed that most of the students (66–73%) gave a rating of 4 or 5 ("Agree" or "Strongly Agree") to all the statements for the "intent to use" construct. The statement "It is probable that I will use or continue using the Facebook group as a supplementary LMS" (Q20) has the highest mean score for, or agreement on, the "intent to use" construct (mean score = 3.90).

Learning Style Preferences in Relation to the Students' Perception of the Use of a Facebook Group as a Supplementary LMS

The mean scores for students' learning preference in relation to their perception of the use of Facebook as an LMS are presented in Table 3.8. Based on the highest mean scores for each construct, the results suggest that, compared to the other learner types:

- Verbal learners were in agreement that the Facebook group as an LMS is useful (mean score = 3.98) and easy to use (mean score = 4.02), and they thought that

Table 3.7 Intent to use

	Intent to use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean rating
Q20	It is probable that I will use or continue using the Facebook group as a supplementary LMS.	3.39%	3.39%	20.34%	45.76%	27.12%	3.90
Q21	I intend to begin or continue using the Facebook group as a supplementary LMS.	3.39%	5.08%	25.42%	42.37%	23.73%	3.78
Q22	I will frequently use the Facebook group as a supplementary LMS in the future.	3.39%	6.78%	23.73%	42.37%	23.73%	3.76
Q23	I will recommend the use of the Facebook group as a supplementary LMS	3.39%	3.39%	25.42%	44.07%	23.73%	3.81

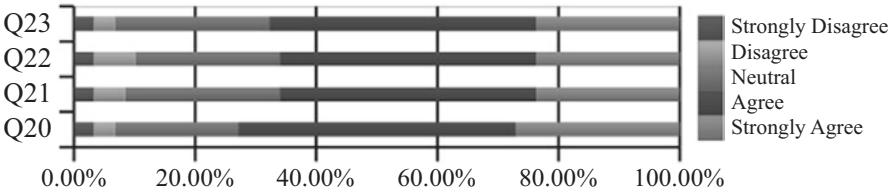

Fig. 3.2 Intent to use

using the Facebook group as an LMS is a good and positive idea (mean score = 4.06).

- Both active and intuitive learners said that they intend to continue to use the Facebook group as an LMS (mean scores = 3.91 and 3.88, respectively).

The results also showed that all students, regardless of their learning style preference, think that "learning to use the Facebook group as a supplementary LMS is easy" (Q10) and "interacting with fellow learners and teachers through the FB group is clear and understandable" (Q12).

Using *t*-test, results showed that there are no significant statistical differences between learners of different learning styles and their use of Facebook as an LMS.

Table 3.8 Mean score for students' learning preference in relation to their perception of the use of Facebook group as an LMS

	Active	Reflective	Sensory	Intuitive	Visual	Verbal	Sequential	Global
Usefulness								
Q1	3.85	3.77	3.76	3.89	3.80	3.78	3.90	3.68
Q2	3.90	3.69	3.78	3.72	3.72	4.00	3.77	3.75
Q3	4.05	3.74	3.88	3.78	3.84	3.89	3.94	3.75
Q4	4.05	3.92	3.95	4.00	3.90	4.33	4.03	3.89
Q5	3.60	3.51	3.49	3.67	3.46	4.00	3.55	3.54
Q6	3.75	3.69	3.61	3.94	3.68	3.89	3.90	3.50
Q7	4.15	3.85	3.93	4.00	3.92	4.11	4.06	3.82
Q8	3.90	3.90	3.90	3.89	3.94	3.67	4.03	3.75
Q9	3.85	3.69	3.68	3.89	3.68	4.11	3.77	3.71
	3.90[a]	**3.75**[a]	**3.78**[a]	**3.86**[a]	**3.77**[a]	**3.98**[a]	**3.88**[a]	**3.71**[a]
Ease of use								
Q10	4.10	4.15	4.17	4.06	4.10	4.33	4.16	4.11
Q11	3.80	3.74	3.78	3.72	3.72	4.00	3.90	3.61
Q12	4.15	4.05	4.07	4.11	4.08	4.11	4.13	4.04
Q13	3.85	3.90	3.85	3.94	3.82	4.22	3.94	3.82
Q14	3.45	3.38	3.44	3.33	3.42	3.33	3.48	3.32
Q15	3.90	3.95	3.95	3.89	3.90	4.11	4.00	3.86
	3.88[a]	**3.86**[a]	**3.88**[a]	**3.84**[a]	**3.84**[a]	**4.02**[a]	**3.94**[a]	**3.79**[a]
Attitude								
Q16	4.05	3.87	3.95	3.89	3.90	4.11	3.97	3.89
Q17	3.70	3.79	3.73	3.83	3.72	4.00	3.84	3.68
Q18	4.10	3.85	3.90	4.00	3.90	4.11	3.97	3.89
Q19	4.10	3.77	3.80	4.06	3.86	4.00	3.94	3.82
	3.99[a]	**3.82**[a]	**3.85**[a]	**3.95**[a]	**3.85**[a]	**4.06**[a]	**3.93**[a]	**3.82**[a]
Intent to use								
Q20	3.95	3.87	3.85	4.00	3.90	3.89	3.97	3.82
Q21	3.90	3.72	3.76	3.83	3.76	3.89	3.87	3.68
Q22	3.85	3.72	3.71	3.89	3.76	3.78	3.84	3.68
Q23	3.95	3.74	3.83	3.78	3.80	3.89	3.97	3.64
	3.91[a]	**3.76**[a]	**3.79**[a]	**3.88**[a]	**3.81**[a]	**3.86**[a]	**3.91**[a]	**3.71**[a]

[a]Average values per learning style preference

Table 3.9 Reliability test using Cronbach's alpha

	Questions	Cronbach's alpha	Internal consistency
Perceived usefulness	Q1–Q9	0.96	Excellent
Perceived ease of use	Q10–Q15	0.93	Excellent
Attitude	Q16–Q19	0.96	Excellent
Intention	Q20–Q23	0.97	Excellent

Reliability Test Using Cronbach's Alpha

Cronbach's alpha was used to determine whether the scales used in the survey instrument were reliable. The results (Table 3.9) showed high values for all the constructs, which means that the scales used were reliable and have excellent internal consistency.

Discussion

Most of the respondents in this study used social media as learning tools. Apart from Facebook, YouTube and Google+ are among the most popular learning tools used by students. This could be associated with the finding that, in terms of modality for receiving information, 84.75% of the respondents preferred learning from images, films, demonstrations, and diagrams (visual learners).

The majority of the respondents spent three to six hours on social media, a range considered as medium average daily use. This includes using Facebook for personal and non-academic functions. As an LMS, however, respondents used Facebook for a low average daily use of less than three hours only. This could imply that the students use Facebook for informal socialisation more than for academic purposes.

The findings also showed that, aside from using laptops and desktops, students also used cellphones and smartphones to access the Facebook group as an LMS. This implies that, nowadays, the use of cellphones and smartphones is not limited to sending and receiving messages and calls alone — the mobile gadgets can also be used for learning.

The "ease of use" construct generated the highest combined percentage of "Agree" or "Strongly Agree" ratings (75.14%). This was followed by "attitude" (73.31%) and "usefulness" (71.75%). Among the four constructs, the "intent to use" construct had the lowest agreement percentage of 68.22%. These findings suggest that respondents perceive the Facebook group as easy to use. This perception is explained by the observation that all respondents have social media accounts and are familiar with Facebook in terms of its features and uses. The Facebook group is perceived as easy to use more than it is perceived as useful for online learning. This coincides with previous research studies that Facebook can be used as a supplementary learning tool in blended learning environments (Irwin et al., 2012; Sclater, 2008; Wang et al., 2012) and that Facebook has the potential to promote

collaborative and cooperative learning, affect satisfaction among online learners, and promote the development of educational micro-communities (Bosch, 2009; Irwin et al., 2012; Meishar-Tal et al., 2012).

Based on the TAM framework, the perception that Facebook is easy to use and is useful for learning most likely influenced the respondents' agreement to the "attitude" construct. Students thought that it is a good idea to use the Facebook group as a supplementary LMS because it is easy to use and helpful for their learning. This supports the finding of Wang et al. (2012) that students at a teacher education institute in Singapore are satisfied with the use of a Facebook group as an LMS because the fundamental functions of the LMS can be easily implemented in Facebook.

The combined agreement percentage on the "intent to use" construct (68.22%) was lower than the other three constructs. This can be attributed to the finding that the advantages of Facebook for some types of learners can also be the disadvantage for other types of learners (Meishar-tal et al., 2012). For example, the dynamic nature of Facebook may be preferred by active learners but not by the reflective learners who would prefer opportunities for reflection and thus favour a learning platform that is less dynamic.

In terms of learning preference in relation to the perception of the use of Facebook as an LMS, the findings showed that, among the learner types, verbal learners perceived the Facebook group as easy to use and useful. This can be associated with the observation that verbal learners prefer opportunities to explore materials through writing, explaining, and discussing. Since the Facebook group had features that quickly allowed one to express ideas, verbal learners found it convenient to use and suitable for them.

The relatively high agreement response of intuitive learners on the "intent to use" construct could mean that they saw the Facebook group as providing innovations and varied approaches to learning. Intuitive learners are said to prefer discovering possibilities and relationships. The use of the Facebook group as a supplementary LMS could be very appealing to intuitive online learners since social media are continuously evolving and possibilities for innovation are high.

Active learners also had a high agreement response on intent to use the Facebook group. This could be associated with their preference for student–student and student–instructor interaction.

As a whole, all the students, regardless of their preferred learning style, thought that "learning to use the Facebook group as a supplementary LMS is easy" (Q10) and "interacting with fellow learners and teachers through the Facebook group is clear and understandable" (Q12). This suggests that the use of Facebook as a supplementary LMS can encourage engagement and clear interaction and discussion among online learners.

While the use of Facebook as LMS was positively perceived by students, issues involved during the practice should not be neglected. For example, student privacy has been raised as a concern when using Facebook. Gabarre, Gabarre, Din, Shah, and Karim (2013) explored the impeding factors of using mobile social networking sites, and identified the lack of privacy as one among other factors that impedes the use of Facebook for communication. Hsu, Wang, and Tai (2011), in their study on

the attitudes of Taiwan users, also found that the vagueness of privacy of Facebook is a concern for the users. The practical issues reveal the needs for further research on factors other than those covered in TAM which may also affect users' intention and actual use of Facebook as LMS.

Conclusion

This chapter shows the perceptions of online students on the use of a Facebook group as a supplementary LMS and the relation of the perceptions to their learning styles. Findings and observations from this study could help teachers decide how they can effectively use social media to meet the different needs of their students. It is recommended that further research studies be done on the relationship between learners' learning style and their use of Facebook as LMS on a wider scale of population from different fields and academic programs. It is also recommended to study which pedagogical and technological affordances of Facebook can be explored to suit the diverse learning styles of students. Case studies on how students engage themselves in learning activities designed around these affordances can also be conducted.

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Chapter 4
The Effect of Using Instant Messaging Communication on the Teaching and Learning Experience of Students

Francis Yue

Abstract There has been recent interest in studying the use of instant messaging (IM) as a teaching tool for supervising student dissertations and tutoring undergraduate students as discussed by Yue (2014a, 2014b, 2015). The research studies on this area have indicated that students are very positive about the use of IM for communicating with their tutors or supervisors. This chapter aims to study the use of IM as a supplementary tool in tutoring undergraduate students. The use of IM was analysed, based on the teaching and learning feedback obtained from an end-of-course questionnaire survey. A correlation analysis was carried out to study the possible relationship between the use of IM and the teaching and learning experience of students. Other associated measures, such as the tutorial attendance rate and assessment marks, were also examined.

Keywords Instant messaging communication · Teaching and learning experience · Teaching performance

Introduction

The management and monitoring of student learning are becoming increasingly important. This process has to be both efficient and effective, at the same time being able to meet quality assurance standards and procedures. Many universities in different parts of the world place great emphasis on enhancing the learning experience of students. Quality assurance for university teaching is growing in significance. It

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_4

is very common for academic staff to be appraised in relation to the quality of their teaching measured in formative and/or summative ways.

According to the Office of the Communications Authority (The Government of Hong Kong Special Administrative Region), the mobile subscriber penetration rate was more than 230% in January 2016, which is very high when compared to other countries. The use of mobile digital devices (such as smartphones) is very popular among local university students, with many of them using instant messaging (IM) software tools such as WhatsApp for communication purposes. Research has been carried out on the use of IM for enhancing the teaching and learning experience of students. For example, Bere and Rambe (2016) found that the flexibility of mobile learning contributes to students' positive attitudes to the adoption of WhatsApp which in turn enhances their learning outcomes. Klein, da Silva Freitas Jr., da Silva, Barbosa, and Baldasso (2018) identified the educational affordances of IM for learners, including interactivity, knowledge sharing, sense of presence, collaboration, and ubiquity. Tang and Hew (2017b) summarised the ways IM has been used in education — journaling, dialogic, transmissive, peer feedback, helpline, and assessment. There have also been studies on the use of IM in specific subject disciplines such as English language teaching (Sivabalan & Ali, 2019).

However, the focus of these studies has been on the students' views on using IM communication tools (Sivabalan & Ali, 2019; Sun, Lin, Wu, Zhou, & Luo, 2018); and the target participants were mainly students working on individual dissertations or small-group projects (e.g. Carpenter & Green, 2017; Tang & Hew, 2017a). This chapter aims to study the effect of using IM communication on teaching and learning feedback from a larger group of students. Possible effects on aspects such as the tutorial attendance rate and assessment marks were also studied.

Relevant Research

Importance of Feedback

It is widely accepted that students should be given feedback during their learning process. Researchers such as Chickering and Gamson (1987) point out that frequent student–teacher interactions and prompt teacher feedback are important factors for enhancing student motivation and involvement. Hara and Kling (2001) describe the adverse impact on students when teachers are unable to provide clear and timely feedback. Arbaugh (2001) points out that prompt feedback given by teachers is positively associated with student satisfaction with the course. Also, Shea, Li, Swan, and Pickett (2005) emphasise that student–instructor interaction has a positive association with the level of learning.

Use of IM

Motiwalla (2007) discusses the great popularity of mobile devices among students and their importance in the learning environment. Research has indicated that students are prepared to use text and instant messages for academic purposes in communicating with their tutors (Hill, Hill, & Sherman, 2007). Jeong (2007) points out that the use of IM can facilitate a closer student–teacher relationship. Also, Rau, Gao, and Wu (2008) suggest that students will have a positive attitude towards associated classroom activities when they receive messages from their teachers.

More recent studies have been conducted on the use of IM in the higher education context. For example, Lauricella and Kay (2013) considered the response from a student survey on the use of IM by studying the effect of social interaction on student-teacher and student-student relationships. Kuyath, Mickelson, Saydam, and Winter (2013), who examined the use of IM for student-teacher communication in distance education courses, found that it was related to the reduction of sources of dissatisfaction and improvement in students' performance when compared with asynchronous communication tools (such as emails). Finally, Yue (2014a, b, 2015) considered the use of IM in supervising individual dissertations and tutoring undergraduate students.

Evaluation of Teaching Performance

One method for obtaining information on the performance of university teaching staff is by collecting student ratings. Cashin (1995) described the research on student ratings of teaching and pointed out that their interpretation should be combined with other sources of data. He emphasised that, while student ratings do give some measure of teaching performance, they do not necessarily imply effective teaching.

Trout (2000) discussed the limitations of student evaluations. Nicholls (2002) considered some personal attributes — which are individual-dependent — that effective teachers should have, including being accessible and listening carefully, and being fair, friendly, and supportive. Professional attributes include being organised, flexible, well-prepared, knowledgeable, and a good time-keeper. These attributes are included in the teaching and learning experience surveys conducted by many universities.

Kuo and Troy (2009) point out that there is no universally accepted measure for teaching performance. While student ratings of teaching are widely used in

universities, they are not the only measure of teaching performance. Also, many university teachers argue that teaching performance cannot be evaluated by such student ratings, although, as noted earlier, they are often used for staff appraisal purposes.

There are different means for evaluating teaching performance as well as limitations of student evaluations. In this chapter, teaching performance is measured by other aspects (e.g. attendance rate and assessment results) in addition to the usual student ratings of teaching and the effect of using IM is studied.

Methodology

The target participants in this study were students taking an information systems course for an undergraduate degree in Accountancy. The degree programme is offered by a British university in co-operation with the City University of Hong Kong. The teaching involved 15 h of intensive lectures and was conducted by a British lecturer. There were 243 students, divided into 11 tutorial groups; and there were six tutorial classes, each lasting one and a half hours for each tutorial group. The face-to-face tutorial classes for all 11 tutorial groups were conducted by the same local tutor. Students were required to submit an individual written essay not exceeding 2500 words, which accounted for 100% of the overall assessment for the course. During the first tutorial class, the students were all invited to contact their tutor via IM (using the WhatsApp communication software) in addition to the other contact methods usually used. The lecturer was not involved in communicating with the students using IM in the present study.

A teaching evaluation survey on the teaching in the tutorials was carried out for each of the 11 tutorial groups at the end of the course. The students were invited to complete a Teaching and Learning Experience Questionnaire (TLQ) during the last tutorial class. The questionnaire had three parts: (1) teaching, (2) course learning experience, and (3) overall evaluation. The students were invited to express their views on ten statements in total, five of which were on teaching, four on the learning experience, and one on an overall evaluation of the learning experience provided by the tutor in the course. The student ratings on each statement were measured on a 7-point Likert scale, with point 1 being “strongly disagree” and point 7 being “strongly agree”. The confidential students’ responses given in the TLQ were collected on a tutorial-group basis so that individual students could not be identified. The average responses for the three parts of the TLQ were checked to see whether they were affected by the use of IM.

The ratings on individual statements appearing in the TLQ may help teachers to make appropriate improvements, but they do not contribute much to the present analysis. In this study, the student ratings on relevant statements related to the teaching and learning experience are combined (using simple averages) to give separate measures on teaching and learning experience. As regards tutorial class attendance, the average attendance rate (out of a maximum value of six) over the number of

students in each tutorial group was computed first. The average tutorial class attendance, as well as the average assessment marks for all 11 groups, was also recorded.

Findings

During the 6-week tutorial period, only a few face-to-face meetings outside the classroom and electronic mails were exchanged between the tutor and students. Instant messages (using the WhatsApp IM communication software) were only exchanged between the tutor and students after the tutorial classes ended. These messages were mostly related to the assignment essay and its submission. For each tutorial group, the extent of IM usage was measured based on the number of students who had exchanged instant messages with their tutor. About 18% of the students (44 out of 243) contacted the tutor using WhatsApp before the assignment submission deadline.

Some statistics related to the TLQ (based on the 11 tutorial groups) were compiled and are listed in Table 4.1. Other statistics, such as the T-score (the average score for ratings on statements A1–A5), LE-score (the average score for ratings on

Table 4.1 Statistics on the ratings obtained for the statements in the TLQ and other measures included in the study (N = 11)

	Mean	Standard deviation
A. Teaching		
A1. The teacher was well prepared for class.	6.01	0.287
A2. The teacher's instruction and explanations were clear.	6.07	0.285
A3. The teacher provided useful feedback and comments.	6.02	0.273
A4. The teacher was helpful.	6.13	0.320
A5. The teacher used English as the medium of instruction throughout the course.	5.66	0.375
B. Course learning experience		
B1. I found the learning experience well designed.	5.51	0.301
B2. I was encouraged to be creative/innovative.	5.41	0.338
B3. I was encouraged to think critically.	5.41	0.325
B4. I found the course difficult.	5.12	0.516
C. Overall evaluation		
C1. Overall, I consider the learning experience provided by the teacher in this course as valuable.	5.82	0.261
Other measures		
T-score (average score for ratings on statements A1–A5)	5.98	0.276
LE-score (average score for ratings on statements B1–B4)	5.37	0.302
Average WhatsApp usage	0.18	0.163
Average tutorial class attendance	4.71	0.273
Average assessment marks	55.05	2.040

statements B1–B4), WhatsApp usage, tutorial class attendance, and assessment marks are also listed in Table 4.1. According to Table 4.1, the ratings on each of the statements appearing in the TLQ were well above the middle value of 4. The average student ratings on the teaching part (statements A1–A5) are higher than those on the learning experience part (statements B1–B4). As noted above, the average level of students exchanging IM with their tutor was about 18%, while the tutorial class attendance rate was 78.5% (4.71 out of 6.00). Furthermore, the difference in the average assessment marks of the tutorial groups was not large given the small standard deviation of 2.04.

A correlation analysis was conducted to study the strength of the relationship between the use of IM and measures of teaching and learning experience. It can be seen from Table 4.2 that there was a very strong positive correlation between the overall TLQ score and both the T-score (0.884) and LE-score (0.676). The higher score of 0.884 indicates that the overall TLQ reflects the response of students to teaching better than to the learning experience. The positive correlation coefficient of 0.224 indicates that the usage of WhatsApp between the students and their tutor was positively associated with the overall TLQ score. On the other hand, the correlation coefficient of 0.254 between WhatsApp usage and the T-score suggests that the positive association is much stronger than that between WhatsApp usage and the LE-score (with a correlation coefficient of 0.078).

Student tutorial class attendance was found to be positively associated with the overall TLQ score, T-score and LE-score, with correlation coefficient of 0.505, 0.502, and 0.347, respectively. These statistics indicate that the students who were more satisfied with the teaching efforts made by the tutor (T-score), as well as their good learning experience (LE-score), were those who had more face-to-face tutorial class contacts with their tutor.

On the other hand, the student assessment marks were found to be negatively associated with the overall TLQ score, T-score and LE-score, with coefficient values of −0.617, −0.495, and − 0.579, respectively. The students who showed greater appreciation of the tutor's efforts in teaching (T-score) and their good learning

Table 4.2 A matrix with the correlation coefficient computed between different pairs of measures

	Teaching score (T-score)	Learning experience score (LE-score)	WhatsApp usage	Tutorial class attendance	Student assessment marks
Overall TLQ score	0.884	0.676	0.224	0.505	−0.617
Teaching score (T-score)		0.797	0.254	0.502	−0.495
Learning experience score (LE-score)			0.078	0.347	−0.579
WhatsApp usage				0.544	−0.179
Tutorial class attendance					−0.155

experience (LE-score) were those who obtained lower assessment marks. This could be due to the fact that the use of IM benefits more those weaker performing students (who need more timely assistance in their study). Future research could be carried out to study the impact of using IM on these weaker performing students. Also, the mild negative correlation (−0.179) between IM usage and assessment marks suggests somewhat that students with a less good performance tended to use IM more with their tutor.

Discussion and Conclusion

Conventional measures of teaching performance are based on the student ratings of teaching. This chapter considers the additional use of other measurements (class attendance and assessment marks) of teaching performance as proposed by Cashin (1995) and Kuo and Troy (2009).

The results obtained in the present study show that the use of IM is positively associated with the teaching performance of the tutor, as well as the learning experience provided by the tutor. These positive results are consistent with the findings of Arbaugh (2001) and Shea et al. (2005). The use of IM provided prompt feedback made by teachers to students and promoted their interaction. The fact that the tutor was involved in IM with the students could lead to a better understanding and appreciation of the tutor's efforts in teaching. The results of the correlation analysis indicate that the use of IM is not a factor determining the assessment marks, given the low level of association found.

The participants in the study were involved in a course with only one summative assessment, the submission of an essay, which is rather different from the usual university courses with both coursework and final examination components. Further research on the use of IM in those university courses would be of interest. Also, the present study involved a limited number of tutorial groups and focused on the teaching performance of only one tutor; and the fact that the confidential students' responses given in the TLQ were collected on a tutorial-group basis limits the coverage of the study. Further research could be pursued on possible scenarios where there are a greater number of tutorial groups and/or more than one tutor is involved.

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Chapter 5
Educational Technology Research in Mainland China: A Review Based on Textual Datamining

Jiyou Jia

Abstract This chapter examines the academic papers published in seven Chinese journals listed in the CSSCI (Chinese Social Science Citation Index) from 2013 to 2017. It analyses the word frequency, keywords, and contents in these papers in order to find the research foci in the field of educational technology in mainland China in recent years. The statistics on the frequency of keywords showed that the papers are concerned with the core elements of the education system — learners, teachers, and the learning process. Based on the results of textual datamining, the achievements of educational technology research in mainland China are summarised in six aspects. Finally, the chapter points out the problems which exist in these papers and suggests the future research trends.

Keywords Educational technology research · Textual datamining · Mainland China

Introduction

In mainland China, the subjects in higher education are mainly set up according to three levels: discipline category, large discipline or first-level discipline, and profession or second-level discipline (Ministry of Education China, 2011). Currently, there are 13 discipline categories. Education science is one of these discipline categories with three large disciplines or first-level disciplines: education science, psychology, and physical education. In education science as a first level discipline, research on educational technology is one profession or second-level discipline.

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_5

The concept of educational technology refers to all kinds of technology applied in education and training, from the earlier slides, films, and radio and television, through to modern computers, with computer projectors, communication networks, the Internet, mobile devices, and interactive whiteboards. The research on educational technology studies its design, development, implementation, application, evaluation, management, and policy.

One main branch of educational technology is information and communication technology (ICT). It combines information technology, represented by computer hardware and software, and communication technology, including wired and wireless communication networks and protocols. The Internet may be regarded as a typical product of ICT.

Under the umbrella of educational technology research, there are many subresearch fields with different foci and subjects. For example, technology-enhanced learning involves learning facilitated, supported, or enhanced by various technologies, such as the computer, computer projector, interactive whiteboards, interactive feedback devices, the Internet, and mobile devices. Online learning refers to the learning supported by the Internet.

In official documents in mainland China, one special phrase — "education informatisation" — is often used instead of "educational technology". In international publications written in English, most papers containing this phrase were written by Chinese researchers. However, according to a literature search, the first paper using this phrase was published in 1990 by Kerr, a researcher from the former Soviet Union. The use of this phrase in Chinese official documents expresses the government's determination to apply ICT and other technologies to reform and develop education.

In a survey on the educational research of ten universities in China and the United Kingdom, Crook and Gu (2019) identified two worrying trends: (i) only 10% of the research focused on new technologies and (ii) the research was conducted mostly in the classroom context. In the context of China, Mao, Ifenthaler, Fujimoto, Garavaglia, and Rossi (2019) discuss the national policies on educational technology and point out that real-time learning and teaching improvements and open educational resources are two major trends of educational technology. Besides, there has been a rapid development of massive open online courses, but more systematic policy planning and implementation as well as well-trained staff on educational technology are required. Their concerns echo the views of Chinese scholars gathered by Lai (2017) regarding the development of educational technology in China.

This chapter presents a review of journal papers published in Chinese journals which are related to education informatisation/educational technology. However, it is a major academic challenge to summarise the achievement and shortcomings of the research on educational technology as a discipline, especially in mainland China. There are more than 1,000 higher education institutes with this discipline as an undergraduate or graduate major, and above 10,000 researchers and 10,000 master's or doctoral students in this major. Also, every year, there are more than 100 journals and 100 conferences which publish thousands of papers in this discipline. For reviewing the massive amount of papers, a word frequency analysis was conducted.

Research Methods

The papers reviewed were collected from the China Knowledge Resource Integrated Database (http://www.cnki.net) — the largest and most often used research portal in China. Among the thousands of journals it covers, seven are specially focused on educational technology or technology-enhanced learning, and are listed in the CSSCI (Chinese Social Science Citation Index) at the Center for Chinese Social Science Research Evaluation in Nanjing University Library. They are:

- *China Educational Technology*
- *Educational Technology Research*
- *China Distance Education*
- *Modern Distance Education Research*
- *Open Education Research*
- *Modern Educational Technology*
- *Journal of Distance Education Research*

The word frequency analysis was employed to retrieve the research focus of the published documents. For the exploratory nature of this study, few similar attempts on reviewing research on educational technology in China have been made. The results of the word frequency analysis present an overview of the current status in this area on a descriptive basis, and allow comparison with future findings. The analysis provides a list of the words that occur in documents and the number of times they occur. The words can be classified according to their parts of speech (POS) in a sentence, such as nouns, verbs, adjectives, articles, and so on. Because a noun describes a concrete or abstract object in the world, and a verb describes the state or action of one object, or the relation between two or more objects, the frequency distribution of the nouns and verbs in documents reflects the degree to which they are used.

The word frequency analysis for Chinese is different from that for English, because the Chinese characters in a sentence are written one by one without any space. In the word frequency analysis for this study, we first pared the Chinese sentences in a document into Chinese words, and then calculated their frequency of occurrence in the documents. We also analysed the frequency of the keywords listed in every document, which express the foci in the documents.

Based on the statistical results of both the word and keyword frequency analysis, the following section attempts to summarise the research work in educational technology.

Results

Word Frequency Analysis

Using the Chinese word frequency analysis, we analysed the noun and verb frequency in all the relevant academic papers collected from the China Knowledge Resource Integrated Database. The results of the analysis showed that those papers contained 240,260 different Chinese words. On average, every word was used 67.7 times, and every paper contained 910 different words.

The noun "student (学生)" was the most frequent, with 156,000 uses; and the second was "learn (学习)" with 143,000. The third, fourth, and fifth were "teacher (教师)" (117,000), "research (研究)" (101,000), and "learner (学习者)" (84,000), respectively. The three words, "student", "learn", and "teacher", have always been listed as the top three in frequency over the years. If the similar "student (学生)" and "learner (学习者)" are merged, the frequency count was 240,000. The meaning of "learner" is broader than that of "student", because a student is usually studying in a formal educational institute, while a learner can study in both formal and informal settings (e.g. workplace trainees).

The frequency statistics showed that the subjects of most interest to researchers in the field of educational technology were the learners, including students, followed by the learning process — including relevant theory, technology, method, and effects — and thirdly the teachers. This result reflects the idea of "teachers as the guiders and students as the main body" that is embodied in Chinese educational policies and practices, and highlights learning as a bridge linking the teacher and the students or learners.

As a secondary discipline under the primary discipline "education science" in China, the research field of educational technology has been focusing on the same research areas as educational science, i.e. learners, teachers, and learning. This feature can be demonstrated in the word frequency statistics of the academic papers published in authoritative journals.

Other words whose frequencies were ordered from sixth to tenth were "instruction (教学)", "education (教育)", "knowledge (知识)", "curriculum (课程)", and "question (问题)". The concepts of "research" (the fourth most frequent word) and "question" are necessary components of all academic papers, with research in educational technology being no exception. The two concepts of "instruction" and "education" are also vital links between the teachers and learners, and are related to both teaching and learning, while the concept of "learning" (with its frequency in the second place) emphasises the students' learning. One target of instruction or education is the students' knowledge transformation or building through teachers' instructional activities. The concept of "curriculum" is the organisational and categorical unit of different kinds of knowledge.

In short, the top ten most frequently used words in the academic papers published in Chinese core journals cover the major concepts including students, teachers, and knowledge. They reflect the key elements of education as defined in Jia

(2014) that education is a system or process for the learners to improve their natural intelligence, and the educational system contains five key elements: learner, teacher, knowledge, media, and approach.

The words related to ICT include "information", "technology", "resource", "system", "data", and "network", which are between numbers 11 and 30 in the word frequency list, showing that they are also commonly used in academic papers.

Among them, the concept of "technology (技术)" was in the 11th position. This word is the hypernym of all kinds of ICT and is often mentioned in academic papers. Its hyponyms include "resource (资源)", "system (系统)", "data (数据)", and "network (网络)". Resources, which are an important component in an educational system, may include all kinds of media used by teachers and students, such as teaching materials, exam papers, and multimedia courseware. The concept of "system" generally means computer-assisted instructional systems which can facilitate a given teaching or learning activity — for example, an intelligent tutoring system. On the one hand, the concept of "data" is the basis for information technology and, on the other hand, it covers the research subjects in quantitative research in educational science, especially in educational technology research. The concept of "network" is a system comprised of computer hardware, including servers and clients' machines, software, and communication equipment, which is an important carrier of mass modern educational resources, and supports the environment of computer-assisted instructional systems. The close relations of these words with ICT serve as a possible reason accounting for the common use of the words in academic papers.

Keyword Frequency Analysis

The keywords in every paper usually label the research subjects, methods, and even conclusions, so it is valuable to investigate the keywords frequency in published papers. We extracted the keywords from every paper, and merged the synonyms, full names, and abbreviations, both English abbreviations and their Chinese translations. For example, "flipped classroom" in English and its Chinese translation "翻转课堂" or "翻转课堂" were merged into one keyword; the English abbreviations "MOOC", "Mooc", and "MOOCs", together with its Chinese translation "慕课", were also merged into one keyword. Those keywords were then sorted into the sequence of their frequency in the papers.

The keywords frequency distribution showed that:

1. MOOC — a hot topic in research on educational technology — was the most frequently used keyword.
2. Words whose frequency was listed in the top 100 keywords included, for example, "education", "instruction", "learning", "technology", "curriculum", "resource", "system", and "network".

3. Other keywords in the top 100 included “flipped classroom”, “mobile learning”, “network class”, “micro video or lecture”, “open education resource”, “collaborative learning”, and “electronic schoolbag”.

The Achievements of Educational Technology Research

Based on the empirical study of the papers published in seven Chinese core journals, this section attempts to summarise the achievements of educational technology research in recent years in six aspects — all the characteristics of which were reflected in the keywords frequency analysis of Chinese journal papers.

1. ICT provides massive, high-quality, and free resources for schools, teachers, students, and parents. Researchers in educational technology are studying the design, development, construction, application, evaluation, and management policies for these resources. These resources include not only the encyclopaedic knowledge database for various disciplines in primary, secondary, and higher education — such as the foreign Wikipedia, and the domestic Sogou Wikipedia, and Baidu Encyclopedia — but also complete online courses, such as MOOC, excellent courses, and micro-lectures. The above full-text word frequency analysis found that the word “resource” was listed at the top of the frequency sequence, and “MOOC” and “micro-lecture” were at the top of the keyword frequency sequence. These research “hotspots” confirm that the Internet can provide free and high-quality education resources and facilitate the supply side of reform in education.
   MOOC started in 2011, first in the United States and Canada. In March 2013, the President of Peking University, Zhou Qifeng, announced in the National People’s Congress that Peking University would put a large number of high-quality courses onto Coursera and other global platforms for free access. In September 2013, the first MOOC was put online and ran successfully (Jia, Miao, & Wang, 2014). Meanwhile, Tsinghua University also invested very considerable resources on the development of the Xuetang Online platform and attracted many excellent MOOCs internally and from other universities in China. The pioneering work by Peking University and Tsinghua University on MOOC was of great interest to other universities, the government, and enterprises, so the year 2013 was called “the first year of MOOC” in China. Since then, MOOC research has expanded greatly and involves work on its theoretical foundation, operation mechanism and mode, related supporting policies, curriculum construction, instructional design, and effectiveness and efficiency.
   A micro-lecture presenting a key but difficult knowledge unit within a short video clip attracted much attention from researchers about its product technology, application, and potential impact.

2. The Internet environment allows people to quickly and conveniently search and acquire massive educational resources with the help of the increasingly popular smartphones, tablet computers, notebooks, and other mobile devices, besides desktop computers. Of course, these mobile devices can be used not only for searching for resources, but also as electronic schoolbags for storing the educational resources. Also, the devices can be used as important media to support teacher–student and student–student interaction — and even as electronic learning companions (Jia, 2012) — to promote ubiquitous mobile learning. Researchers on educational technology are examining the supporting technology, system architecture, instruction design, application in different subjects, effect evaluation, and management policies for mobile learning and electronic schoolbags. The above keywords frequency analysis of Chinese journal papers showed that the frequency of, for example, of "mobile learning," "e-schoolbag," "search," "mobile device", and "mobile Internet" were in the top list.
3. In the Internet, participants in education — including teachers, students, and parents — can use mobile devices such as smartphones or conventional equipment such as desktop computers to communicate synchronously or asynchronously via voice, video, or text to achieve collaborative learning, breaking the time and space restrictions of traditional education. Research in educational technology is being carried out on the implementation technology, instructional design, learner analysis, teacher role analysis, effect evaluation, and development process for computer-supported collaborative learning (CSCL). The analysis of the frequency of keywords in Chinese journal papers illustrated that the frequency of, for instance, "collaborative learning", "communication", and "interaction" was high on the list.
4. The Internet supports an exploratory instructional approach, such as the flipped classroom. The flipped classroom refers to the class instruction method in which the students preview a micro-video lecture and other materials before the class, and consolidate their knowledge through discussion and collaboration with each other in the class, together with the teacher's help and question-answering. It emphasises cooperation and communication among students, and the construction of knowledge by the students themselves, and is the concrete implementation of constructivism and connectionism (Zhang, Wang, & Zhang, 2012). In educational technology, the researchers are examining the implementing technology, instructional design, curriculum integration, and effect evaluation of such an exploratory learning approach. The above keywords frequency analysis of Chinese journal papers showed that the frequency of the "flipped classroom" was in the top list.
5. The Internet environment can help to realise personalised learning. Confucius, the great thinker and educator in China 2000 years ago, proposed the ideal of "individualised" education. But in the traditional school and classroom education settings, a teacher faces dozens of students, and completes various tasks, including lesson preparation, classroom teaching, producing assignments, and checking homework and examinations. It is difficult for the teacher to give each student appropriate and instant feedback. However, supported by cutting-edge technologies, such as the Internet, artificial intelligence, big data, and learning analytics, personalised instruction has been made available.

The design, development, application, and evaluation of the effects of personalised and adaptive learning systems or intelligent tutoring systems have been studied by the researchers in educational technology in recent years. The above keyword frequency analysis of Chinese journal papers showed that the frequency of items such as "big data", "learning analysis", "personality", "personalised learning", "adaptive", "hierarchical teaching", and "intelligence" was in the top list. Ding, Jia, Chen, Bai, and Xiang (2012) introduced quasi-experimental comparison research, using the intelligent English instruction system CSIEC in teaching English in the first grade in a junior high school and found that the system could reduce the difference between weak students and more successful ones.

6. ICT helps to achieve a fair and balanced development of education. However, due to historical reasons, there are great differences in the development of education in different regions in China, and also between different schools in the same cities. However, the Internet and other advanced information technologies have made great progress in promoting an equal and balanced education. The researchers in education technology are studying the technology, its theoretical foundation, policy guarantees, and practical exploration of educational balance and justice supported by ICT. The above keyword frequency analysis of Chinese journal papers showed that the frequency of keywords such as "balance", "fairness", and "development" was also in the top list.

   Regarding the combination of theory and practice, He (2011) argued that the basic connotation and characteristics of educational informatisation have great potential for improving education quality and balancing the development of compulsory education — but this can only be brought about if it is guided by innovative education theory. His ten-year practice of the project "Leap-forward development and innovation experimental research for compulsory education" demonstrates that, guided by innovative education theory, education informatisation can really improve both the teaching quality and students' performance in all school subjects in the weak, especially rural, schools, so as to promote high-quality, fair, and balanced development in compulsory education.

   In conclusion, the research achievement of education technology researchers is summarised in the above six aspects. It focuses on the major theoretical and practical issues from the state announced in official documents and serves the needs of the state (Ministry of Education China, 2012; State Council of China, 2010), such as implementing the instructions of National Chairman Xi Jinping (Xinhua News Agency, 2015) and Premier Li Keqiang (State Council of China, 2015). The research on education technology can be said to have had remarkable achievements, and the support of education informatisation to reform and develop education is becoming more and more prominent.

Existing Problems

Although the research on education technology has achieved fruitful results, it still faces more problems to meet the requirements of national social and economic development as well as the deep integration and innovative application of technology in education in developed countries. The main three problems can be summarised as follows.

1. *Papers full of theoretical speculation are excessive, and empirical research needs to be strengthened.*
   Theoretical thinking and logical reasoning is the tradition of educational technology research in China. Papers filled with theoretical discussion have been common in all journals in the past years. For example, in research on MOOC, micro-lectures, and flipped classrooms, a large number of papers have analysed the concepts and their development history, proposed their potentially important influence theoretically, and designed some frameworks or models for applying those concepts. The single concept of "micro-lecture" was repeatedly defined in hundreds of papers, so some scholars claimed that "the definition of micro-lecture was plunged into tedious argumentation" (Wang, 2014). As Wang, Wang, Yang, and Wang (2013) summarised through the analysis of domestic and international mobile learning research papers that this research approach belongs to the mode of "tree expansion", rather than the "ring cycle" mode. In contrast, the components of "practice, reflection, once practice, and once reflection" are used internationally and are based on practical research. In order to improve the quality and influence of education technology research in China, it is necessary to promote the transformation of the research paradigm and strengthen empirical research.

2. *Research on the application effect needs to be further strengthened.*
   During the analysis of the achievements of educational technology research, it has been noticed that some of the proposed pedagogical ideas, designs, or models based on ICT have been applied to instructional practice, and their actual effects evaluated through questionnaires, quasi-experiments, or other empirical research methods. However, research papers presenting such effects are still few in number, and their reliability and validity need to be improved. For example, some instructional experiments have failed to provide pre-test scores for the experimental and control classes, but concluded that the experimental intervention had an effect on students' performance based on just post-test differences. Also, some papers have acknowledged the significant effect of ICT without reporting any quantitative data such as experimental results or survey data.
   The empirical studies on educational information technology in papers published in international authoritative journals are mostly of high quality. For example, the effects have been established through quasi-experiments with experimental and control classes, pre- and post-tests, and rigorous statistical methods. China has invested a great deal of capital and human resources in the field of education informatisation, and the achievements have attracted global attention. Researchers

in the field of education technology have the responsibility and obligation to introduce China's great achievements to the world through international journals and conferences. We should follow the international norms for educational research and reinforce empirical research on the instructional effects.

3. *The extent of homogeneity in the research is limited.*
   The keyword frequency analysis of Chinese journal articles showed that MOOC, micro-lecture and flipped classroom were of wide concern, and became the focus in the whole field of educational research. However, many papers have studied those phenomena just through theoretical and logical reasoning and lacked empirical experiments which investigated their instructional effects. The results suggest that more diverse methodologies could be used in future research.

Future Research Trends

In the future, researchers on educational technology should pay attention to the following development trends.

1. *The full integration of ICT with curricula and its innovative application*
   The Chinese government has invested a large amount of money for building the infrastructure for ICT in education, from the latest hardware to cutting-edge software. Many schools are equipped with large-screen electronic whiteboard or interactive television sets, and tablet computers. The infrastructure in many Chinese schools in the metropolitan areas is better than that in some developed countries, such as the United States. However, the equipment has not been used regularly for classroom teaching and extracurricular activities, but just for leaders' inspection and teachers' lectures. Many school teachers do not know how to use the complicated instruments and software in their ordinary instruction. Researchers on educational technology should investigate how to integrate all kinds of ICT in different school subjects and apply them creatively, and then evaluate the instructional effect on students and teachers through empirical studies.

2. *The application of the latest advances in artificial intelligence in education*
   In recent years, the milestone breakthroughs and rapid development of artificial intelligence research — represented by the Google's AlphaGo program — have had a profound and extensive impact on education, especially education technology research. The maturity of large data, machine learning, and learning analytics technology will accelerate the development of individualised learning and intelligent tutoring systems. These emerging frontiers deserve attention from researchers in the field of educational technology in China.

3. *The maker education or innovation education supported by ICT*
   The Chinese government has recently been promoting innovation education in primary and secondary schools, and universities and colleges. ICT plays an

important role in the field of innovation education by, for example, facilitating computational and innovative thinking through robot programming. The keyword frequency analysis of journal papers showed that the keyword "maker education" has had a bigger frequency in recent years and should be worth more research in the future.

Conclusion

To investigate the research on educational technology, we collected all the papers published in seven Chinese journals listed in CSSCI in the past 5 years and analysed the word frequency and keyword frequency of these papers through full-text mining technology. The results of the analysis demonstrated that the areas researchers in education technology are most concerned about are the audience for education; learners, including students; and learning, including the theory, technology, process, method, and effect. Their next concern is teachers. These results embody fully the idea of "teachers as the guiders and students as the main body", and also reflect the role of learning as a bridge linking teachers and learners/students.

Education, as an open, dynamic, complex, and non-linear system, with all its components — including learners, educators, media, content and pedagogies interacting with each other — is also affected by external factors arising from policymakers, educational authorities and school administrators, technology providers and parents, whose interplays cannot be ignored. Among all the stakeholders in the educational system, the learner is the most important and central one, because the system would not exist without the learners (Jia, 2016). Therefore, in the research on online learning and technology-enhanced learning, we should still focus on the learners, especially on the effects of technology on them, and cost-effect analysis.

The papers, which responded to the national demand for educational development and reform, applied ICT to solve major theoretical and practical challenges, and made great achievements. These achievements can be summarised in six aspects: promoting the supply of high-quality education resources; the convenient sharing of education resources with mobile devices; exploratory and innovative instructional approaches; collaborative learning supported by ICT; personalised learning; and education balance and equality supported by ICT.

However, compared with the expectation of a better and fairer education from the government and the people, and the development of deep integration and the creative application of ICT in developed countries, researchers on educational technology in mainland China have still a long way to go. Besides the tradition of valuing theory in guiding practice, they should reinforce empirical research; study the deep integration of ICT with curriculums and its practical effects on students and teachers; and pay special attention to the potential influence of artificial intelligence in education and the cultivation of students' creative thinking through ICT.

Acknowledgements The author thanks Mr. Bilan Zhang for collecting the Chinese journal papers. The author also gratefully acknowledges the helpful comments and suggestions of the reviewers, which have improved the presentation of the paper.

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Chapter 6
Mobile Learning with Augmented Reality: A Case Study of Acupuncture Points

Sin-Chun Ng, Andrew K. Lui, Pui-Yu Chan, Kin-Ying Yu, and Siu-Kit Hung

Abstract Augmented reality (AR) has been widely applied to educational practices in various disciplines. This chapter presents a case study of its use in nursing education for learning of acupuncture points. Acupuncture plays an important role in Traditional Chinese Medicine (TCM), and nursing students need to learn the locations and functions about acupuncture points (acupoints). Learning acupoints is challenging due to the difficulty in locating the acupoints and memorising the functions of each acupoint. In this chapter, a mobile application is introduced for learning acupoints in an effective way. The application contains three main parts. The first part is the AR system which shows the 3D hand model with acupoints and their details using the AR technology. The second part is the Quiz system which tests a user's knowledge on acupoints. The last part is the acupoint application system which allows users to apply the acupoints in daily life. With the use of AR technology, the mobile application provides a new paradigm of interactions that can improve the learning efficiency of acupoints.

Keywords Mobile learning · Augmented reality · Nursing education · Acupuncture point

Introduction

Augmented reality (AR) has been regarded as one of the mainstream technologies widely adopted in education in the next decade (Blessinger & Wankel, 2012). It has been becoming a popular medium for facilitating learners to interact with digital

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_6

information in physical world, and it can be applied in various areas of mobile learning (Craig, 2013). This chapter presents the teaching and learning of acupuncture as a case study in nursing education to illustrate the potential of AR for enhancing learners' understanding of challenging concepts.

The study of acupuncture points (acupoints) has been challenging for nursing students. There are more than 350 invisible acupoints in human body and each of them has more than one function. Learning acupoints is the fundamental step for nursing students to learn acupuncture and Chinese medicine. Nursing students have to memorise and locate the acupoints, and understand their functions and values. However, existing referencing tools of acupoints usually contain full of textual information, which are difficult for students to visualise the concepts and locate the acupoints on human body accurately. To solve this problem, AR technology can enhance students' learning experiences and memorisation (Radu, 2012) in terms of making the learning environment more attractive so that students are more willing to spend time on it (Blum, Kleeberger, Bichlmeier, & Navab, 2012).

There have been some initiatives to explore the potential of AR for advancing acupuncture practices. For example, Chen, Maigre, Hu, and Lan (2017) presented a mobile app with AR technology which can locate the acupuncture points on face images. Jiang, Starkman, Kuo, and Huang (2015) proposed a wearable acupuncture assistant system using AR technology to record the treatment process with augmented information.

In this chapter, we present an effective mobile learning tool with AR features for nursing students to improve their effectiveness on locating acupoints and memorising their functions. The mobile application provides a 3D model to visualise the position of the acupoints. With AR technology, it also provides an AR system allowing users to learn acupoints together with the 3D model which facilitates a deeper memorisation. It also provides a quiz system for testing and strengthening users' knowledge on the acupoints, as well as suggestions on pressing different acupoints for the relief of pain and illnesses.

Background

Acupoints

An acupoint is any of the specific locations on the body that, in the practice of acupuncture and acupressure, are stimulated (by the insertion of a thin needle or by the application of pressure) to produce beneficial health effects (Merriam-Webster Medical Dictionary, n.d.). Acupoints are abstract and controversial. They usually locate in the "valleys" of the body, not on a bony prominence or in the belly of a muscle. They are found in the depressions next to or between muscles, bones, and tendons, and around joints (Zidonis, Soderberg, & Snow, 1999). There is no anatomical structure that can be said to represent acupoints, as no such structure has

ever been identified in the body. Also, we do not know what anatomical features, alone or in combination, contribute to the formation of acupoints (Dung, 2013). In an international consultation, 86 of the 92 controversial points (among the total of 361 acupoints) were standardised (Lim, 2009).

Existing Solutions

Most acupuncturists make a diagnosis and prescribe therapy according to former cases and basic principles. It is difficult for beginners to acquire the knowledge. Conventionally, students can only practice either on real patients or unrealistic artificial mannequins. An artificial mannequin provides very limited visual and unrealistic force feedback, while vivo practice has a high risk of invasion. Wrong identification of acupuncture points or incorrect manipulation may result in dizziness, pain, internal bleeding, and even long-term adverse effect (Heng et al., 2006).

There are a few mobile applications for learning acupoints in the markets. Most relevant applications do not apply AR technology.

AcuMapa This is a mobile application which mainly shows an image when opening the camera in a smartphone. The image is very flexible, and users can upload their own image, and control its opacity and size, so as to compare the real-time object with it. However, as the images are static, which may not suit different users, there can be a deviation in accuracy. Also, it contains few images related to acupoints only. To learn about acupoints, users may download them on their own.

Total Acupuncture 3D This is a commercial mobile application for acupuncture. It provides rich knowledge and information about acupoints and 3D models locating them. This seems good for learning about acupoints, but, unfortunately, user reviews have been negative about the app's performance and it cannot even be used in some smartphones. Also, some students may not be able to afford it. However, the most important point is that AR technology is not applied in this application.

Acupressure for Keeping Fit This is a mobile application about health and acupoints. The application discusses some common illnesses and provides the related massage methods for acupoints to relieve them. The application uses photos to locate acupoints. As a health application, it provides useful information to the public about the usage of acupoints. However, it does not include sufficient functions of acupoints; and also there may be problems with some devices, such as failure to load the app or a poor performance. Again, most importantly, AR is not available in this application.

Our application is built to include the above advantages and exclude the disadvantages.

Methodology

Mobile Application

A mobile application is preferred as users can learn about acupoints anytime and anywhere once they have a mobile device which can run this application. In addition, it gives a faster user experience as this application involves AR technology and a 3D model which are data-consuming. The user interface and data are in Chinese, as acupoints are mostly learned in Chinese.

Datasets

At this stage, all the acupoints on the hand are focused on, since a hand model is a relatively easy way to give enough information as a prototype. A 3D model of the hand and a target image are required in the AR System. A QR code is used as the target image, since it can be tracked easily and steadily. It is supposed to be inserted into a lecturer's online materials or authors' books on Chinese medicine. In addition, for the AR System and Acupoint Application System, basic information about acupoints — their functions, usage, and a textual description and 2D image of their positions — are needed. For the Quiz System, the questions and corresponding correct and wrong answers about the acupoints are also important. All the textual information is obtained from Chinese medicine books, relevant online materials, and the free 3D model is downloaded from Clara.io.

Functions

Three main functions have been developed mainly using Unity3D, C#, and the Vuforia AR Library. Firstly, we provide the AR function to view the 3D model and information on the acupoints. Secondly, there is a random quiz to test users' knowledge of the acupoints. Thirdly, we provide an acupoint application function to help users to apply their knowledge of the acupoints based on examples of simple illnesses. The use case diagram, component diagram, and the data flow diagram of the system can be found in Figs. 6.1, 6.2, and 6.3, respectively.

AR System Once the application is opened, the AR System will start. It shows the camera preview, and waits for the target marker being tracked. If it is tracked, the flag is set to "true" and shows the game object of the 3D model with the specified position relative to the target image. If it is untracked, no model will be shown. There are clickable acupoints on the hand model (Fig. 6.4). When one acupoint is clicked, the information panel will appear at the top of the screen and the name of

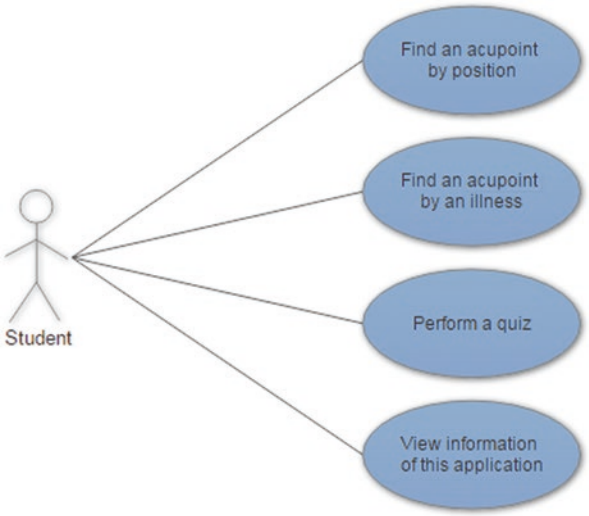

Fig. 6.1 User's case diagram

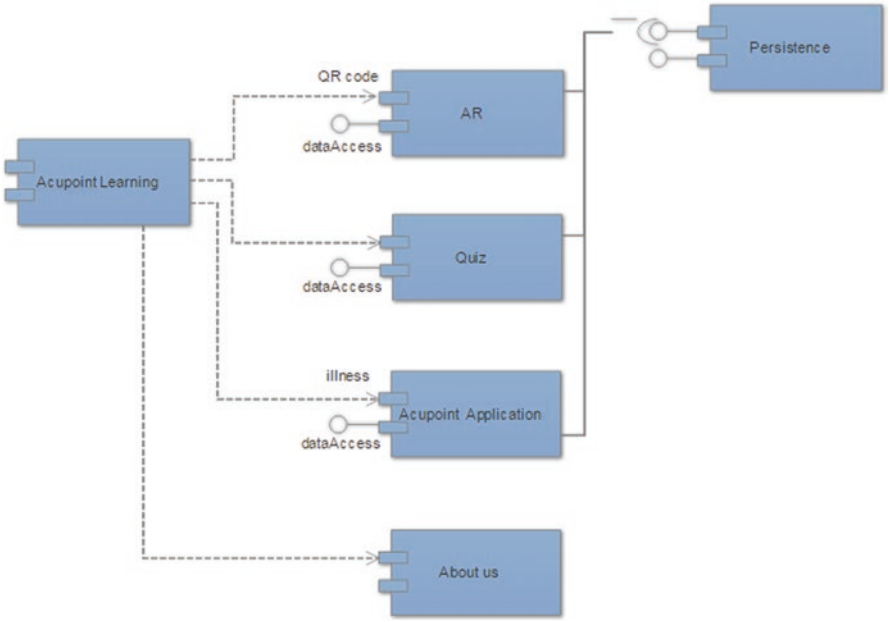

Fig. 6.2 Component diagram

Fig. 6.3 Data flow diagram

that acupoint is stored in a temporary variable. The details of that acupoint are obtained through searching in the local database, and are then shown in the information panel (Fig. 6.5). When the back button on the information panel is clicked, the panel is disabled. Once the target marker is tracked, the slider for rotation is enabled. When the slider value is changed with sliding, the value of one axis on the 3D model is changed correspondingly. This allows users to see the front and back view of the model with the corresponding acupoints, as the acupoints on the front and the back are different.

Quiz System Multiple-choice questions are randomly retrieved from the local database. Once a quiz is started, one question and four choices of answer are retrieved and the timer is started (Fig. 6.6). The system now waits for an answer, with one answer button to be clicked. If an answer is selected, its text is stored for further

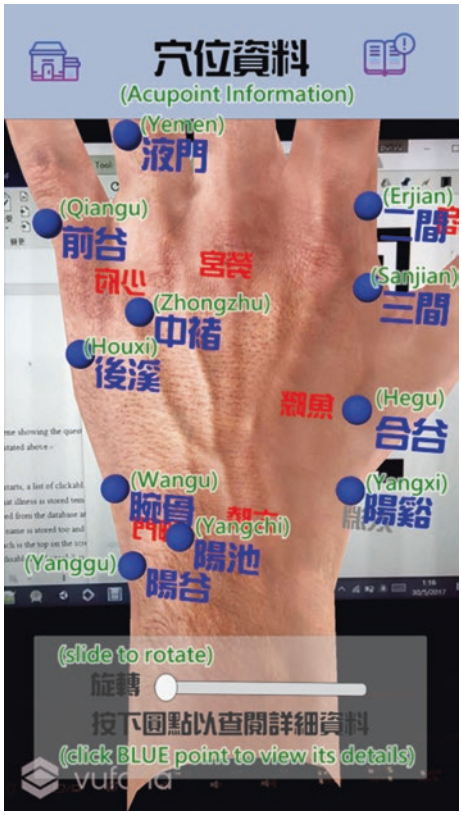

Fig. 6.4 3D model in the AR System

evaluation. By clicking the next button, it then proceeds to the next question. A new different set of questions and answers is retrieved and displayed, and increments the counter variable. If the counter variable reaches enough questions, it will stop the timer, match the stored answers and the correct answer in the database for each question, and navigate to the result scene. The result scene (Fig. 6.7) shows the number of correct answers, the time taken, the button for triggering a panel with all the questions with correct and user-selected answers, and the restart button. When the cross button on the panel is clicked, the panel is disabled, but when the restart button is clicked, it immediately navigates to the scene showing the question and four choices of answers and runs in the same way as stated above.

Acupoint Application System When it starts, a list of clickable illnesses is shown (Fig. 6.8). When clicking one of these illnesses, the name of that illness is stored temporarily. The related applicable clickable acupoints are retrieved from the database and displayed on a panel A (Fig. 6.9). Once an acupoint is clicked, its name is stored too and allows its details to be retrieved and displayed on panel B which is at the top on the screen. When the back button on panel B is clicked, it is disabled and

Fig. 6.5 Some acupoint information

panel A is displayed; and when the back button on panel A is clicked, it follows the same logic and the original list of clickable illnesses is shown.

Evaluation Results

We invited 36 students to answer our questionnaire for evaluation, 50% of whom were nursing students and 50% were students who were interested in learning about acupoints but did not study the relevant subjects, with most of them being university students.

The results of the questionnaire were positive and encouraging. Most of the respondents (more than 90%) agreed that the overall performance of the application was good and useful (Fig. 6.10). Around 80% "mostly agreed" (rating 1) or "agreed" (rating 2) that our application could help them in learning about acupoints. Nearly all the respondents agreed that the AR System was the most helpful function for learning the acupoints (Fig. 6.11). Also, both the Quiz System and Acupoint

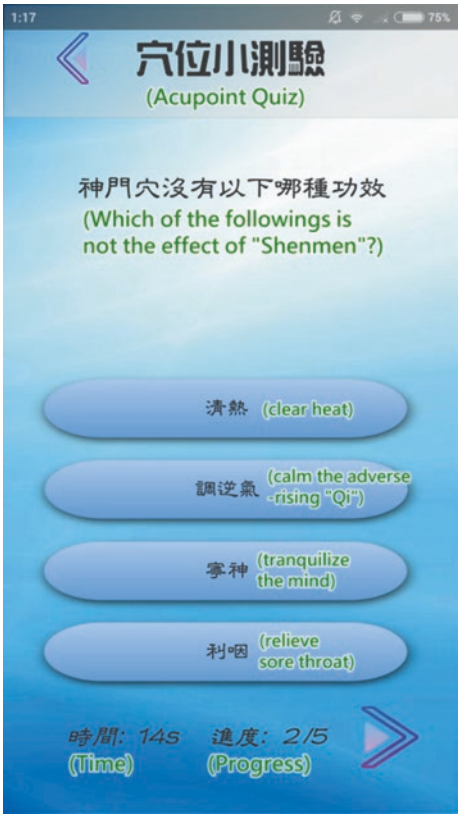

Fig. 6.6 Question in the Quiz System

Application System were seen as useful for learning acupoints by around 50% of the respondents.

The AR function was successful because most of the respondents agreed that the AR System made acupoint learning more interesting and relaxing. Moreover, the respondents believed that AR technology would become an important tool in education and learning about acupoints. In addition, virtually all the respondents agreed that the AR System was more helpful in acupoints learning than text materials. It was therefore not difficult to show that the AR System was a successful function in our application.

The rest of the functions also received good responses. For example, many respondents agreed that the Quiz System was interesting, helpful for memorising acupoints and convenient for leaning them at different places and times. Many of the respondents also agreed that the Acupoint Application System was helpful for learning about acupoints, and gaining knowledge about health; and most of them agreed that this function was useful for helping them to apply the usage of acupoints in their daily lives.

However, a limitation was identified by the respondents. It was considered that the scanning of the user's hand instead of the QR code should be used. To provide a

Fig. 6.7 Result in the Quiz System

better performance to users, a markerless approach, which implies the scanning of the user's hand, will be adopted instead of the marker approach which is currently used.

In conclusion, despite this limitation, our application was successful in solving the problems in learning about acupoints. After analysing the survey data, it was found that, after using our prototype, more than 70% of the nursing students agreed that our application could help them in acupoints learning, as did nearly all other students. Many of the subjects agreed that the application made the learning process more interesting, easier, and useful for learning to locating acupoints. Although there are still rooms for improvement, this application was successfully according to its aims and objectives.

Fig. 6.8 List of illnesses

Conclusion

We developed a mobile application with three main functions: an AR System, a Quiz System, and an Acupoint Application System. A 3D hand model was developed and displayed in the marker AR approach with the QR code.

According to our survey, the majority of the respondents felt that our solution to the problems in learning about acupoints was useful and helpful. Our aims and objectives were achieved, although the respondents suggested an improvement, as a result of which we will include a markerless approach and the use of GIF animation in the AR System in the future development.

Fig. 6.9 List of applicable acupoints for an illness

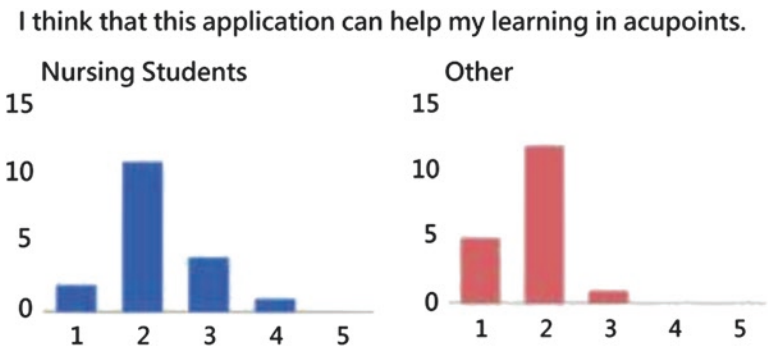

Fig. 6.10 Result of the degree of helpfulness in our solution

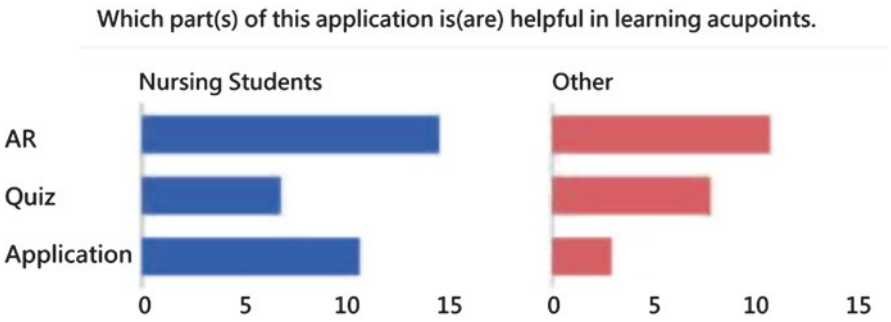

Fig. 6.11 Result of the degree of helpfulness in three main functions

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Chapter 7
The Latest Technologies for Mobile Learning

Larry Ka-wai Ching

Abstract This chapter reviews the latest technologies and their applications in facilitating mobile learning in the new age of education. It introduces and explains the key functions of various technologies and discusses the possible challenges in their applications faced by users. The results provide insights into the planning and preparation for blended learning, with mobile learning integrated into the conventional way of curriculum delivery.

Keywords Mobile learning · m-learning · Blended learning

Introduction

The emerging mobile devices and innovations in communication technologies keep changing the daily lives of human beings and societies. The utilisation of smart phones and other handheld devices have also been extended to education, which has helped the development of mobile learning (m-learning) at different levels. For example, interactive and visual elements have been added to the teaching contents for primary school students through the use of tablets in order to make their learning more interesting; and discussion forums have been added to the mobile learning platforms which encourage adult learners to input, share and exchange their opinions for promoting a better peer learning environment. The recent developments in m-learning have also been integrated with other educational technologies such as 3D techniques (Zakota, 2019) and augmented reality (AR) (Kassim, Abdullah, & Sanusi, 2018). They have been adopted for various educational purposes, such as enhancing learners' self-regulation (Yun, Fortenbacher, & Pinkwart, 2019), digital storytelling (Hussain & Shiratuddin, 2019), and providing a situated, authentic and personalised learning experience (Ally & Prieto-Blázquez, 2014). No matter which

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_7

target group is being served, stakeholders who are involved in "creating" a meaningful m-learning experience should be very familiar with the usage of the latest technologies and their effects and learning outcomes for learners.

This chapter aims to introducing the common and latest supporting technologies that are applicable in m-learning, with a main focus on how their functions contribute to a better learning experience for the end-users when compared with conventional learning.

Technologies Applied in M-Learning

In recent years, the rapid development of m-learning and its applications to support and facilitate a better learning experience for students has been mainly due to the continuous advances in mobile devices and the increasing use of wireless communication technologies. Examples of mobile devices range widely, including smartphones, PDAs, tablets, mobile media players, notebook computers and other similar handheld devices with high mobility for users (Duman, Orhon, & Gedik, 2015; Vrana, 2015). Although most of the devices are not purposely designed for mobile learning, their built-in features, such as cameras, video/media players, social media applications and WiFi connectivity—plus the flexibility of connecting and interacting with different kinds of interfaces and applications—have provided a favourable environment which has helped to inspire educators and academic bodies to integrate various mobile tools into their curriculum delivery.

As stated by Ferreira, Moreira, Pereira, and Natércia (2015), the applications of mobile technologies for education through the blended use of diverse approaches, systems and devices are being carried out in different parts of the world. Some examples of technologies that are extensively used in mobile learning include (1) the learning management system that can be operated not just on desktop but in a mobile environment; (2) the global positioning system (GPS) which enables the implementation of location-based learning; and (3) the technology of AR which further enhances the ease of learners in acquiring knowledge in reality by interacting with real objects. However, the examples quoted above, plus other peripheral technologies, do not "stand alone" in contributing to a meaningful learning experience for learners. Instead, it is more likely that there will be a blended use of different technologies and learning tools which make learning more "enjoyable" and "flexible" from the perspective of users (García-Peñalvo & Conde, 2015; Parsons, 2014; Tsinakos & Ally, 2013).

The following sections highlight key examples of m-learning technologies, and their functions which help to enrich the knowledge of educators and, at the same time, lead them to review existing practices in their teaching processes. The understanding of the latest m-learning technologies and their applications will help educators to further improve and add "value" to their curriculum delivery if the right m-learning technologies are selected.

Learning Management System

Used broadly by many educational institutions, a learning management system (LMS) is expressed in various forms, including "course management system" (CMS), "managed learning environment" (MLE), "learning support system" (LSS) and "virtual learning environment" (VLE) (Chung, Pasquini, & Koh, 2013; Saroha & Mehta, 2016). As an e-learning platform, LMS was originally designed for facilitating distance learning and the offering of various online learning courses in higher education which gave flexibility to students with an alternative choice of learning mode other than the conventional face-to-face learning (Gros & García-Peñalvo, 2016; Hung, Lam, Wong, & Chan, 2015; Navimipour & Zareie, 2015).

LMS Functions

As described by numerous scholars, the key functions of LMS cover the management and administration of courses and programmes; the provision of information and distribution of course content to students; tracking students' performance and status of learning; and enabling discussion and interaction among educators and students (Itmazi, Megías, Paderewski, & Vela, 2005; Konstantinidis, Papadopoulos, Tsiatsos, & Demetriadis, 2012). As further explained by Jurado (2013), an LMS enables both one-way and two-way communications, including teacher-to-student, student-to-teacher and student-to-student. Kasim and Khalid (2016) provided a more comprehensive description of LMS functions by categorising them into three different aspects: (1) learning skills tools, (2) communication tools and (3) productivity tools, as illustrated in Fig. 7.1. Typical examples of functions performed in different aspects are highlighted which project a clear picture of how educators or stakeholders can use the system for supporting and improving students' learning experience in real practices.

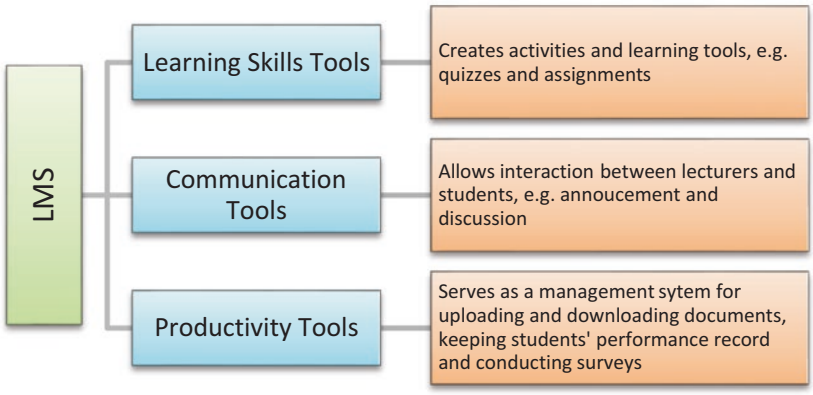

Fig. 7.1 Functions performed by a typical LMS (Kasim & Khalid, 2016)

Development of LMS: An Extension from E-Learning to M-Learning

Moodle, WebCT, Blackboard, ATutor, Carvas and Desire2Learn are common examples of LMS being used by institutions for supporting e-learning (Lu, Newman, & Miller, 2014; Madeira, Silva, & Palma, 2012). Due to the significant increase in the use of mobile devices by students nowadays, many existing LMS service providers have integrated and converted the original versions used in the desktop environment into a mobile-usable version—the "mobile learning management system" (m-LMS). As pinpointed by Hung et al. (2015), the majority of m-learning services available at this stage are basically operated by LMS. The mobile version keeps all the original functions of LMS which enable educators to distribute learning materials and information to students, and conduct online teaching and assessment, such as the provision of online teaching videos and online quizzes. At the same time, it provides an interactive platform through the functions of online forum and messenger which allow group discussion and sharing of opinions among students and educators for facilitating cooperative learning. The transformation of conventional LMS to m-LMS has led to a key advantage for users—its convenience and flexibility in gaining access to the learning system anytime and anywhere, which creates a more favourable foundation and environment for promoting m-learning in the new era (Hamuy & Galaz, 2010; Lowenthal, 2010).

The technical issues of converting all contents to be used from the original LMS setting into a mobile environment which fits different types of mobile devices seem no longer a problem with the advances in technologies and the introduction of new operational systems. Nowadays, any user can easily gain access to the m-LMS by using the web browser application available in their mobile devices. Illustrated below in Fig. 7.2 is a typical example of an LMS operated in a desktop environment.

Fig. 7.2 An example of LMS operated in a desktop environment

Fig. 7.3 An example of m-LMS with the contents automatically fitted to the screen size of a mobile device in the environment of a web browser

The same contents can also be accessed by using a mobile device through the built-in web browser as shown in Fig. 7.3. A slight change in the layout can be observed due to the difference in screen size in the two different platforms. In principle, the contents and layout will be automatically adjusted to fit the screen sizes of mobile devices to improve the readability and ease-of-use for the end-users. Yet, the access to the m-LMS by using the web browsers in mobile devices still has its limitations. For example, common problems reflected by users are that they cannot stay logged in for long hours and the presentation of the contents may not be nicely fitted on the screen.

The introduction of LMS apps in recent years has eliminated these limitations (see Fig. 7.4 for examples of LMS apps available in the market). After downloading the LMS apps, end-users can gain access to the system at any time by just one click without entering log-in names and password every time which has further enhanced the usability of LMS when operated in a mobile setting.

Challenges of LMS Applications

Although LMS is considered the most frequently used option for e-learning as highlighted by Bogdanović, Barać, Jovanić, Popović, and Radenković (2014), it cannot be overlooked that there are still many limitations which hinder the use of such a learning system from the perspectives of students, educators and institutions. Even though the increase in the use of mobile devices has successfully created a new option for students in accessing LMS at anytime and anywhere, the overall usage rate of m-learning is still low. According to the works of different scholars

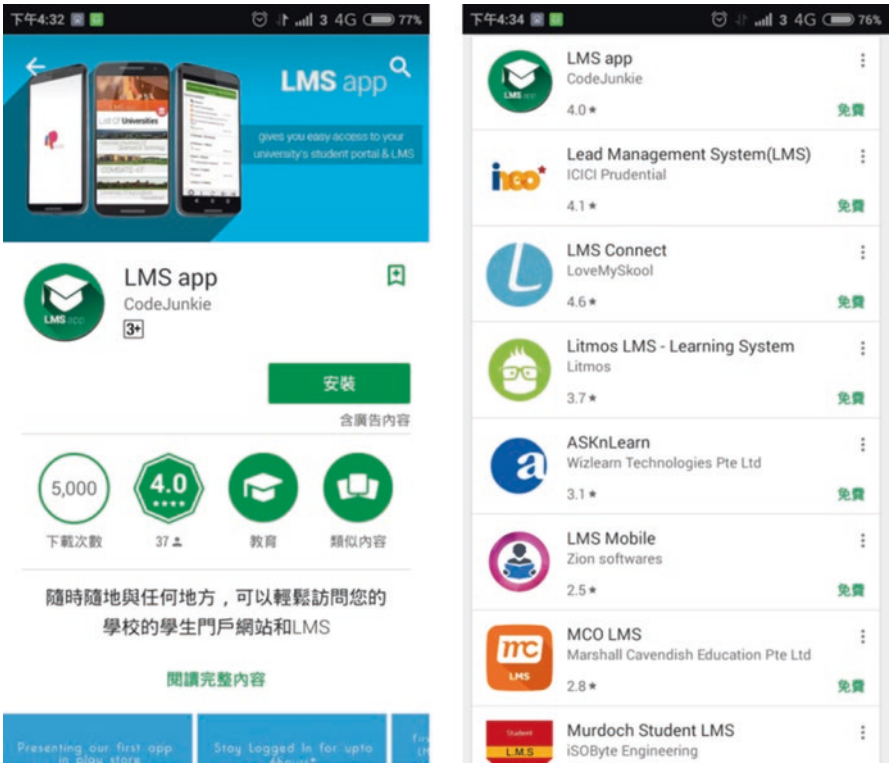

Fig. 7.4 Examples of m-LMS apps tailor-made for mobile devices

(Bogdanović et al., 2014; Chu, Hwang, Tsai, & Tseng, 2010; Jurado, 2013; Leavoy, 2016; Mays & Wiggill, 2016; Pappas, 2014), various challenges are being faced by institutions in the use of LMS, both the desktop and mobile versions. A summary of the key difficulties being confronted by different stakeholders is given in the following table (Table 7.1).

Global Positioning System (GPS)

GPS Functions and Applications in Daily Life

According to Zahradnik (2016), a global positioning system (GPS) refers to a group of satellites operating in the earth's orbit, from which signals can be transmitted and detected by receivers on the ground for generating useful information, including location, distance, speed and time. As a built-in feature installed in mobile and other devices, the GPS is widely utilised by different sectors for offering various kinds of location-based services. Examples of services vary depending on the applications

Table 7.1 Challenges in the use of LMS applications

Key challenges	Problems of LMS/m-LMS in detail
Poor design of the learning content	The learning contents are mainly written in text only.
	The readability is low if the contents cannot be optimised but are presented in lengthy sentences and paragraphs which may discourage students from learning online.
	The use of multimedia (e.g. video, audio and graphics) is limited, which fails to attract students and draw their attention.
Shortcomings of mobile devices and network connectivity	The short battery life of mobile devices may limit the duration of using m-LMS.
	The screen sizes are generally small for mobile devices, leading to difficulty in reading the learning contents.
	Typing by using mobile devices is less convenient when compared with desktops, creating barriers to discussion and sharing of information in the forum.
	The hardware requirements of mobile devices are high and not all people can afford to purchase a high-quality smartphone.
	Network connectivity in some locations or countries is poor which hinders the development of m-learning, including m-LMS.
	Data transferring and wireless communication fees can be very high in some countries, which may prevent people from learning online.
	A majority of LMSs only enable users to access their contents online, but there is no accessibility when staying offline.
Lack of student motivation	Students mainly use LMS for accessing learning materials, such as only downloading lecture notes. Other functions such as the discussion board or forum are rarely used by students if they are not requirements set by the course.
	It has become a trend for some students, and even teachers, to utilise less formal communication channels for sharing learning information or initiating group discussion on course issues, such as WhatsApp and other social communication networking tools. Some consider LMS as too formal or bounded by its usage for academic purposes which has demotivated students from using it.
	Students can be easily distracted by various stimuli in their surrounding environment when m-LMS is being used, leading to lower concentration on e-learning when compared with face-to-face learning.
Inexperienced teaching staff applying e-learning	Subject matter experts may not be knowledgeable about using IT and may hesitate to applying LMS in their teaching.
	Teaching staff generally receive no formal training on how to transform dull subject contents into interesting e-learning resources.
	In general, it takes time for teaching staff to become familiar with LMS applications before they can start integrating them into their curriculum delivery. Most of them have no instructional design knowledge in advance, meaning that it is less likely for them to optimise the use of LMS even if LMS training is provided.

(continued)

Table 7.1 (continued)

Key challenges	Problems of LMS/m-LMS in detail
Cost implications	For initiating the use of LMS, institutions have to pay the cost of development and technical support. The fees charged by commercial LMS service providers can be expensive.
	Even if free/open source LMS can be used, the add-on functions or tailor-made features may require extra fees to be paid to suppliers.
	Institutions which develop their own LMS have to invest money for the development project. Setting up one's own servers and long-run IT support may involve a huge investment.

Table 7.2 GPS applications in different sectors and their corresponding examples

Sectors utilising GPS	Examples
Agriculture	GPS data collected can help precision soil sampling and determine localised variation of chemical applications and planting density.
Aviation	The GPS provides useful data which enables the planning of safe, flexible and fuel-efficient routes for airlines.
Ground transportation	The GPS is used to locate vehicle location, making it possible to provide useful information to passengers such as approximate waiting time for public transport, or to enhance the accuracy of navigation systems for drivers.
Recreation	Positioning information on the GPS can help tourists or outdoor adventurers with safer exploration anywhere in the globe.
Environment	Preservation and protection of endangered species can be facilitated by GPS tracking and mapping functions.
Health care	The positioning of victims in accidents enables speedy rescue searches to be conducted.

used by the general public, such as Google Map for identifying locations and offering navigation services to applications used in specific situations such as conducting rescue searches in accidents or emergencies (GPS.gov, 2017). A few sectors which have benefitted from the use of the GPS and their corresponding examples of applications are illustrated in Table 7.2.

GPS Applications in Education

With no exceptions as in other sectors, GPS technology has also been extended and utilised in education. For example, Prasad and Aithal (2017) stated that the GPS is a key element for facilitating location-based M-learning which allows learners to gain access to different learning contents based on their location information detected by the GPS. It also helps mobile context-aware learning (MCL) and authentic learning as described by Sun, Chang, and Chen (2015) which offers a more favourable environment for learners to associate their learning with real-life

situations when knowledge transfer is no longer bounded by or has happened in a conventional classroom setting.

There are numerous practical examples of GPS applications in enhancing m-learning. For instance, a mobile plant learning system (MPLS) was developed based on GPS technology which allowed young students to search and identify plants to be located nearby by referring to an electronic map (Huang, Lin, & Cheng, 2010). As an outdoor learning activity, a database with information on known plants, including their features and locations in the map area, was developed for creating the MPLS. While enjoying the outdoor learning activities, students were instructed to go to different locations based on the e-map installed in their mobile devices. Once a specific plant was found, students can observe the real objects and, at the same time, gain access to the database which provides detailed information about the plant. In addition, the system also has a sharing function which allows students to share their photos, locations and text information in their learning process. Such a function has helped to enrich the existing database of known plants and, moreover, the creation of a new database with unknown plants to be found in other locations also promotes peer learning among students.

One point that should be highlighted is that educators tend to combine the use of the GPS with other technologies in creating m-learning experiences for users. For example, Smith, Bradley, Cook, and Pratt-Adams (2012) have conducted a study on how urban education can be delivered through the use of a mobile learning tour programme. The programme was developed by using a media gaming platform 'Mscape' with GPS as the positioning tool which enables learners to receive learning contents, that is the past and present stories on certain locations when they walked along the tested area. This illustrates a typical example of how game-based and location-based learning can be combined to create a more interesting and meaningful learning experience for users. The popularity of a mobile game "Pokémon Go", with the integration of both GPS and AR technologies may have also led educators in new directions for m-learning design. A recent case of a college in the United States which used "Pokémon Go" as a theme in its physical education course and promoted exercises through walking and searching for Pokemon characters (as described Ryssdal, 2016) may project how GPS and other m-learning technologies can be utilised to motivate our learners in the future.

Limitations of GPS Applications

Research with the main focus on examining the shortcomings of GPS applications in education is rare at present. However, studies investigating the general applications and accuracy of GPS, as well as other location-based technologies of a similar nature, are numerous (Basiri et al., 2017; Koyuncu & Yang, 2010; Liu, Darabi, Banerjee, & Liu, 2007). In principle, the key challenges of GPS application can be classified into two categories as summarised in Table 7.3.

Privacy and safety concerns may affect learners' trust in using GPS-based software for an m-learning experience. Whether such uncertainties can be removed or

Table 7.3 Challenges of using GPS applications in education

Key challenges of GPS applications
Users' perspective
Service providers offering GPS location services can potentially store, use and sell users' data, such as location history, activities and preferences, for profit.
Users may feel insecure about disclosing their locations to others due to privacy and safety concerns.
Technical perspective
GPS technology can function well in outdoor but not indoor positioning. Signals transmitted in an indoor environment will be very weak as they are always blocked or reflected by the walls of buildings, leading to a decrease in accuracy in generating positioning information.

not depends mainly on the regulations on how data should be collected and used by service suppliers, and the terms agreed by customers on their using the GPS-based learning software. From a technical perspective, the weakness of GPS in its accuracy in indoor positioning can be resolved by the use of other indoor positioning technologies, such as beacon-based and dead-reckoning positioning systems which supplement and automatically switch from the GPS when m-learning software detects users to be situated in an indoor environment (Basiri et al., 2017).

Augmented Reality (AR)

AR Functions and Applications in Daily Life

Tan, Chang, and Kin (2015) define "augmented reality" (AR) as a technology which enables the display of "virtual contents superimposed upon real-life objects". As further elaborated by Van Krevelen and Poelman (2010), AR is not limited to visual stimuli, but has possible applications in generating stimuli in all senses, including sound, odour and physical stimuli in real contexts. Through using computer-generated graphics, sound and other forms of stimuli, AR enables a mixing of virtual elements with reality which creates a new way for users to see, hear or even touch, and such a learning experience seems to be more meaningful for students when compared with the conventional way of learning in a classroom environment (Emiroğlu & Kurt, 2017; Van Krevelen & Poelman, 2010).

In principle, AR differs from virtual reality (VR) in its ability to combine and align both real and virtual objects in three dimensions which allows interactions with users in a real environment in real time. For AR applications, basic hardware is required, including the presence of a high-resolution camera, efficient storage space and a powerful processor, plus other supporting technologies such as a GPS system, image recognition software and other interfaces (Bower, Howe, McCredie, Robinson, & Grover, 2014).

Referring to numerous studies (e.g. Chi, Kang, & Wang, 2013; Mekni & Lemieux, 2014; Shin et al., 2010), the applications of AR cover a variety of different areas, including medical, manufacturing, marketing, navigation, tourism and civil

Table 7.4 AR applications in different sectors and their corresponding examples (Mekni & Lemieux, 2014)

Sectors utilising AR	Examples
Medical	An integration of ultrasound imaging with AR enables health practitioners and pregnant women to view the interior of the abdomen.
Military	An animated terrain can be created and displayed by using AR technology which can assist the planning of military intervention.
Manufacturing	Graphical assembly instructions for products can be made by using AR technology which increases the ease and reduces the time spent on staff training.
Advertising	Visual advertising messages can be added in a football field and be seen by the audiences at home with the help of AR while in live broadcasting.
Tourism	Tourists can use an AR interactive visualisation system installed in their mobiles to provide information on different points of attraction in a self-guided itinerary.
Navigation	A car windshield heads-up display which shows the actual front view of the vehicle with AR routes, highway exits and other information overlaid in 3D can be referred to by drivers.
Urban planning	A projection-based AR tabletop interface can help to create a simulation of a certain site or area which helps to make urban planning easier for engineers.

engineering. A summary list of AR applications in different sectors is illustrated in Table 7.4.

AR Applications in Education

There are numerous papers on AR applications in education, among which is a comprehensive review conducted by Bacca, Baldiris, Fabregat, and Graf (2014) which stated that AR technology is being applied extensively in the learning of science, humanities and arts disciplines. The AR applications assist in the explanation of topics and provide additional information which helps to enhance the learning performance and motivation of learners—key advantages agreed by various scholars (Bacca et al., 2014; Chang et al., 2014; Jara, Candelas, Puente, & Torres, 2011). Also, the use of AR technology to improve the presentation of learning content and its interactions with users in the presence of real-life learning objects seems to have been the key factor leading to the rapid development of such a technology in education (Liou, Yang, Chen, & Tarng, 2017; Tan et al., 2015).

With m-learning becoming more popular due to the continuous advances in mobile technologies, the transformation of AR to mobile augmented reality (MAR) has also drawn the attention of educators in the new era of learning (Emiroğlu & Kurt, 2017). As already noted, such a technology has already been extensively applied by educators and learning contents such as AR images can be shown on the display screen of portable devices for improving the effectiveness of m-learning for the end-users (Kidd & Crompton, 2016).

The introduction of Google Glass has shown its potential for facilitating the AR applications by creating various kinds of m-learning experiences for users in different disciplines. At this stage, the function of Google Glass which enables immediate language translation while a user is looking at a paragraph of text (e.g. a book written in a foreign language or a menu in a restaurant) provides a good foundation for the development of an AR or MAR learning experience for the general public across the linguistic boundaries (Rauschnabel, Brem, & Ro, 2015). According to the study by Leue, Jung, and tom Dieck (2015), visitors at an art gallery can put on their Google Glass which produce AR images and information related to the art pieces during the gallery tour. Information such as artists' backgrounds, themes, the meaning embedded in the art pieces, and their association with the corresponding history and culture can be shown concurrently on the screens of the glasses, together with the real objects, or listened to by the users in audio format during their museum tour.

Another recent study conducted by Chaballout, Molloy, Vaughn, Brisson III, and Shaw (2016) also illustrated how health science students can benefit from using Google Glass in their clinical simulation practices. The results showed that students learned better in AR simulations generated by Google Glass when compared with the conventional method of paper-based learning. Moreover, the AR applications have also been strengthened or extended with the integration of gesture detection or motion capture technologies. For example, Lin et al. (2017) recommended the integration of Google Glass with Ubii (ubiquitous interface and interaction), an interface system connected to a number of smart devices in an environment which detects and translates the gestures of users into commands for operating Google Glass without physically touching the device in reality. Such an application can be applied in m-learning with interactive AR contents to be created for learners in different subject areas. To further extend the application, a recent study by Pavlik (2017) tried to examine the use of an IT-driven experiential media platform for helping learners with disabilities. All of the above studies helped educators and m-learning designers to see how AR technologies can be applied to cater for the diverse needs of learners in the future.

Last but not least, while many educators and m-learning designers are exploring how AR technologies can be applied in supporting education, an interesting study was conducted by Liou et al. (2017) which attempted to compare AR and VR utilisations in students' learning experience. By involving a group of young students (10–11 years old) studying an astronomy course as the sample, their experience of using both AR and VR technologies during the course was examined. The findings showed that AR functioned better in reducing the mental load of students and helped to make it easier to acquire the subject knowledge due to its key advantage of integrating virtual objects with reality. The difference in mental load helped students to perform better in AR learning and they perceived AR learning contents to be more useful when compared with the use of VR technology.

Table 7.5 Challenges of using AR applications in education (Akçayır & Akçayır, 2017)

Key challenges of AR applications in education
Users' perspective
AR may be difficult to be used by some students who have their own learning preferences or needs.
The time spent in using AR could be more than with conventional learning—For example, the time spent in learning how to use an AR learning software may not be worthwhile when compared with simply reading a textbook.
It is difficult to be conducted in large group as interaction with the same learning object is required.
Technical perspective
Low sensitivity in triggering recognition
Location-based services/GPS errors
Other technical problems of learning devices, including camera and Internet connection

Challenges of AR Applications

The extensive literature has shown that AR applications can enhance the learning experience of learners in different aspects, but a recent review of the area by Akçayır and Akçayır (2017) has pinpointed the shortcomings of such a technology in the setting of education, with key findings shown in Table 7.5.

It will only be a matter of time before these technical limitations can be resolved with the continuous advances in technology, similar to the situation of GPS applications. However, it will be a significant challenge for educators to re-shape the learning styles and preferences of students if AR is going to be added as a kind of teaching approach in different subject areas. Training will be essential for learners to ensure the effectiveness of AR applications in m-learning. Investment in setting up an AR learning environment which combines technology with learning contents will also be one of the considerations of institutions if such an approach is going to be implemented in the long run.

Instant Messaging and Social Networking Apps

Besides the GPS and AR applications discussed above—which have shown great potential in transforming the conventional way of learning into a new era of m-learning experience for users—it is possible that other IT applications that are being used by the general public for communication in their daily lives may also help learners to learn at any time and any place. The use of instant messaging and social networking apps are two typical examples which are being explored by academics and practitioners for their potential integration with m-learning, and the challenges to be tackled before such a platforms can be fully utilised for educational purposes.

Instant Messaging, Social Networking and their Potential Applications in M-Learning

Due to the continuous advancement of mobile functions and telecommunication technologies, people can contact anyone easily by using mobile apps installed in their handheld devices. The use of instant messaging and social networking apps has become part of our daily lives, which has led to concern among educators about how such applications can be utilised and extended in promoting both formal and informal learning in an m-learning environment. For example, a recent study by Barreh and Abas (2015) illustrated how mobile learning can be implemented and enhanced through the use of SMS and Facebook. The results showed that students were more receptive in using both media for tasks such as the sharing of ideas, discussion and conducting learning activities if they were in the appropriate format for users.

In fact, SMS is no longer the most popular means of instant messaging used in a mobile environment. Church and Oliveira (2013) highlighted other apps, such as "Line" and "WhatsApp", which enable users to send instant text messages, photos, videos and even files of various formats, to individuals and groups easily and conveniently. Even though mobile instant messaging apps are widely used nowadays, studies on how they can be applied in promoting learning are limited and disorganised. The study conducted by Tang and Hew (2017) is one of the few exceptions, which aimed at providing a comprehensive review on this particular aspect. As highlighted in their study, not only text but the integration of audio and video in one single interface makes instant messaging apps very user-friendly when compared with the conventional LMSs which students consider as too complicated in their operations. The audio recording function also supports language learning with dialogic activities such as focused discussion being easily promoted by using the media. Functions such as adding 'emoji' in messages, instant photo-taking and an online visual phone also help users, especially learners on online courses, to develop their social presence and strengthen their motivation to participate actively in collaborative and peer learning tasks with no boundaries of geographical location.

Facebook is a typical example of social networking platforms. It can be defined as a public/semi-public profiles created by users and their articulations with other users to exchange and share information (Gikas & Grant, 2013; Pimmer, Linxen, & Gröhbiel, 2012; Salehan & Negahban, 2013; Shen, Kuo, & Ly, 2017). As the most popular social networking platform, with active users reaching two billion in June 2017 (Kallas, 2017), it is in a leading position, far ahead of other players in the market, including YouTube, Instagram and Twitter. With such a huge user population, various scholars have tried to highlight the potential and advantages of integrating social networking with learning (Lomicka & Lord, 2016; Rennie & Morrison, 2013; Traxler, 2016). In particular, Traxler has pinpointed the key characteristics of social networking platforms which enable the delivery of a more

"timely, personalised and contextual experience" for learners. These will be the advantages of using the social networking platform and may help to overcome the general criticism of the conventional way of learning as being based too much on mass-production.

Challenges of Instant Messaging and Social Networking Applications in M-Learning

While users are motivated to learn through the use of instant messaging and social networking apps, numerous scholars have also highlighted their potential problems which may be created in the m-learning experience for users as highlighted in Table 7.6 (Bosch, 2009; Bouhnik & Deshen, 2014; Lauricella & Kay, 2013; Mao, 2014; So, 2016; Tang & Hew, 2017):

It can be observed that the key challenge in using both channels in m-learning is concern about privacy by both learners and teachers. Communications after school hours and the risk of exposing their personal lives to others may make both parties hesitate, which may hinder the development of m-learning activities to be delivered by both channels. Clear guidelines should be provided by institutions on how the channels concerned should be used to fine-tune users' expectation. Also, learning activities should be carefully designed if delivered through social networking platforms. Educators should think carefully about how learning activities can be developed to fit this informal learning channel and how "entertaining" it can be as perceived by users so that they will be more willing to play an active learning role while enjoying the "fun" provided in the learning process.

Table 7.6 Challenges of using instant messaging and social networking applications in education

Key challenges of instant messaging and social networking applications in education
Instant messaging
Formal language is less likely to be used in the communication process, leading to the risk of miscommunication and misinterpretation of messages among users.
Difficulty in restricting the time of message delivery leads to the risk of intrusion into the private lives of both learners and teachers.
No guidelines are set for teachers on when and how frequently they should respond to messages. Students may expect immediate answers and feedback which can differ from the teachers' expectations.
Social networking
Students can be easily be distracted by other contents posted in the platforms and become less productive in their learning process.
A majority of students still perceive social networking platforms as a kind of "entertainment" rather than a means for "learning".
Both teachers and students may hesitate about "adding" each other in the network as some may not want to expose their private lives to others in non-school hours.

Conclusion—Implications for Education in the Future

The examples discussed in this chapter represent only a small cluster of existing technologies that can be applied by institutions to produce a better m-learning experience for students. As highlighted at the beginning of this chapter, a blending of more than one technology should be applied at the stage of curriculum design as this helps to create a fruitful m-learning experience for users. The decisions on which technologies should be applied depend on a number of factors, including the subject area, budget and students' learning preferences/styles—as well as the capability of educators and m-learning designers on how technologies can be combined well with the learning contents to fit the needs of students.

Through the discussion of some existing m-learning technologies in this chapter, the author would also like to conclude that well-designed m-learning applications should share some similarities in two key aspects as listed in Table 7.7.

Users should experience minimal barriers (e.g. ages, languages, locations and time) when using m-learning technologies. The effectiveness of m-learning can be further enhanced, assuming that the compatibility and connectivity of applications across various mobile platforms will no longer be a concern under continuous advancement of technologies in the future.

How m-learning technology can be designed to become more enjoyable should be a hot topic for future investigation. It is believed that a well-designed m-learning application should have close connection with users' daily experience and it should facilitate interactions and sharing of opinions with peers which help encourage users to develop a "habit" of using such technologies in their daily lives, like the use of Facebook and other social media at this stage. Besides, the critical issues of how educators can add "fun" elements into the m-learning applications and how they can motivate learners to take implicit learning should be left for future considerations by educators in their planning of using m-learning technologies on a case-by-case basis. This chapter has summarised the existing state of m-learning technologies—their applications and key considerations—that help informing decisions on adopting such technologies in curriculum delivery.

Table 7.7 Key factors leading to a well-designed m-learning application

High Usability
User-friendly for all with diversity needs
Easy access at anytime and anywhere
Affordable to all
Compatible to all mobile devices with no specific hardware and software requirement
Enjoyable learning experience
Should have close connection with one's daily life
Encourage not just explicit but implicit learning of users
Add "fun" elements in the m-learning design
Interactions among users can be the key to facilitate peer learning and enrich their learning experience

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Chapter 8
E-Learning and Innovative Education: Strategies for Adding Innovation and Value to Educational Research

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Abstract The advancement of computing and communication technologies has significantly changed the conception of teaching and learning in the past decades. Such a paradigm shift has attracted the attention of researchers from the fields of both computer science and educational technology, who have tried to conduct various experimental e-learning studies to improve students' learning performance. However, finding a valuable and innovative research topic is a challenging task for most researchers. Many papers submitted to well-recognised journals are rejected due to their lack of innovation. In this chapter, the strategies for finding innovative e-learning research topics, as well as the criteria for publishing a quality paper, are presented. In addition, several authentic examples are given to demonstrate how the value of an e-learning study can be promoted. Finally, several suggestions are given to provide guidance to researchers for planning their research careers.

Keywords e-learning · Educational research · Innovative education

Importance of Finding a Good Research Topic

There is no doubt that a good research topic is the key to the success of a study. A good research topic for e-learning should be innovative and meaningful — that is, it is different in some way from those reported by previous studies. Also, the findings of the study must be able to inspire researchers, school teachers/learners, or policy-makers to conduct follow-up studies, improve teaching/learning, or make good decisions in the future. The problem is how to find a valuable and innovative research topic.

What is a good research topic? To answer this question, we need to know the features of technologies and how they can be applied to educational settings. Also,

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_8

we have to know what has been done in the field of technology-enhanced learning. Usually, we would suggest that novice researchers should read a series of relevant studies, or even write a review paper, if they are going to conduct research in a new field. Through writing a literature review, a novice researcher would become aware of the research trends in a particular field, which is helpful in finding an innovative research topic. For example, from a review paper entitled "Applications, impacts and trends of mobile learning – a review of 2008–2012 publications in selected journals" by Hwang and Wu (2014), it was found that most mobile learning studies were conducted in the areas of environment and ecology, history and culture, language, engineering, and computer courses. On the other hand, there were far fewer studies in astronomy, physics, chemistry, biology, art, medical science and nursing, mathematics, and business; and, therefore, for those researchers who are going to conduct innovative research, it could be a good direction to consider using technologies in these areas. Moreover, from the review paper, it was also found that a large number of studies have reported that students' learning achievements, motivation, and interest were significantly improved when using mobile technologies to learn, implying the need to investigate other issues, such as students' higher-order thinking, in the future.

After determining a good research topic, a proper experimental design is usually required to collect data in order to answer the research questions. Following that, it is also important to write a quality paper to present one's research findings and their implications in a logical manner.

Learn to Tell What Is Innovative in Existing E-Learning Studies

There is an interesting way to test a researcher's sense of innovation in e-learning studies, viz. trying to find the important terms from the titles of existing e-learning papers or projects. In the following section there are several titles of research projects approved by the Taiwan Ministry of Science and Technology (Taiwan MOST) in 2010.

1. *"From Web 2.0 to Web 3.0:Impacts of information technologies on learning motivation, learning process and assessment"*

   This research project was approved by Taiwan MOST in 2010. Here is the first question: if a project with the same or a similar title is proposed this year (i.e. 2017), does it have a good chance of being approved? If the answer is "yes", try to find the most important term in the title that makes this project still innovative nowadays. Is it "Web 2.0", "Web 3.0", "information technologies", "learning motivation", "learning process", or "assessment"? The answer is "learning process", since most previous studies have mainly investigated research issues and examined the effectiveness of an e-learning strategy or system by collecting data through conducting pre-tests, post-tests, pre-questionnaires, and post-

questionnaires, while only a few have tried to examine students' learning processes. Therefore, I consider that a research title that takes "learning process" or "learning analytics" into account would be more innovative than those that do not consider this issue.

2. *"Motivation-oriented design and performance evaluation of game-based learning."*

   Is this topic still innovative nowadays without adding additional value to the study? It seems to me that a study like this is not innovative enough since there have been many digital game-based learning studies reported by researchers in recent years, and a large portion of these studies have investigated the issue of "motivation". Therefore, if someone intends to conduct a study related to digital game-based learning and motivation nowadays, it would be better to reconsider the research design by adding new elements to the study; and a good example would be the investigation of the issue of "learning process" or "learning analytics" mentioned above.

3. *"Impacts of the lead-in of Demon spokesperson (a character who always proposes opposite opinions) on young students' participation in collaborative argumentation and development of argumentation ability."*

   Is this title still innovative today? Yes, I think so. It would be interesting to answer a question about this project title: what is the most important term in this title which makes it still innovative? Is it the term "collaborative"? No it is not, as there have been many collaborative learning studies in the past decades, and so to have innovations nowadays, more valuable elements are required. As mentioned above, most previous studies have focused mainly on students' learning achievements, motivations and interest, or some other such issues, while few studies have been conducted to investigate students' "argumentation" competence; and so "argumentation" would be the most important term that adds value and innovation to this project.

4. *"Implementation and evaluation of an emotional intelligence assessment platform for preschool children."*

   What about this project title? Could a project with such a title be approved if it is proposed this year? The possibility is high, since few studies have been conducted to investigate the issue of "emotional intelligence"; moreover, the subject of "preschool children" is rarely seen in e-learning studies.

5. *"Impacts of students' cognitive styles on their reasoning performances in digital games."*

   Following the above discussion, it is apparent that a project with such a title is likely to be approved nowadays since "reasoning" is a higher-order thinking competence that has seldom been investigated in previous e-learning studies.

Strategies for Adding Innovation and Value to Educational Research

Based on the discussion above, five strategies for adding innovation and value to e-learning studies are proposed, as follows:

1. *Using innovative technologies in an e-learning study*: The problem is how to define "innovative technologies". Can Augmented Reality (AR) be considered as an innovative technology nowadays? The answer is "no", since there are several well-known AR apps available in Android or Apple stores, meaning that it is already a popular technology. This implies that simply applying AR to educational settings would fail to increase the innovation of a study. At the present time, the Internet of Things (IOT) and wearable devices could be innovative technologies for e-learning since so far few educational studies on these two technologies have been reported.
2. *Investigating seldom-discussed issues*: "Seldom-discussed issues" refers to those important issues that have not often been discussed or investigated in previous studies. Usually, it is more difficult to evaluate such issues than those that are frequently discussed (e.g. learning achievement, learning motivation, and learning interest). Normally, such seldom-discussed issues are associated with higher-order thinking, such as problem-solving ability, creativity, critical thinking, or learning process analysis, such as learning behaviours and interactive behaviours. There is no doubt that investigating such issues would increase the innovativeness of a study.
3. *Proposing or leading in new strategies or tools*: It should be noted that using "new" strategies or tools does not imply that the strategies/tools have never been used in previous studies. Instead, they could be some well-known strategies or tools that are "new in the present learning context". For example, in the study by Hwang, Shi, and Chu (2011), concept mapping was employed to help students organise what they had experienced in the field, as well as what they had learned from the textbook, in a mobile learning activity. Concept mapping was not a new strategy at that time; however, in the learning context (i.e. mobile learning in the field), using concept maps to help students organise knowledge and experience was new. Therefore, if we design a learning activity which engages students in developing concept maps in the class, the learning design might not be new. However, if the same strategy is employed on a different occasion that no or few studies have ever tried, the research design could be new. This implies the importance of knowing the research trends and reading the literature.
4. *Investigating the impacts of e-learning on the learning performances and perceptions of seldom-applied subjects*: Usually the participants in an e-learning study are elementary school students, high school students, or college students, while the impacts of e-learning on the learning outcomes of some particular subjects — such as gifted students, working adults, students with different levels of high anxiety, and pre-school children — have seldom been investigated.

5. *Applying e-learning approaches to seldom-applied domains*: Based on the literature, several application domains, such as art, design, business, chemistry, physics, nursing education, and enterprise training, are examples of such domains.

Examples of Using the Five Strategies to Add Innovation to a Study

Here are some examples of adding innovation and value to research based on the five strategies.

1. *Leading in new technologies:* A good example of this approach can be found in the study conducted by Hwang, Wu, Chen, and Tu (2016). In their study, a board game-like context-aware AR system was developed for guiding students to learn in a butterfly garden in a competitive gaming mode. Although both gaming and AR seem to be well-known strategies and technologies, the integration of AR and the in-field board game did create a quite interesting and innovative learning context.
2. *Investigating new or seldom-discussed issues:* An example can be found in the article by Hwang and Chen (2016), in which they investigated students' behavioural patterns, critical thinking, and problem-solving tendencies, as well as their learning achievement and motivation in a context-aware gaming environment. Another example is the paper by Wu, Hwang, Su, and Huang (2012), in which a context-aware mobile learning system was proposed for supporting nursing skills training, which is an issue relatively seldom discussed.
3. *Leading in new strategies or tools:* The first example of using this strategy is the study carried out by Hwang, Wu, and Ke (2011), who proposed an "interactive concept map approach" to support mobile learning activities for natural science courses. Although concept mapping is not a new strategy, a map that can "interact" with students in the field by providing instant feedback to them based on the quality of the concept maps they developed is innovative. Another example is the study by Wu, Hwang, Tsai, Chen, and Huang (2011), who developed a mobile learning system for clinical nursing courses based on the repertory grid approach. Although the repertory grid was a knowledge acquisition and organisation method proposed in 1955, the use of this method in mobile learning for nursing education was new.
4. *Applying e-learning approaches to particular subjects*: One example is the study conducted by Hung, Hwang, Lin, and Su (2012), who compared the difference between the in-field mobile learning performances of gifted students and average students for ecology enquiry.
5. *Applying e-learning approaches to seldom-investigated domains:* The study published by Hwang, Yang, Tsai, and Yang (2009) is a representative study of applying mobile, wireless communication and sensing technologies to a very particular application domain — complex science experiments in chemistry or

material science. Another study in this category of innovations is that of Sung, Hwang, Liu, and Chiu (2014) who employed a prompt-based annotation approach for in-field activities on an architecture design course. It is apparent that both complex science experiments and architecture design are application domains of e-learning which are rarely seen, even nowadays.

Conclusions and Suggestions

In addition to the strategies for finding innovative research topics, here are several suggestions for researchers who intend to conduct e-learning studies. First, design a series of research topics based on your strengths — individual researchers have their own strengths, such as a strong theoretical background in education, good technological skills, or good experience in particular courses. For an experienced English language teacher, the knowledge and experience of teaching English courses are his/her strengths; and, therefore, it is suggested that he/she could design a series of research topics related to English learning by adding innovative strategies, new technologies, or particular issues to the studies.

The second suggestion is to adopt the existing measures or questionnaires in the research design. Those frequently adapted measures or questionnaires published previously — such as the questionnaires on learning motivation, learning attitudes, self-efficacy, cognitive load, problem-solving, critical thinking, communication, collaboration and creative thinking, or cognitive styles — are generally more reliable.

The third suggestion is to carefully design an experiment to show the effectiveness of your approach. Two adjectives should be noticed here: *meaningful* and *reasonable*. We need to design meaningful experimental group learning with the proposed intervention or learning approach. Moreover, it is important to examine why the intervention could benefit the students. It is also important to design a reasonable control group as the students in the control group need to be treated fairly (e.g. in learning time) in comparison with the experimental group; and the approach taken for the control group should at least research the quality of a conventional approach in the school setting.

Fourth, there is no shortcut to fostering research competence and knowledge, but there are some helpful strategies, as indicated below:

1. *Read as many papers published in quality journals (in particular, the journals you are interested in) as possible:* It is suggested that novice researchers start a new research direction by writing a review paper, which enables them to have a global view of what has been done in the field and helps them to determine what needs to be done in the future.
2. *Organise a meeting for knowledge-sharing and brainstorming:* Through sharing my experience with people without hiding anything from other researchers, I am motivated to find more and better research topics. I am very lucky to have great

opportunities to know researchers in different fields; and with their help and my own efforts, I am becoming a researcher who is able to design and conduct cross-field studies. Twenty years ago, I initiated a research meeting for my students every Monday evening to share what they had learned from reading academic papers; and I propose potential research topics based on what they shared. Currently, more than ten researchers from other universities participate in the meetings to share their research ideas.

3. *Serve as a reviewer of quality journals:* Being an active reviewer of more than 30 journals enables me to know the research trends in the field, as well as the criteria for doing good research. I suggest that researchers should spend time serving as a reviewer, which is a very helpful way of fostering the competence of judging whether a research topic is valuable and knowing how to conduct research properly.

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Part II
Educational Resources

Chapter 9
Use of Instructional Design Models and Emerging Technologies in Designing OER Textbooks

Eva Yuen Mei Tsang and Henry M. F. Choi

Abstract The problem of the high price of printed textbooks has aroused attention over the past decades. A major solution for tackling this problem is the use of OER textbooks. The Open University of Hong Kong (OUHK) has developed a series of 12 OER textbooks, namely, Open English, which covers all the school levels in Hong Kong, i.e. from Primary 1 to Secondary 6. The English OER textbooks are not only presented in printed form but are also delivered in electronic form, together with multimedia components. Teachers can customise and adapt the materials to suit various teaching and learning circumstances. In designing the OER textbooks, certain instructional design (ID) models, pedagogical principles and the use of emerging technologies are employed to ensure the quality of teaching and learning. In order to evaluate the materials in a classroom setting, the English OER textbooks have had a pilot run in schools; and teachers' and students' comments and feedback have been collected through surveys. This chapter first discusses the selected ID models and pedagogical principles which guide the development of the whole series of OER textbooks and the rationale behind them. It also illustrates how the various formats—such as PDF, EPUB(s) and mobile apps—can be used in pre-class, in-class and after-class learning environments. The second part of the chapter reports the data collected in the surveys. Both teachers and students were quite positive about adopting the OER textbooks. The possibility of further customising the materials was especially appreciated by teachers in schools for special educational needs.

Keywords ID model · Instructional design · Open textbook · OER · Emerging technologies · Language teaching

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_9

Introduction

Over the past few decades, the high price and frequent revision of school textbooks have aroused attention. For the parents, the price of expensive textbooks for their children is a heavy burden every year. The high price of textbooks does not affect the teachers directly, but they face the problem of adapting the teaching materials to suit students with different abilities in their schools. Tailor-made materials for the school-based curriculum and the use of multimedia learning resources are certainly beneficial for teachers in meeting the various needs of students (Baker, 2019). However, owing to copyright restrictions, teachers are not allowed to revise or modify materials in commercial textbooks. Therefore, they have to seek alternative solutions: either by developing their own materials from scratch, which is quite impossible for busy full-time teachers, or by looking for Open Educational Resources (OER) which are by their nature free of copyright and then customising them (Nagar & Hallam-Miller, 2019).

Relevant studies have shown students' positive attitudes on OER textbooks. Students have been found more likely to use OER textbooks compared to traditional printed textbooks (Algers, 2019; Cuttler, 2019). However, the resources required for OER development and the sustainability of OER have been the major hurdles. Supportive measures have been proposed for development of OER textbooks, such as incentives for reviewing the quality and appropriateness of OER contents and practices of open content creation (Brown, Costello, & Mhichíl, 2019; Nagar & Hallam-Miller, 2019; Pitt et al., 2019).

To support the development of OER textbooks, the Open University of Hong Kong (OUHK) proposed the open textbooks project for Hong Kong in 2012 (Leung et al., 2012; Tsang, Yuen, Li, & Cheung, 2013). With the support of the Education Bureau of Hong Kong SAR (EDB) and funded by the Hong Kong Jockey Club Charities Trust, the OUHK has developed a series of OER English textbooks, namely, *Open English*, for local schools. The open textbooks were sent to the EDB and got approval in 2015. *Open English* was then included in the EDB's *Recommended Textbooks List*.

The OER textbooks are presented not only in printed form but also in various electronic formats, such as PDF and EPUB. The electronic textbooks and the interactive activities and audio tracks are all downloadable from the web, free of charge; and printed textbooks are also available from commercial printers at a reasonable price. The e-versions of the textbooks can be customised and adapted easily by teachers to suit various teaching and learning situations.

Instructional design (ID) models were adopted in the process of design and development of the OER textbooks. The ID models provide guidelines for project management and content design. A number of pedagogical and technological considerations also played vital roles in the development process.

Open English was formally adopted in some schools as their English textbooks in the 2016/2017 school year in Hong Kong. In the process of development, a formative evaluation study was carried out, and students' feedback was very positive

in general (Yuen & Li, 2015). After a pilot run of some modules of the OER textbooks in 2015, a more thorough survey study was conducted to collect teachers' and students' feedback; and both teachers and students were quite positive about adopting them. The possibility of further customising the materials was particularly appreciated by teachers in schools for special educational needs. The design of the surveys and the results of the study are reported in this chapter.

Use of ID Models in Developing the *Open English* Textbooks

Developing an entire open textbook series for primary and secondary level based on curriculum guidelines was an arduous task involving pedagogical and technological considerations. It was also a project management challenge with resource constraints and a very wide variety of stakeholders: reviewers, the Hong Kong Education Bureau and other teams. To undertake the development project effectively and efficiently, the ID models should be adopted as the guidelines for project management and content design. According to Smith and Ragan (1999, p. 2), instructional design is the "systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation". It is crucial to implement learning and teaching strategies effectively so that successful learning experiences can be created. The use of ID models is an essential reference guide as model creators usually adopt one or more learning theories to shape their model and form guidelines for users to follow (Dick & Carey, 1978; Gagne, 1965; Keller, 1987; Morrison, Ross, & Kemp, 2004; Seels & Glasgow, 1998). As Gros, Elen, Kerres, Merriënboer, and Spector (1997) mention, ID models are intended to provide a link between learning theories and the practice of building instructional systems.

In fact, ID models helped us to conceptualise a process or system and simplify the complexities of real situations into sets of generic steps that can be applied in many contexts. Although there are numerous models from which to choose, it is quite difficult to find a "one-size-fits-all" solution as each project has its specific conditions and requirements. Some studies have expressed doubts about the linear approach which does not reflect dynamic ID practices in reality (Branch & Kopcha, 2014; Willis, 2009), and others have indicated difficulty in following the systematic step-by-step prescriptions suggested by the ID models but influenced by authentic situations (Branch & Merrill, 2011; Kirschner, Carr, van Merrinboer, & Sloep, 2002; Silber, 2007; York & Ertmer, 2011). Moreover, ID models based on emerging technologies and changing instructional theories are further fragmented into different versions.

However, the basic ID model concept is based on five foundation concepts, viz. Analysis, Design, Development, Implementation and Evaluation. Although there are several substantive differences among ID models, some scholars have reviewed current ID model development and consolidated them into different categories (Lee & Jang, 2014; Yanchar, South, Williams, Allen, & Wilson, 2010). Gustafson and

Branch (2002) classify the models into three main types: classroom-oriented, product-oriented and systems-oriented models. They further explain the characteristics of product-oriented models which assume the amount of learning materials to be developed within a period of time. The primary focus of product-oriented models is on creating instructional materials/products rather than the comprehensive instructions of systems-oriented models.

Open English closely aligned with the curriculum set by EDB, with heavily structured content in many of its learning activities. Its development also involved various teams with limited resources. The Bates Model (1995) and Seels and Glasgow's "ISD Model II: For Practitioners" (1997) were selected as reference guides during the development process. The Bates Model emphasised four phases which Bates based on his experience in developing open and distance learning. The process includes:

1. Course outline development
2. Selection of media
3. Development and production of materials
4. Course delivery

Bates (1995) mentions that this model relies on theories of instructional design, including those for building student activities and structuring content. Regarding the rapid development in technology, Bates states that technological change has to be considered as one of the crucial factors in the development of instructional materials. He evaluates each technology using his ACTIONS decision-making tool.

Content development is in fact a type of project management. Seels and Glasgow (1997) suggest that the steps undertaken within the parameters of a project management plan can be divided into the following three phases:

1. Needs analysis management
2. Instructional design management
3. Implementation and evaluation management

The development of open textbooks for primary school levels (P1–6) and secondary school levels (S1–6) is necessarily more complex than that of a single print-based course because of the wide range of new technological formats involved in the development process and deliverables. The project team sought to maximise the potential of technology-enhanced learning by providing an interactive, media-rich learning and teaching environment for the students. Therefore, three major teams, (i) the Project Management Team, (ii) the Content Development Team and (iii) the Multimedia Technology Team, were set up.

The role of the Project Management Team was to decide the scope of the open textbook project, undertake specific roles and tasks, schedule timelines and budget checkpoints, establish supervisory procedures and undertake promotion. The team considered the criteria listed by Bates' ACTIONS model in deciding which types of technologies were appropriate for the development of open textbooks. Questions to be considered in such a decision-making process are noted below:

Access	Can users (i.e. teachers and students) easily get access to the open textbooks with multiple formats (i.e. print, EPUB, online, mobile app)?
Costs	Can users afford to use multiple formats?
Teaching and learning	What are the appropriate instructional strategies, media and technologies for designing the OER content and associated materials?
Interactions	What kind of interactions will be designed for various learning environments (i.e. pre-class, in-class, after-class)?
Organisational issues	What barriers do we encounter if the schools do not have technical support (i.e. Wi-Fi set up)?
Novelty	How well will new technologies (i.e. EPUB) survive?
Speed	How quickly can the EPUB version be made available?

The Content Development Team was responsible for developing the content of the open textbooks (*Open English*) and for ensuring that the materials produced for it were in accordance with the English Language curriculum of the Curriculum Development Council. The Content Development Team was divided into two groups for Key Stages 1–2 (Primary 1–6) and Key Stages 3–4 (Secondary 1–6). External members of this team included veteran teachers, English subject specialists, instructional designers and multimedia specialists.

The team members had a good understanding of the English Language curriculum and knowledge of the subject. They worked together and cross-reviewed each other's work during the development process. The draft content of the textbooks went through internal and external reviews. The internal review was conducted by in-house experienced instructional designers and subject specialists within the OUHK. Many illustrations based on the internal team's suggestions were developed by the multimedia specialists. The external review was conducted by academic consultants in the field of English Language education from local universities, in-service teachers from primary and secondary schools and native-speaking editors. The content, learning and teaching strategies, structure and organisation, language and layout of the textbooks were closely scrutinised.

Finally, *Open English* went through EDB's textbook vetting process. In 2015, the series of *Open English* for primary and secondary schools were endorsed by the EDB for placement on the Recommended Textbook List (RTL).

Open English satisfies the official EDB standard in the areas of content, learning and teaching, structure and organisation and language, as well as textbook layout.

The Multimedia Technology Team was responsible for the production of cartoons and illustrations, photography and image editing, layout design, audio-visual production, interactive programming components for EPUB files, mobile apps and the online platform.

All the open textbooks in the system are available in both PDF and EPUB formats. The PDF format allows users to read them on computers as well as mobile devices and is handy for printing out in hardcopy. The EPUB format is suitable for viewing on mobile devices (both iOS- and Android-based) and can include multimedia components and interactive exercises. An online EPUB reader was also developed so that users can view the EPUB contents through any browser. The

textbooks also allow users to adopt the contents, make modifications and reproduce new versions with the aid of the online Open Textbooks System (OTS) which was developed by customising an open-source content management system called "Drupal". The open textbooks are stored in the OTS. This high level of flexibility means that teachers can easily make use of the open textbooks and adapt them to their teaching needs. In addition, certain components have been developed in mobile app format which can facilitate teachers' monitoring of students' progress with the learning data that the app provides.

The OTS serves as not only an online repository to host open textbooks and courseware but also a central hub for different users to collaborate, share their experiences and update themselves on the latest developments of the open textbooks. Users can give ratings and write comments on any of the materials. Teachers are invited to share their views on how they use the materials at school in the discussion forum. Also, announcements such as content updates or upcoming seminars are issued via the Blog and News and Events sections.

Open Textbook Design and Pedagogical Principles

Besides adopting ID models as the development framework for open textbooks, the use of pedagogical principles for designing the content is also of the utmost importance. Pedagogical principles incorporated in the development of *Open English* can be classified into five main aspects: (i) content design; (ii) structure and organisation; (iii) language usage; (iv) spatial organisation; and (v) learner engagement.

As regards content design, the textbooks are module-based, with each module containing two to three units (from Primary 1–6 and Secondary 1–6). The module themes are adopted from the suggested list in the Curriculum Guides. Each unit has a reading section featuring a variety of text types, followed by sections focusing on vocabulary development and grammar. Most of the exercises are contextualised in order to facilitate language learning through interpersonal communication and real-life situations.

Open English adopts a "Reading to learn" approach which helps learners to acquire effective reading skills and develop good reading habits. Hence, the open textbook series use an extensive variety of text types. A learner-centred approach is also adopted to develop vocabulary-building skills, phonics skills and information skills and provide opportunities for the mastery of these skills through purposeful tasks in meaningful contexts. Last, but not least, open-ended learning tasks are used to help students develop critical thinking skills.

Structure and organisation can be a problem if too much information is put together, or the relationship between ideas and sequences is confusing as this can affect learners' reading process. Well-organised information should contain overviews, headings, sub-headings, charts, tables, graphs and summaries. To promote learning, it is better to chunk the information into small sections with graphical presentation.

Language usage is also important. If the vocabulary and syntax of the text are unfamiliar and sentence patterns are unexpected, making sense of a text becomes more complicated: reading speed is reduced and comprehension may be impaired.

Spatial organisation refers to the spacing, size of typefaces, length and spacing of the lines and the colour of the print and page size, all of which can affect legibility. Furthermore, visual communication is a crucial factor in the learning process: visually attractive materials increase the reader's motivation. This can include illustrations, attractive layouts and colour photos, especially in primary-level textbooks. Learners nowadays do not like learning materials that look "difficult" and "boring" and have come to expect the visual complexity and vibrancy of the infographics, cartoons and other images found in the modern media.

"Learner engagement" here refers to how students interact with the content and activities. Learners construct the meaning of the texts in different ways. Good design of learning activities is an important factor in motivating students and also facilitates their critical thinking. Using an integrated approach in designing the learning activities, different generic skills such as reading, writing, listening and speaking are used in the tasks.

The main task in each unit requires students to make use of the target vocabulary, language structures and text type to complete a variety of well-scaffolded writing, speaking or presentation tasks. Some activities are also designed for group work and pair work to enhance class interaction, communication and collaborative skills.

Use of Emerging Technologies in Various Learning Environments

Just as different teachers have individual teaching preferences for ways of meeting students' needs, using emerging technologies in teaching and learning suits the needs of different learning environments. In conventional teaching, teachers use print textbooks to teach and students work on worksheets. In the digital learning environment, teachers and students may use the electronic versions of textbooks for teaching, learning and sharing. In this open textbook project, teachers and students are provided with the PDF files free of charge. Teachers can use the PDF files to project the textbook onto the screen, so as to show the pre-reading activities and demonstrate all sorts of things on the board. They can also ask the students to come and do the interactive exercises and check the answers instantly.

When students use the EPUB version of the textbook, they can listen to the audio recordings of the main texts and easily look up the vocabulary item via the built-in dictionary feature. They can also make use of the bookmarking feature for their self-study and complete the activities and check the answers instantly. Students can also instantly enlarge text on any parts of the page. Certain textbooks also have discussion board features.

Before class, students can study on their own by using the format of their choice, be it print, EPUB or the online version. During class, teachers can make use of the electronic version to do demonstrations; and after class, students can go back to their own versions for their study and revision.

Survey and Feedback by Teachers and Students

Teachers

During 2014–2016, approximately 47 primary school teachers from 13 primary schools and 92 secondary school teachers from 22 secondary schools joined the pilot scheme of *Open English*. They tried out some of the *Open English* units (either the printed or electronic version) and the associated audio tracks in their classes. A questionnaire was devised to collect teachers' feedback and another was separately designed for students. There were 20 questions in the teachers' questionnaire and questions in the students' questionnaire. The responses to the questionnaires were measured on a Likert 5-point scale. Table 9.1 illustrates the ratings given by 136 teachers (45 primary school teachers and 91 secondary school teachers) on the questionnaire survey of the Open Textbook Tryout Scheme. The survey looked at five aspects of the textbooks, viz. content design; language usage; structure and organisation; spatial organisation; and learner engagement.

Overall, the majority of the primary school teachers (86%) and secondary school teachers (75%) had a positive attitude towards the quality of the open textbooks across the five categories investigated.

Content Design

The content in the open textbooks was seen as locally relevant and engaging, as 95.8% of the primary school teachers found the content "relevant to students' daily life" and 87.3% felt that the content was "interesting". Secondary school teachers agreed on these two points at 96.7% and 85.9%, respectively.

Table 9.1 Summary of the teachers' ratings in five different aspects

	Primary school teachers (n = 45)		Secondary school teachers (n = 91)	
Aspects	Mean	SD	Mean	SD
1. Content design	3.98	0.27	3.90	0.46
2. Language usage	3.87	0.29	3.72	0.56
3. Structure and organisation	3.84	0.28	3.80	0.52
4. Spatial organisation	3.94	0.33	3.88	0.49
5. Learner engagement	3.84	0.31	3.87	1.91

The level of difficulty of the open textbooks' content design was deemed generally suitable for learning: most of the primary school teachers (89.4%) considered the level of difficulty to be appropriate compared to 68.4% of the secondary school teachers.

In short, the content of the open textbook was seen as well-suited to local Hong Kong schools as it was written according to Hong Kong students' experience and average language abilities, as well as the EDB's English Language curriculum. Differences in teachers' opinions might be explained by the specific choice of units adopted during the pilot scheme.

Language Usage

In terms of language, the level of difficulty of the open textbook was considered to be desirable for learning as most of the participating school teachers agreed that the difficulty of the language used in the units was appropriate (primary school teachers, 87.2%; secondary school teachers, 73.9%). This aligns with the result obtained under "content design" above.

The language in the open textbooks is seen as authentic and engaging as most of the teachers found the language used "familiar and interesting" (primary school teachers, 78.7%; secondary school teachers, 68.5%). This also mirrors the result obtained under the aspect of content design.

Moreover, most of the teachers found the language used in the textbooks to be "accurate" (primary school teachers, 89.4%; secondary school teachers, 84.7%). Few suggestions on language were given by the teachers on the pilot scheme. Overall, the teachers found the quality of the open textbook in terms of language to be up-to-standard, which again coincides with their opinions in terms of the content design.

Structure and Organisation

Almost all the participating primary school teachers agreed that the use of tables of content, headings and outlines was appropriate (93.6%). Most of them found the organisation of content to be logical (87.2%) and felt that the overviews facilitated students' learning (76.6%).

Most of the participating secondary school teachers also agreed that the use of tables of content, headings and outlines was appropriate (85.8%) and the organisation of content was logical (84.8%), and they saw the overviews as facilitating students' learning (71.7%).

Spatial Organisation

This part of the survey evaluated the layout, spacing, illustration and choice of fonts in the textbooks and the use of paper. In general, the quality of the layout in the open textbooks was considered to be good. Most primary school teachers found the layout to be logical and consistent (91.5%). They viewed the illustrations as facilitating students' learning (85.1%); and they considered the use of space and margins (83%), and also the use of non-glossy paper (87.3%), as making reading easy. Over three quarters of them found the font size and style appropriate (78.8%) and the paper lightweight and durable (76.6%).

Most secondary school teachers also found the layout to be logical and consistent (83.3%) and the font size and style to be appropriate (83.7%). They felt that the illustrations made students' learning easier (79.3%); and many of them agreed (70.7%) that the use of space and margins promoted easy reading.

The open textbooks are printed in separate booklets. Each booklet contains two to three theme-based units. Teachers can choose suitable units only instead of obtaining the whole textbooks.

Learner Engagement

The primary school teachers thought that students were able to acquire and apply what they learned from the open textbooks as over 80% of the teachers observed that students can "achieve learning targets through the learning activities in the units" (87.2%) and "integrate, practice and apply new knowledge" (83%).

These teachers felt that the students appeared more engaged in language learning when they used the open textbooks as they observed students' motivation to learn (84.3%). One teacher expressed his/her appreciation of the design of a "main task" section in which students were asked to design their school uniforms. The teacher remarked that his/her students loved the task very much.

The primary school teachers did not seem to encounter difficulties in using the open textbooks for teaching as the instructions were deemed to be clear (84.3%).

The secondary school teachers noted that students were able to acquire and apply what they had learned from the open textbooks as over 80% of the teachers observed that students could "achieve learning targets through the learning activities in the units" (80.4%). The secondary teachers also deemed the textbook instructions to be clear (84.7%).

Well over half of the secondary teachers felt that their students appeared to become more engaged in language learning after using the open textbooks. Some teachers observed students' motivation to learn (64.2%), and many secondary students were also able to integrate, practise and apply new knowledge from the open textbooks (65.2%).

Overall, the content of the open textbooks seemed quite effective in helping teachers to conduct engaging language activities and helped students to achieve learning targets, especially in writing activities. Some teachers suggested further

improvements in the instructions to allow weaker students to follow them with greater ease.

However, it must be noted that teachers in the pilot scheme tried out only selected sections in some of the units, with the implementation period being short (e.g. a few weeks). It might therefore have been difficult for teachers to observe real changes in students' performance.

As an example of a suggestion for improvement, one teacher remarked that he/she needed more guidelines on the use of the electronic version of the open textbooks. This reflects the lack of technical support for teachers.

Students

Table 9.2 shows the feedback from 589 primary school students and 1693 secondary school students on the questionnaire survey of the Open Textbook Tryout Scheme. The students' ratings were categorised into four aspects: content design; language usage; spatial organisation; and motivation.

Content Design

Nearly 70% of primary school students found the reading texts interesting (67.8%). However, nearly half of the students (42.3%) had no comments on the listening tasks. This might be explained by the fact that most of the teachers only used the sections which they found useful (87.2%) and only 34% of them used the post-reading section of a unit, in which there is the listening task.

Over 50% of the secondary school students found the reading texts interesting (55.9%). Around two-thirds of the students agreed that the level of difficulty is appropriate (64.4%) and the textbook was effective in improving their English language skills (65.7%).

Table 9.2 Summary of the students' ratings in four different aspects

	Primary school students (n = 589)		Secondary school students (n = 1693)	
Aspects	Mean	SD	Mean	SD
1. Content design	4.15	0.97	3.62	0.75
2. Language usage	3.78	0.99	3.58	0.75
3. Spatial organisation	4.21	0.33	3.37	0.55
4. Motivation	4.02	1.00	3.58	0.80

Language Usage

The effectiveness of the open textbooks in helping students to acquire new vocabulary and new text types seemed prominent. Over 80% of the primary school students agreed that they had acquired new vocabulary; and over 60% of them agreed that they became familiar with various text types.

As for the secondary students, over 70% agreed that they had acquired new vocabulary; and around 60% of them felt that they had acquired knowledge about text types and grammar. Meanwhile, over 40% of the students said they gained a better understanding of the "Electives modules" through the open textbooks.

Spatial Organisation

Over 70% of primary school students liked the open textbooks because of the appealing illustrations (72.1%) and the handy booklets (79.3%).

Just over 40% of secondary school students believed that the well-designed layout and illustrations sparked their interest in learning (42.4%). Around two-thirds of the students agreed that the font size was appropriate (67.7%) and the booklets were handy (65.1%). This coincides with a teacher's comments about the illustrations: "The textbook is good with plenty of attractive and colourful pictures".

Motivation

Most primary school students were motivated to learn English as a result of using the open textbooks. About 80% of the students liked the textbooks, and over 70% of them agreed that they became more interested in learning English after using the open textbooks. Over 60% of the students gained a sense of satisfaction after completing the main task in a unit. This result is in line with the teachers' observation that students seemed more engaged in language learning when they used the open textbooks as teachers could see their motivation to learn (84.3%).

The majority of secondary school students were also motivated to learn English by using the open textbooks. Around two-thirds of the students found the content of the open textbooks to be relevant to their life and just over half of them agreed that they became more interested in learning English after using them (51%). Again, this result ties in with teachers' observations about learning and teaching: teachers saw secondary students' motivation to learn after using the open textbooks (64.2%).

Discussion

Open English generally satisfied local schools' requirements for a textbook in terms of content design, language usage, structure and organisation, spatial organisation and learner engagement. The results of the survey show that the overall quality is not affected by the fact that the textbooks are free and downloadable.

However, even if teachers are using quality textbooks, they tend to still have other school-specific requirements and criteria for their chosen textbooks. These criteria cannot be satisfied by one publisher's modifications or by using a single set of quality textbooks because the requirements are school-based.

Some primary school teachers, especially those from schools for special educational needs (SEN), expressed their intention to change the content of the textbooks because those currently available in the market do not cater for the learner diversity in SEN schools. Therefore, SEN teachers are enthusiastic about adopting *Open English* as their OER textbook so that they can freely adapt and modify it for their teaching needs.

Secondary school teachers in general had quite a number of ideas on how to change the textbook content in order to suit their own students' needs. However, it is not possible for commercial publishers to allow teachers to rewrite part of the content or activities in the textbooks as their suggestions are school-based and might not be suitable for other schools. Therefore, it is estimated that there will be a great demand for OER textbooks which allow teachers to freely change the content.

Conclusion

Overall, the stakeholders, especially teachers and students, are very positive about the adoption of OER textbooks and the possibility of customising the content and activities to cater for learner diversity. In fact, the beauty of this project is the flexibility and saving of time offered by the multiple technological formats which are endlessly adaptable for teaching and learning needs.

The most fundamental aspect which sets OER textbooks apart from those in the commercial market is that the materials are entirely copyright-free. This means that teachers can adapt or rewrite any parts of the units in order to suit the needs of their students. Therefore, any part of *Open English* can be further reproduced, reused, shared and adapted as needed. Teachers are encouraged to make full and creative use of this in order to customise, share and contribute to the wider OER textbook project.

We initially developed this OER textbook series for Hong Kong teachers and students to promote the use of OER in the local education system. With the support of emerging technologies, teachers can create new materials and practise pedagogies and new teaching and learning styles by using OER textbooks. We hope this

OER textbook series will play an important role in improving pedagogical efficiency in local schools and pave the way for a new chapter in education.

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Chapter 10
The Talking Comic Strip: Technology-Enhanced Learning for English Communication

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Abstract There have been challenges in educational fields which involve a diversity of learners from different countries because the majority of learning materials and resources are written in English. In nursing education, the comprehension of the written materials in English has a bilateral effect on the academic and clinical performance of the learners and the teaching capacity of the mentors. This chapter presents the development of technology-enhanced learning material—the talking comic strip—as an aid in improving English nursing communication. This learning material features the use of augmented reality technology that allows the convergence of real-world objects and digital objects. It allows learners to read the comic strip and hear its audio at the same time. A total of 39 nursing student-respondents completed a usability survey to evaluate the acceptability of the learning material. The majority of the respondents found the talking comic strip to be useful, easy to use, and easy to learn, and they were satisfied with using it.

Keywords Augmented reality · AR · Technology-enhanced learning · English-as-a-Second Language · Comic strip

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_10

Introduction

It is undeniable that the population of English-as-a-Second Language (ESL) students is growing worldwide. In Asia, because of the language barriers due to its multicultural presence, some of the ESL students have not developed enough realisation of their full career potential (Scheele, Pruitt, Johnson, & Xu, 2011). Because of increased diversity in the continent, communication barriers have been a trademark, especially in the learning practices. For professionalism and career development, ESL students suffer high attrition rates (Condrey & Derico, 2012), which is a significant threat to assuring their successful participation in the workplace.

Studies have shown that there are already interventions performed to address this issue. Crawford and Candlin (2013) reported some English support programmes for ESL students, including the utilisation of videos, group meetings, and role play as strategies for developing English communication skills among these students. Academic support workshops have also been established for ESL students to improve their English proficiency (Salamonson, Koch, Weaver, Everett, & Jacson, 2010).

In the field of nursing, the diversity of the students from different countries tends to pose challenges to nursing educators globally because the majority of the learning materials and books are written in English. This is the case for the Association of Southeast Asian Nations (ASEAN) where the official working language is English. ASEAN member-countries are envisioned to combine into one community that consequently promotes free movement of goods, investments, services, and people of various backgrounds and professions (Hew & Soesastro, 2003). Moreover, there already exists an arrangement called the ASEAN Mutual Recognition Arrangement (MRA) on Nursing Services, which is expected to develop nursing competencies in terms of skills, knowledge, attitude, and English proficiency for clinical practice (Gunawan & Aungsuroch, 2017). This has a bilateral effect on the academic and clinical performance of the learners and the teaching capacity of the mentors since comprehension of the materials written in the English language will be a factor.

In this regard, there have been several technological advances that may help in numerous application domains, including e-Learning and English communication skills of ASEAN nurses. One of these technologies is augmented reality (AR). AR allows the convergence and interspersing of real-world objects and virtual objects with each other (Azuma et al., 2001). Computer-generated inputs, such as audios, videos, graphics, and GPS data, may be overlaid in the physical world. AR is now being injected as new digital media for innovative teaching and learning (Bower, Howe, McCredie, Robinson, & Grover, 2014). There have already been studies stating its efficiency since the learning environment is already properly defined by the real-world context (Moralishvili, 2014). Information imparted by virtual objects helps the learner to perform real-world tasks (Azuma, 1997). The use of AR makes learning more interactive, engaging, and convenient for everyone. When applied to nursing education, it results in a useful learning technique that may enhance the knowledge and clinical skills of nursing staff and students through realistic

situations with computer-aided technology. However, the use of AR in nursing education focused mainly on nursing procedural practices such as injection and wound dressing (Wüller, Behrens, Garthaus, Marquard, & Remmers, 2019).

On the other hand, AR has been increasingly applied in language learning. This technology can be used to cope with students' different learning styles and learning needs for the best learning outcomes (Hsu, 2017). The use of AR for learning English also has positive effects on students' achievement, attitudes, and cognitive loads. This chapter presents the development of a learning material for English nursing communication with the aid of AR together with other technologies.

Objectives of the Study

With the use of AR as a learning tool, this study aims to help nursing students to learn English through relevant clinical scenarios. The objectives of this research are to:

1. Develop usable technology-enhanced learning material for a simple clinical scenario
2. Evaluate the acceptability of the material by conducting a usability survey among selected nursing students in the Philippines and Thailand

Review of Related Literature and Principles

Augmented Reality in Nursing Education

AR has been used in educating and training nursing staff and undergraduate nursing students to enhance their knowledge and clinical skills through realistic situations with computer-aided technology. It has also been increasingly used in a wide range of topics in healthcare education, such as endotracheal intubation, clinical breast examination, laparoscopic surgery, and life support training (Zhu, Hadadgar, Masiello, & Zary, 2014).

Another application of AR in nursing is the utilisation of the Evena glass which, according to Tansey (2014), has high-tech 3D light imaging, used by nurses to visualise blood flowing through the veins of patients and capture those images on the skin layer.

Also, a tablet-based AR system was developed in Sheffield Hallam University. It is used in nursing and midwifery training to build up empathy and promote caring approaches while delivering technical skills. This system uses iPads to display videos of patients played by actors that are superimposed onto training manikins. Whenever nursing students and trainees look at the dummies through their iPads, they get a taste of a real-life situation, including the possible reactions and emotions of patients (Pultarova, 2013). Feedback from staff and students stated that the

application provided a much greater patient-centred focus (Sheffield Hallam University, 2014).

In addition, Rahn and Kjaergaard (2014) undertook a project which aimed to create a realistic visualisation of the human anatomy to enhance the learning outcomes of nursing students in Denmark. An app was developed that shows a set of breathing lungs. Students were provided with iPads and t-shirts with printed logos to serve as markers for the AR app. The students who participated found that AR was an interesting and highly helpful supplementary tool.

Principle of Usability

ISO 9241-11 states that usability is the extent to which a system or software can be used to achieve specified goals in a specified context of use (Baharuddin, Singh, & Razali, 2013). Brooke (1996) mentioned that, according to ISO 9241-11, measures of usability should include:

- *effectiveness*, which refers to the ability of users to complete tasks using the system and the quality of output of those tasks;
- *efficiency*, which pertains to the level of resource utilised in performing such tasks; and
- *satisfaction*, which refers to the subjective reactions of users in using the system.

Users appear to have a good sense of whether a system is usable or not (Lund, 2001). If a system is usable, users can accomplish tasks easily and efficiently. On the contrary, if a system is difficult to use, they will not use it. To determine usability, potential end-users should be asked to evaluate the system through a usability test or survey (Pugoy, Habito, & Figueroa, 2016).

Several tools and scales for measuring usability and perceived usefulness have been designed to predict how likely people will use their systems. For example, Brooke (1996) developed a five-point Likert scale called the *System Usability Scale* (SUS), which is quick to use and simple to interpret, but it lacks the dimension of perceived usefulness—unlike Davis' (1989) Technology Acceptance Model (TAM). This model initially defined perceived ease of use and perceived usefulness as the factors in a system that can predict the users' attitude towards using the system. Attitude, together with perceived usefulness, predicts behavioural intention to use, which then predicts actual system use. Further studies have expanded on this model, resulting in the latest version 3 of TAM (Venkatesh & Bala, 2008). TAM version 3 includes the concepts of trust and perceived risks in using systems in the context of e-commerce. Venkatesh and Morris (2003) also designed the Unified Theory of Acceptance and Use of Technology (UTAUT). In this expanded model, four constructs were identified as factors that explain users' behaviour in using a system. In the present study, a scale that includes the essential concepts of learning curve and user satisfaction was adopted, which is discussed further in the Methodology section of this chapter.

Methodology

The Implementation of Comic Strips

Technology-enhanced learning material for nursing communication in English—the talking comic strip—was developed. This allows the learner to read the provided comic strip (real-world entity) and hear its audio (digital entity) at the same time while pointing his/her smartphone or mobile device to the comic strip. This setup is made possible with the utilisation of AR. Providing the audio, which in essence makes the comic strip talks, helps nursing practitioners learn the proper pronunciation and intonation of English words and statements. Listed below are the steps involved in the development of the talking comic strip:

1. The script of the clinical scenario in English (Fig. 10.1) was written by a nursing professional, a professor of the Master of Arts in Nursing programme at the UP Open University where English is used as the medium of instruction. The scenario is about providing basic care to patients, and its degree of English difficulty is elementary.
2. The comic strip (Fig. 10.2) was designed and drawn by an artist.
3. The audio tracks that accompany the comic strip were recorded by voice actors.
4. A scanned copy of the comic strip and the recorded audio tracks were integrated using CraftAR, an AR tool that provides a web-based drag-and-drop interface for a convenient way of creating AR content (Woods, 2014).

Afterwards, an app was generated that can be installed on the learners' smartphones and mobile devices. Figure 10.3 shows how to interact with the talking comic strip. Once pointed, the accompanying audio automatically plays.

Usability Evaluation

Measuring the acceptability and usability of the talking comic strip involves evaluating the perceptions of its learners/users. For this purpose, 39 nursing students from the Philippines and Thailand were selected as respondents. They include 7

SITUATION 1: *The nurse in the morning shift is assigned to a female patient in the Medical Ward. Reading the medical charts, the nurse found out that the patient was diagnosed with Congestive Heart Failure and Unstable Angina. The nurse approaches the patient to assess her Functional Health Patterns on Activity and Exercise, and Role and Relationships.*

Nurse: *Good morning, Ms. Ellen. I'm Luisa, your nurse for this morning shift. How are you feeling today?*

Patient*: Good morning, Nurse Luisa! I am actually feeling dizzy from a whole day of coughing. (coughs hardly)*

Fig. 10.1 A portion of the clinical scenario script

male and 32 female respondents. They were first asked to use and explore the talking comic strip and were then given a usability survey which consists of the 30-item USE Questionnaire (shown in Table 10.1) and two additional items.

According to Lund (2001), the USE Questionnaire tests the following dimensions of usability:

- Usefulness refers to the degree to which a software or system enables the user to achieve his/her goals.
- Ease of use pertains to effectiveness and productivity.
- Ease of learning refers to how intuitive a system is and, if it is not intuitive, how steep the learning curve is.
- Satisfaction refers to user perception of the pleasantness of the system.

Each item in the questionnaire was rated on a 7-point Likert scale, where 1 means "Strongly disagree", 4 means "Neither disagree or agree", and 7 means "Strongly

Fig. 10.2 An example of the comic strip

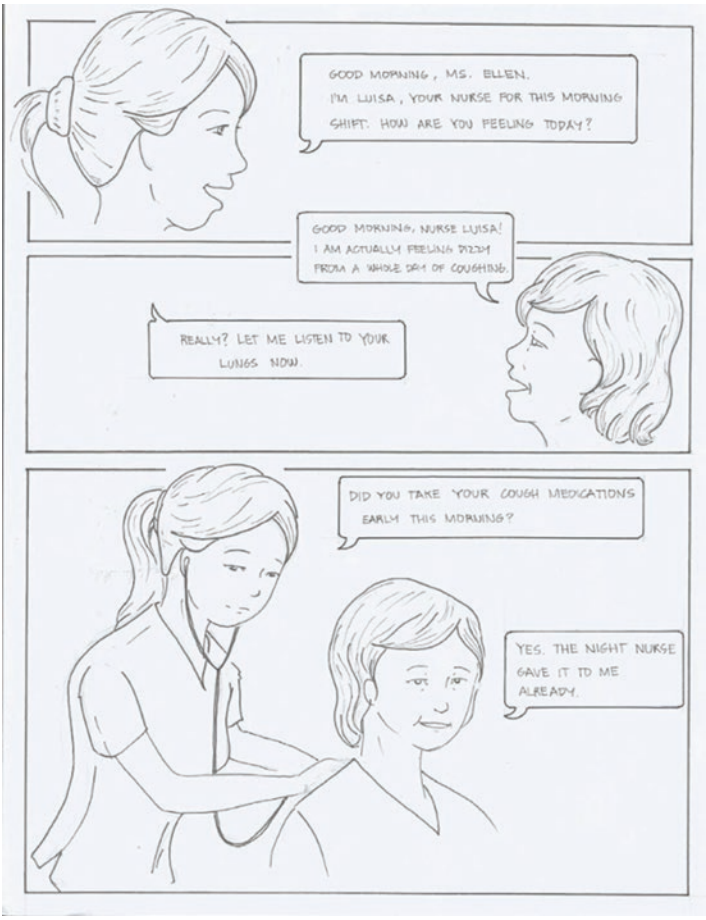

Fig. 10.2 (continued)

Fig. 10.3 A learner pointing her mobile device to the comic strip

Table 10.1 USE Questionnaire items

Usefulness (8 items)	**Ease of use (11 items)**
It helps me be more effective	It is easy to use
It helps me be more productive	It is simple to use
It is useful	It is user-friendly
It gives me more control over the activities in my life	It requires the fewest steps possible to accomplish what I want to do with it
It makes the things I want to accomplish easier to get done	It is flexible
It saves me time when I use it	Using it is effortless
It meets my needs	I can use it without written instructions
It does everything I would expect it to do	I don't notice any inconsistencies as I use it
	Both occasional and regular users would like it
	I can recover from mistakes quickly and easily
	I can use it successfully every time
Ease of learning (4 items)	**Satisfaction (7 items)**
I learned to use it quickly	I am satisfied with it
I easily remember how to use it	I would recommend it to a friend
It is easy to learn to use it	It is fun to use
I quickly became skillful with it	It works the way I want it to work
	It is wonderful
	I feel I need to have it
	It is pleasant to use

agree". Comparisons were also made to observe the differences in perceptions according to nationality, gender, and age by using respective mean ratings for each usability dimension. Moreover, the two additional items formulated for this study are rated on a 5-point Likert scale, where 1 implies "strongly disagree" and 5 "strongly agree". These items are:

- The technology-enhanced material is better than the printed material.
- It enhances my learning experience.

Results and Discussion

Figures 10.4, 10.5, 10.6 and 10.7 illustrate the left-skewed graphs of the respondents' mean ratings for each of the four usability dimensions. The findings imply that the majority of the respondents (those who gave ratings above the neutral rating of 4) agreed that the talking comic strip is useful, easy to use, and easy to learn—and, in fact, they were satisfied. Specifically, 34 out of 39 participants (87.17%) said that it was useful, and they were satisfied with using it. Furthermore, 82.05% (32 out of 39) and 84.61% (33 out of 39) of the respondents indicated that it was easy to use and easy to learn.

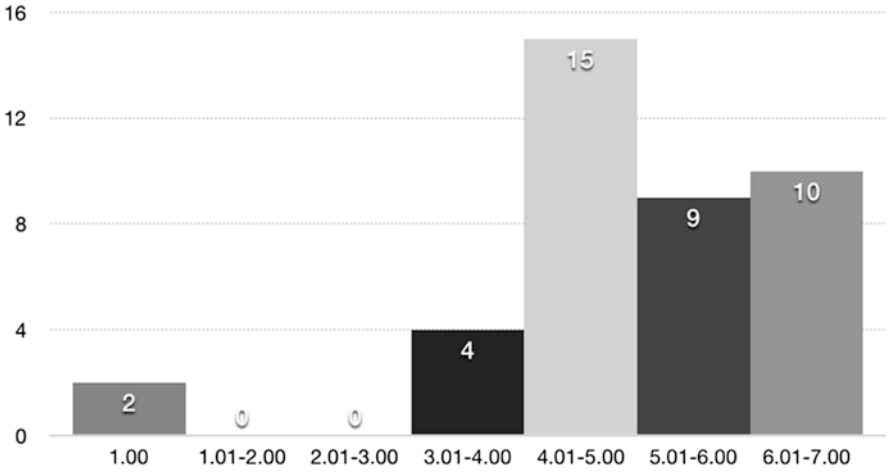

Fig. 10.4 Summary of the respondents' mean ratings for usefulness

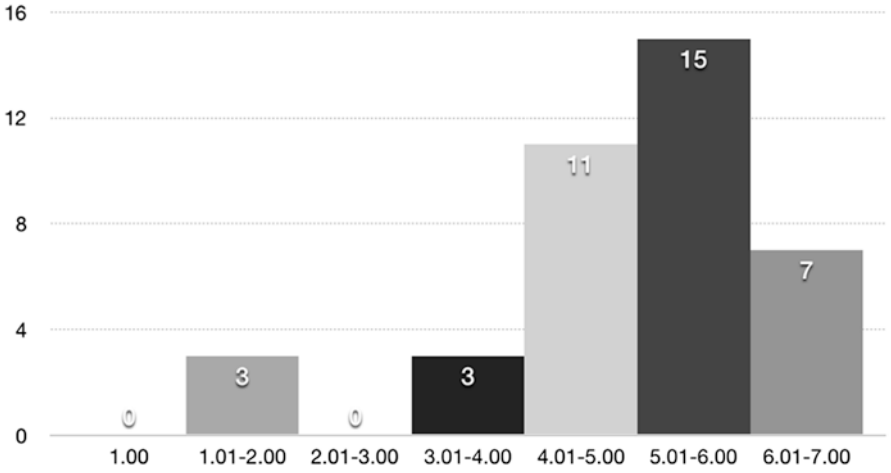

Fig. 10.5 Summary of the respondents' mean ratings for ease of learning

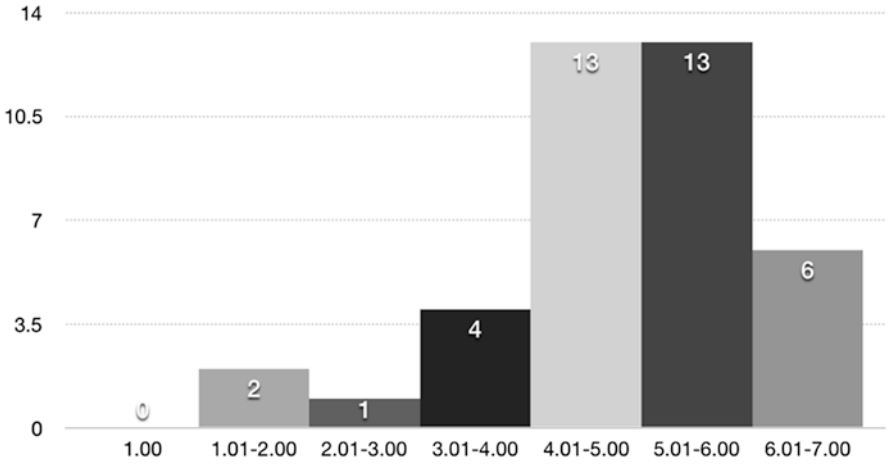

Fig. 10.6 Summary of the respondents' mean ratings for ease of use

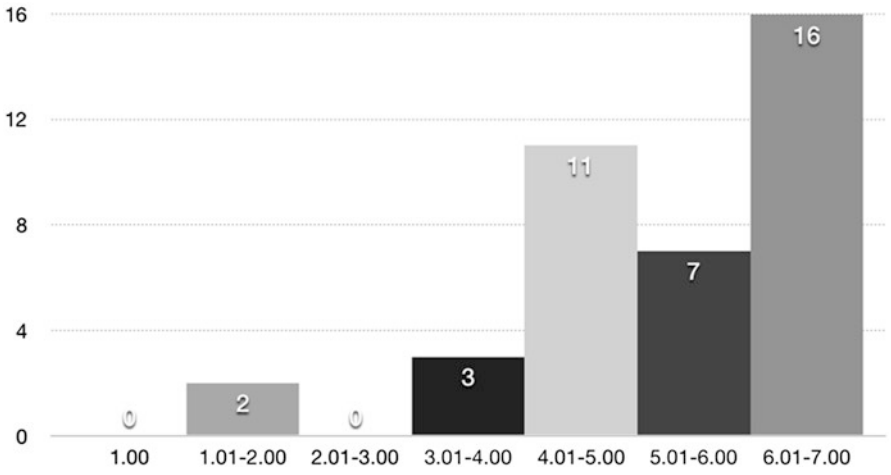

Fig. 10.7 Summary of the respondents' mean ratings for satisfaction

Considering that the technology-enhanced learning material was positively received by the nursing student-respondents, it is also interesting to note the difference in usability perceptions between Filipino and Thai respondents as illustrated in Fig. 10.8. Thai participants found the talking comic strip more useful and easier to use than their Filipino counterparts. On the other hand, Filipino participants perceived it to be easier to learn, and they were more satisfied with it.

Figure 10.9 shows the difference in usability perceptions according to gender. It is worth mentioning that the results consistently illustrate that the male respondents'

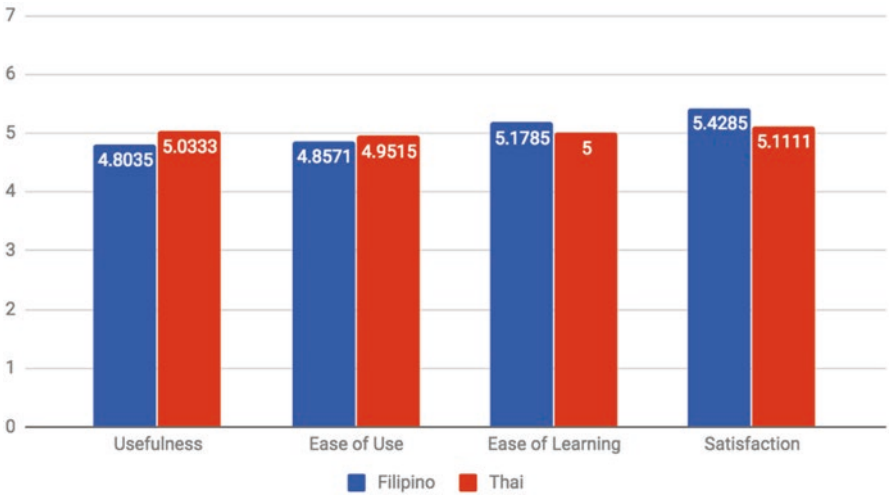

Fig. 10.8 Comparison of mean usability ratings according to nationality

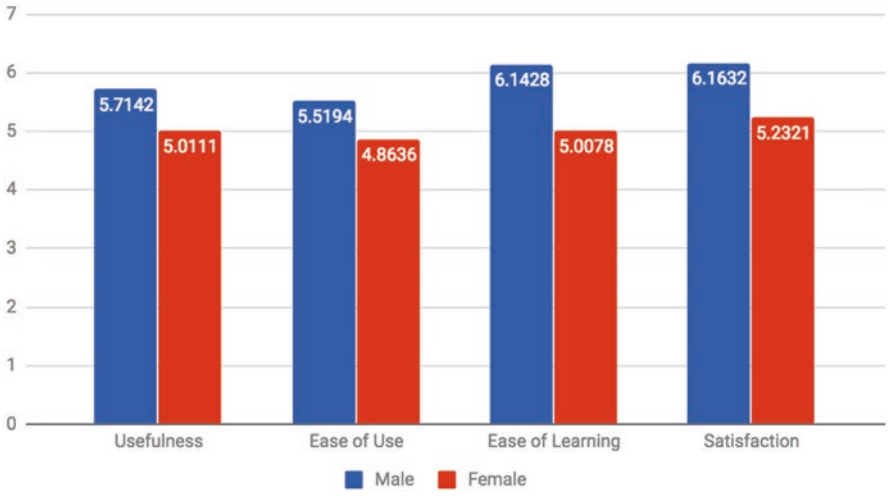

Fig. 10.9 Comparison of mean usability ratings according to gender

mean ratings for the four usability dimensions are higher than the female respondents'. This implies that the former found the technology-enhanced learning material more acceptable than the latter. Furthermore, Fig. 10.10 depicts the difference in usability perceptions according to age. The results are also consistent across all usability dimensions; the respondents who are 30–39 years old gave the highest mean ratings, followed by those who are 40–49 years old. The respondents who are at least 50 years old gave the lowest ratings. In other words, younger respondents found the talking comic strip more acceptable than their older counterparts.

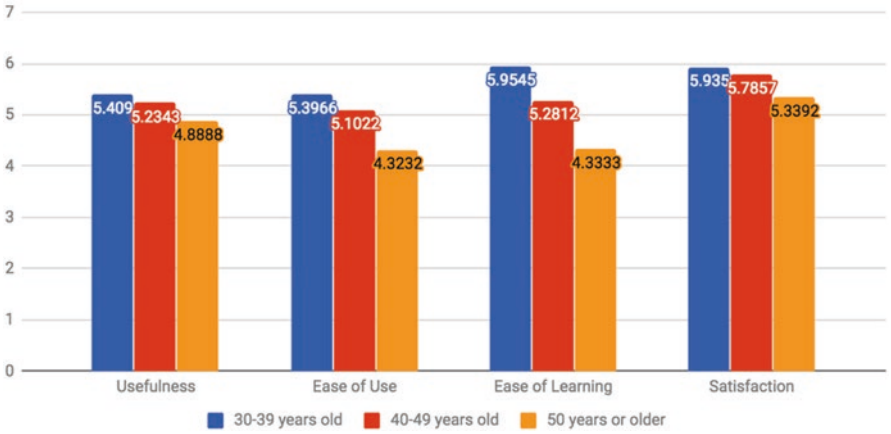

Fig. 10.10 Comparison of mean usability ratings according to age

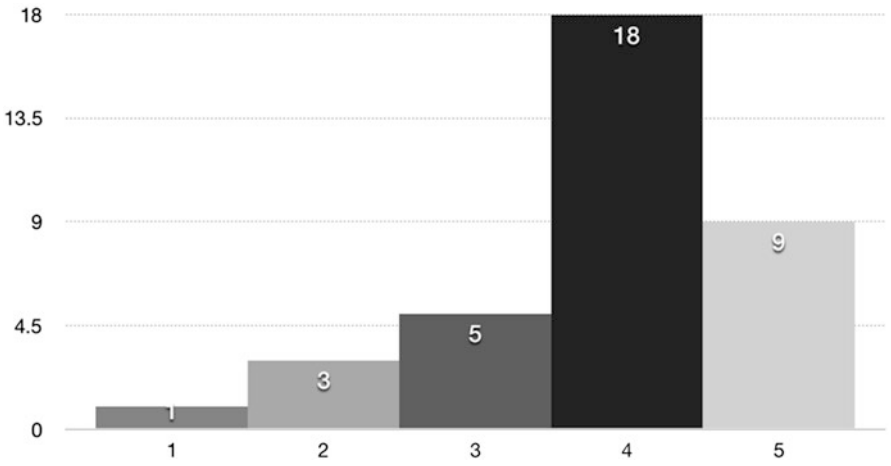

Fig. 10.11 Summary of respondents' ratings on whether the AR-enhanced material is better than the printed material

Finally, for the two remaining survey items, their corresponding graphs in Figs. 10.11 and 10.12 also indicate left-skewness. This means that the majority of the respondents (those who gave ratings above the neutral rating of 3) agreed that the technology-enhanced learning material is better than the printed material (27 out of 36 possible responses or 75%). The majority also concurred that it enhanced their learning experience, with 30 out of 36 possible responses (83.33%).

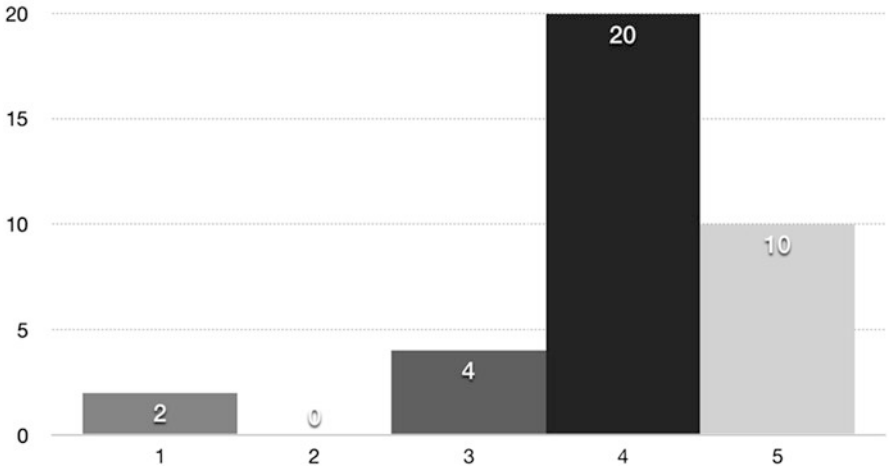

Fig. 10.12 Summary of respondents' ratings on whether the AR-enhanced material enhances their learning experience

Conclusion and Future Work

AR was successfully utilised, resulting in the development of a technology-enhanced learning material for English nursing communication—the talking comic strip. This material was positively received by the nursing student-respondents, as it passed the usability dimensions on the USE Questionnaire, i.e. usefulness, ease of learning, ease of use, and satisfaction. The majority of the respondents also indicated that they preferred the technology-enhanced material than the printed material and that it enhances their learning experience. There were also a difference in perceptions between the Filipino and Thai participants, with the former inclined towards ease of learning and satisfaction and the latter towards usefulness and ease of use. The study also noted that male participants found the talking comic strip more acceptable than their female counterparts. Another observation is that the younger respondents found the talking comic strip more acceptable than the older respondents.

In the future, the talking comic strip will be expanded and enhanced. Further analysis shall be done as far as learning effectiveness, learning outcomes, and potential differences in civil status, education levels, and English proficiency are concerned. Statistical methods shall be applied to prove significance as well. Also, a larger sample size of nursing students, including those from other ASEAN member-countries, will be considered for participation in the study.

Acknowledgement This work was supported by the Faculty Research Grant and Research Dissemination Grant from the UP Open University. The authors gratefully acknowledge the comments and feedback given during the Third International Conference on Open and Flexible Education (ICOFE 2016) held at the Open University of Hong Kong.

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Chapter 11
Learners' First Exposures to Corpus-Based Activities

Yoko Hirata

Abstract Over the last three decades, various corpora (the plural of "corpus", defined as a large electronic database of authentic language taken from newspapers, textbooks, transcriptions, etc.) have played an important role in dictionary compilation and in English teaching in higher educational organisations. Despite their popularity for language learning, not enough research has been conducted concerning how novice users of a corpus or corpora can most effectively utilise these language resources. Many instructors are unaware of what kinds of methodological approaches work successfully for their students. This study demonstrates the results of an investigation into different types of challenges 38 Japanese university students encountered through the process of utilising corpus data in their English studies. It also examines the ways their instructor dealt with these challenges. The findings indicated that students' educational backgrounds have an enormous influence on the outcome of their successful utilisation of corpus consultation (i.e. concordance lines—sample sentence fragments from the database). A further key result was that introductory lexical exercises are of crucial importance in enabling students to utilise corpora more effectively.

Keywords Corpus · English learning · Data-driven learning

Introduction

Since the late 1980s, various applications of a corpus—"a collection of texts, written or spoken, usually stored in a computer database" (McCarthy, 2004, p. 2)—have enormously expanded analytical capabilities to understand lexical and grammatical patterns of languages. In combination with a computer-based text analytical tool called a "concordancer", corpora (the plural form of "corpus") provide students

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_11

with more reliable information about the frequency and typicality of words and phrases than the native speaker's intuition (Stubbs, 1995). Language activities using concordance lines created by a concordancer help students to pay closer attention to the target word and expressions in rich contexts, as well as gain comprehensive knowledge of words effectively (Dodd, 1997). Studies have suggested that these activities are more effective in learning lexical and grammatical patterns and other recurrent patterns of the target words such as collocations (Huang, 2014) and polysemous words (Liu & Jiang, 2009) than learning them through grammar and vocabulary books (Barlow, 2004; Boulton, 2007). This approach is referred to as "data-driven learning" (hereafter DDL), a term coined by Johns (1991), of which the effectiveness has been widely confirmed by relevant research. For example, Yoo and Shin (2020) applied the approach to analyse the error patterns of Korean university students in English use. Lee, Warchauer, and Lee (2019) used the approach to identify learners who are more receptive to DDL, which helps the design of personalised instruction for language learning.

Corpora were also significant contributors to dictionary compilation. The first dictionary compiled using corpus data was the *American Heritage Dictionary* in 1969 (Walter, 2010). Further corpus-based dictionaries (e.g. the *Oxford Essential Dictionary* and *Macmillan English Dictionary for Advanced Learners*) have been developed. In addition, a corpus called the *Bank of English* was developed for the publication of the *Collins COBUILD* (Collins Birmingham University International Language Database) *English Language Dictionary*. Unlike traditional dictionaries, these corpus-based dictionaries describe the most commonly used words and phrases with sample sentences (Conrad, 2002). These dictionaries also provide typical collocational and semantic information, which Sinclair (1991) defines as "semantic prosody", where some words are associated with specific words with either positive or negative meanings.

Commercial materials based on corpora have also been developed. The first major corpus-based English language reference books and workbooks include the *Collins COBUILD Concordance Samplers* (Goodale, 1995) and *Exploring Academic English: A Workbook for Student Essay Writing* (Thurstun & Candlin, 1998). Recently, corpus-informed textbooks, such as *Touchstone* (McCarthy, 2014) and *Face2Face* (Redston & Cunningham, 2013), based on the *Cambridge International Corpus* and the *Cambridge Learner Corpus*, have emerged as important tools in the process of learning foreign languages. These textbooks enable students to learn the most frequent and common lexical and grammatical information used in everyday life (McCarthy, 2004).

Online freely accessible English language databases, such as the *British National Corpus* (BNC) and the *Corpus of Contemporary American English* (COCA), have also made a major contribution to the development of students' writing skills as effective reference methods (Boulton, 2012; Frankenberg-Garcia, 2012; Gilmore, 2008). BNC was developed in the 1990s by a consortium of publishers, the British Library and Oxford and Lancaster Universities. This corpus contains a 100 million word collection from a range of spoken and written texts and is "one of the most heavily used and researched corpora" (Lee, 2010, p. 110). COCA, first published in

2008 (Davies, 2010, p. 448), contains more than 520 million words taken from written and spoken English texts. This is "the most widely-used corpus of English … [and] attempts to capture a snapshot of English as it is used in the U.S." (ibid). These corpora provide students with a variety of lexical and grammatical feedback, help them to raise their awareness of the various language patterns of target words/phrases and correct their errors in autonomous ways.

In spite of these benefits, the use of online corpora has still not become a mainstream practice in teaching languages (Allan, 2009). Unfortunately, up until now, corpora in language teaching have been used mainly for advanced students for linguistic research (Quinn, 2015) or applications such as the writing of personal statements (Almutairi, 2016), despite many directions for the use of corpora have been pointed out by McEnery and Xiao (2010) a decade ago. There has been also corpus-based research on various aspects of English use (Lee et al., 2019; Lu & Cheng, 2019), but these attempts are by no means common.

Students' Difficulties in Utilisation of Online Corpora

In Asian countries, online corpora have provided both instructors and students with considerable flexibility in the pursuit of authentic language data. The importance of corpus referencing has been emphasised as a useful means of compensating for students' insufficient English experience (Quinn, 2015). Although these language resources are freely accessible and, as a result, easy for instructors to incorporate into their classes, it is often challenging for them to familiarise students with these corpora and accompanying learning techniques.

There are several major problems with implementing corpora in the classroom. Firstly, students are overwhelmed by the large number of concordance lines (including key words to examine) because they are required to explore language data quantitatively and qualitatively (Sripicharn, 2010). Secondly, reading concordance lines, which are incomplete sentences, makes it difficult for students to understand the meaning of the lines (Boulton & Tyne, 2015). Although computer-based parallel/bilingual corpora have been developed to solve problems that students with lower proficiencies experience (Chujo & Oghigian, 2012), the use of these corpora has been implemented on an extremely limited and experimental basis. Thirdly, although a "pedagogic corpus" helps students engage in "focus on language form" activities (Willis, 2000), the concordance lines presented to students are often irrelevant to their own experiences. Lastly, getting accustomed to the exploration of language data through a computer interface is challenging for students (Boulton, 2009). In order to solve these problems, research on paper-based concordance lines has been conducted (Huang, 2014). However, not enough research has been conducted into how novice corpus users, who have been used to traditional non-corpus-based teaching methods, initially perceive paper-based concordance lines and become familiar with using them to advance their language studies.

Purpose of the Study

The purpose of this study is to examine Japanese undergraduate students' initial appreciation of utilising English language activities derived from paper-based concordance lines. This study focuses on their attitudes and preferences towards these new corpus-based learning materials. This subject was chosen because of its significance, as previous academic research dealt primarily with more advanced-level learners. There were two research goals:

1. How do novice users of corpus materials perceive the benefits and challenges of this learning method?
2. What are the distinctive characteristics of their feedback in terms of corpus learning methods and materials?

Methodology

The Setting and Participants

The subjects of this study (n = 38) were lower-intermediate learners of English enrolled in a university reading course in Japan. All the students were females in their first and second year of university and were between the ages of 18 and 20. They were non-English majors, and none of them had previous experience of corpus-based approaches. All of them had learned English for at least 6 years in secondary school and were familiar with the traditional teacher-directed language learning approach in a large lecture-type environment where the teacher is seen as an authority figure. In secondary school, all the students viewed vocabulary and grammar acquisition as having a central role in improving language skills. They were also required to do a huge number of decontextualised word and grammar exercises based on word lists without sufficient speaking opportunities. In this university, although in general their English proficiencies are not high, they are required to earn English credits before graduation.

This elective reading course aimed to assist students in developing the four language skills (reading, writing, speaking and listening comprehension) and help them to achieve higher TOEIC® (the Test of English for International Communication) scores. University students in Japan are strongly encouraged to take TOEIC to demonstrate their English abilities because Japanese companies use the scores as convenient metrics for comparing job candidates (TOEIC Newsletter, 2013).

This blended-learning course was comprised of teacher-centred instruction in combination with online independent studies and continued for two semesters. Each class was scheduled for one and a half hours each week over a 30-week period in a computer-assisted language learning (CALL) classroom. A corpus-based project was implemented during week 11 to ensure that students understood collocates and other important lexical combinations in the textbook entitled *The Next Stage to the TOEIC Test* (Herbert, Ito, Murakami, & Herbert, 2011).

The student survey carried out during the course indicated that 58% of the students attended every single lesson, while 13% of them attended only half the lessons. In addition, 53% of the students preferred the teacher-centred lecture type of English teaching, while the remainder preferred blended-learning approaches. Only 5.2% of the students had experience using online resources and/or materials in secondary school to accomplish tasks and assignments. Also, only 15.7% of the students used online monolingual (i.e. English only) dictionaries in secondary school and university. Half of the students preferred doing tasks via digital devices such as smartphones and iPhones. Although students had been using the Internet and smartphones every day, almost none of them thought that they were fully capable of using computers.

Procedure

During the course, students were required to look up new words they encountered in the textbook using several online monolingual English dictionaries, such as *Macmillan Online Dictionary* (http://www.macmillandictionary.com/), *Cambridge Dictionaries Online* (https://dictionary.cambridge.org/) and *Oxford Learner's Dictionaries* (http://www.oxfordlearnersdictionaries.com/). This familiarised them with understanding definitions of English words and phrases, and they learned how they could use these in context by looking at ample amount of sentences.

During the course, two lexical projects were implemented. The first examined whether or not students became used to consulting online dictionaries and understood how to use key words correctly in different contexts. Students were asked to look up some high-frequency verbs such as *make* (which has many different meanings: *produce* something, *do* something and *cause* something *to happen*). After referring to the example of sentences in these dictionaries, students made dialogues, e.g.

You: Wow, your new furnished apartment looks very nice.
Your friend: Well, actually, I made these dining and coffee tables and those cabinets all by myself.
You: Really? When did you learn how to make furniture?
Your friend: I used to work as a furniture designer after graduating from University.
You: So you majored in design?
Your friend: Not really, but I learned a lot of new skills from my old friends.
You: I like this photo frame. It's beautiful.
Your friend: Oh, yes, thanks.
You: And I love these pictures, too.
Your friend: Those are the pictures of a birthday party I attended last year. These funny guys in the pictures were my old friends and they made us laugh a lot.
You: I can easily imagine. Oh, by the way, I need to make a quick phone call. Could I use your iPhone please?
Your friend: No problem. Go ahead.

The second project determined whether or not students were able to identify lexical and grammatical patterns around some high-frequency verbs such as *make* and *made*. A small corpus derived from the TOEIC textbook, which the students had used in the course, was created for this project. The key words *make* and *made* were displayed with the Key Word in Context (KWIC) mode in a plan.

Students were encouraged to identify what kinds of words were used with the key words and what phrases and typical collocations were included with them. They were also asked to identify other lexical and grammatical features associated with these word combinations. Excerpts from the concordance lines students used were as follows:

Welcome to Thompsons. We'd like to **make** a few announcements about our sales
on our current computer systems. Please **make** a special effort to attend the semi
tain! Yes, living in Great Britain does **make** sense. Do you actually believe it?
ine. No. Just some cough drops. Did you **make** an appointment for the dentist? Yes
lu cases. As the flu season approaches, **make** sure you take preventative measures
creen. A man is holding a microphone to **make** a speech. Theman is receiving an a
?s at issue here is whether they should **make** an investment of $4000 in bonds. M
ng the trial period you will be able to **make** unlimited free calls to cell phones
to our club. A party is the best way to **make** friends. The club will provide hamb
business travel, you are encouraged to **make** use of the video conferencing room
travel upstream. The rental car company **made** provisions to have us dropped off a
ls for each room. Luckily Judy's boss **made** arrangement for her to receive the
out the order via e-mail, and they've **made** a prototype for us. Basically, what
e t the workers to consider. Her teacher **made** her study harder, because her grade
cessarily products that perform well. I **made** him go to see a dentist yesterday.
was made to wait for over two hours. He **made** his stomach hurt by eating spoiled
gulfed underwater by the dam. Though we **made** a profit of $600,000 on the sale, h
18 s will be of getting a good position. I **made** the best of my small work space and

Students were then instructed to focus on various language features such as prepositions and collocations, organise their findings and discuss them in the classroom. This included language activities creating sentences and dialogues using the lexical combinations they had found.

Questionnaire and Observation

At the end of the course, the students were provided with a questionnaire containing five questions (see Table 11.1 in the Findings section). Most of the questions had a 10-point Likert scale, with 1 representing "strongly disagree" and 10 representing "strongly agree". The questionnaire had a column where students were encouraged to write their opinions on the benefits and challenges of these projects. All 38 questionnaires were returned, the points were totalled and averaged, and standard

Table 11.1 Students' views on the project

	Mean (SD)
1. English is important for the rest of my life	7.80 (1.50)
2. The lexical and corpus-based projects were effective in improving my English skills	7.20 (2.00)
3. It is worthwhile introducing corpus-based learning approaches into other English courses	6.40 (2.10)
4. Students think that the instructor should provide them with Japanese translations for each concordance line	7.60 (1.90)
5. Students find it easy to identify various lexical patterns of the key words because the corpus was based on the textbook they read	5.10 (1.80)

N = 38

deviations were calculated. The data presented in this paper are both the mean and the deviations from the mean (±SD).

In order to assess students' engagement and involvement in the activities, classroom observations were also conducted during the two projects. This assisted in determining students' progress in understanding and provided insights into what should be taught next with what kinds of materials (Rea-Dickins, 2001). The aim of the observation was to collect data and examine the efficacy of this study. Written records of what students said when they created sentences and dialogues were made.

Findings

The findings of the questionnaire revealed that the majority of students thought English was important for the rest of their lives and that overall they were satisfied that the projects improved their English skills. The averages and standard deviations (±SD) of these responses were 7.80 (±1.50) and 7.20 (±2.00), respectively.

From the concordance lines below, students learned that, as Willis (2006, p. 112) suggests, the verb *make* is used with nouns referring to "taking" (i.e. *announcements* and *speech*) and "plans" (i.e. *appointment*, *provisions* and *arrangement*).

Welcome to Thompsons. We'd like to **make** a few announcements about our sales
creen. A man is holding a microphone to **make** a speech. The man is receiving an a
ine. No. Just some cough drops. Did you **make** an appointment for the dentist? Yes
travel upstream. The rental car company **made** provisions to have us dropped off a
ls for each room. Luckily Judy's boss **made** arrangement for her to receive the

In addition, from the concordance lines below, students learned how a causative verb *make* was used in different contexts, such as *made her study*, *made him go* and *made his stomach hurt*.

et the workers to consider. Her teacher **made** her study harder, because her grade cessarily products that perform well. I **made** him go to see a dentist yesterday. was made to wait for over two hours. He **made** his stomach hurt by eating spoiled

Although students learned in high school that an object and a base form after the verb *make* is used to "say that one person causes another person to do something" (ibid, p. 146), the concordance lines including these phrases were more useful for students to expand their capability to create different sentences without remembering the grammar rule.

The students' feedback on the benefits of using the concordance lines also indicated that they felt the project helped them achieve a deep understanding of a variety of usages of the key words in different contexts. Students stated as follows:

> Although the major definition of the word "make" provided by dictionaries is produce, the corpus-based project helped me make sure that there are different lexical patterns including the word "make". These patterns are quite useful for me to use when I communicate in English.

In addition, students discovered from these projects that Japanese translations of the sentences including the word "make" did not help them to learn how commonly used everyday verbs are used in different contexts. One of the students said the following:

> Usually various meanings of a particular word such as "make" are explained in Japanese in different pages in a textbook. These explanations make it difficult for me to connect the meanings of the word with how it is used in real life situations. The project helped me organise how different usages of the word "make" can be used in different situations.

The projects also helped students to understand the importance of learning various language patterns in various contexts, i.e. that memorising words and phrases in isolation is not enough. Concordance lines are ideal for achieving this goal. A student stated that:

> Although in secondary school and even in other English classes in this university I was taught individual words with their meanings in small quantities at a time, the concordance lines in this project helped me learn different lexical and grammatical patterns including the word "make" at the same time. Although I'm usually unwilling to consult words in dictionaries, these two projects encouraged me to look at various ways of how words are connected with each other at the same time.

The comment of the student below indicates that, although students rated highly the effectiveness of using concordance lines for their English study, teachers need to encourage students to look up words in dictionaries when they encounter unfamiliar words and expressions in the lines:

> Although it was difficult for me to do this project, I think combination between consulting dictionaries and examining concordance lines is an interesting approach to study English. I would like to keep doing this kind of exercise for my future English study.

However, despite the fact that the students were familiar with the corpus used in the second project, a significant number of them were not able to identify the lexical patterns of the key words they were required to examine. The average and standard

deviation (±SD) of this response were 5.10 (±1.80). One of the possible reasons why students thought in this way is because, although they were encouraged to focus on these patterns in the regular classroom in the course, they had been trained over the past 6 years to look at individual words instead of patterns. Therefore, they were dubious about the value of introducing corpus-based approaches into other English courses they might take. The average and standard deviation (±SD) of this response were 6.40 (±2.10).

In addition, due to the grammar-translation pedagogical methods students experienced in secondary school, 74% of them required Japanese translations for each concordance line. The average and standard deviation (±SD) of this response were 7.60 (±1.90). This indicates that students completed the projects based on their traditional notion of how language should be taught in educational settings. Other issues students brought up were as follows:

> I don't understand why the corpus is useful for my language studies. Since I'm not used to using online dictionaries, it was very difficult for me to complete these projects. It was difficult for me even to upload my electronic file to the instructor.

> It was difficult to understand the relationship between the words in lines since each line was incomplete. As a result, it was hard for me to identify the meaning of some proper nouns and the context each line provides. I wish the instructor could have provided Japanese translation for those unclear lines.

These comments indicate that some students found this new way of looking at a language using concordance lines was too challenging, as well as too demanding in the limited period of time of the course, and therefore it was difficult for them to appreciate the benefits of utilising the corpus for their English studies. Although this negative feedback came from a minority of students, due to their essentially similar educational and social backgrounds, there were no distinctive demographic differences between the respondents.

Discussion and Conclusions

This study demonstrates the results of an investigation into the benefits and challenges Japanese university students encountered through the process of utilising corpus data in their English studies. As the findings outlined above have suggested, the majority of the students thought these corpus-based projects were important for them to raise their awareness of how language works in different contexts. At the same time, despite the fact that these students in high school were required to memorise individual words and learn grammar rules discretely, from observation a number of them were able to answer which words or phrases co-occurred with the verbs in what contexts. Students were able to identify words commonly preceded by and/or followed by verbs. These students could easily apply what they learned from the concordance lines to their acquisition of productive language skills, such as speaking and writing. However, the results of this study also indicated that different

students appreciate corpus-based activities differently. Students' feedback showed that their educational backgrounds significantly affected their appreciation of this new language learning approach. This is in accordance with Sun's study (2007), which indicated that students' appreciation of corpus-based activities is strongly based on their previous language learning experiences. As stated above, the previous learning experiences of the students in this study included learning words without any context, as well as word-by-word memorisation and literal translation from English to Japanese.

A limitation of this study is that these corpus-based projects were implemented only once, in only one course. Since the sample size was very small, these findings cannot be generalised and applied to all students learning English in Japan. Further investigation needs to be carried out to identify the effectiveness of similar corpus-based projects and to examine their long-term educational contributions to language learning achievement. In addition, for the purpose of familiarising students with corpus-based activities, the development of adequate introductory exercises is essential.

In order to develop students as effective users of online resources such as corpora, more comprehensive on-going research is indispensable to determine how other different factors influence students' successful completion of corpus-related activities. These factors include students' language proficiencies, as well as the types of corpus and the objectives of assigned language tasks. Research into a wider spectrum of learning environments and contexts will contribute substantially to the sustainable development of online resources for flexible language learning environments.

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Chapter 12
Using Custom Textbooks as Distance Learning Materials: A Pilot Study in the OUHK

Henry M. F. Choi and Eva Yuen Mei Tsang

Abstract The Open University of Hong Kong (OUHK) has been providing distance learning programmes for more than a quarter of a century. Over the years, OUHK students have been provided with specially developed self-contained study units, regular face-to-face tutorials and online learning support. The students are also directed to read selected textbook chapters or journal articles in the comprehensive study units. However, the development of study units is labour-intensive and time-consuming. In view of the advances in learning support provided by tertiary-level textbooks, the OUHK has considered the possibility of adopting commercial textbook(s) or selected chapters of textbooks to replace its study units. Four courses in the School of Business and Administration were chosen for a pilot study, and the present paper evaluates this new approach to learning support—which is called the "custom textbook approach"—to see whether it provides comparable learning support to OUHK students. A total of 20 students from the 4 courses were invited to attend focus group interviews. The interviews were semi-structured in nature, and students were asked to express their opinions on this new approach to learning support. Students who had completed courses with self-study units were asked to compare their learning experience between the two approaches and express their preference. The expected quality of custom textbooks and possible enhancement of this approach were also explored. The interviews revealed that the new approach to learning support was quite acceptable to students, though some still preferred the traditional study units. The pros and cons of the new approach were also identified by experienced distance learners. Some useful suggestions were made which could be beneficial to the later development and provision of learning support.

Keywords Distance learning materials · Learning support · Custom textbook

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_12

Introduction

The Open University of Hong Kong (OUHK) was established in 1989, with the title the Open Learning Institute of Hong Kong (OLI), and it was the first degree-awarding institution in Hong Kong offering distance learning programmes. Typical distance learning materials in the OUHK consist of a course guide, study units, textbooks and audio-visual materials. Students are also provided with online learning support, as well as regular face-to-face tutorials. However, in most of the distance learning courses, students can fulfil all the course requirements by self-study, as the tutorials are not compulsory. The study units, therefore, are the key learning component in the University's distance learning courses. However, the development of the comprehensive study units is a time-consuming task, and the cost is high (Commonwealth of Learning 2005).

Various initiatives related to the development of learning materials have been carried out to address the challenges. For example, Farmer, Catalano and Halpem (2020) developed electronic textbooks using an adaptive learning platform and examined students' experience in using them. They found that the interactivity of the platform facilitated students' retention of concepts presented in the textbooks, which also promoted student engaging involved in using them. Liu, Vernica, Hassan and Venkata (2017) proposed a multifaceted textbook platform for easy digital-to-print-to-digital content creation and reading service which is claimed to enhance students' learning experience. Pursel, Ramsay, Dave, Liang and Giles (2019) developed a system powered with artificial intelligence for teachers to create open textbooks to support students' learning and decrease their expenditure.

In 2015, a new approach to developing distance learning materials was also started in the OUHK's School of Business and Administration. In the new approach, the key learning materials is a custom textbook instead of self-developed study units. In addition to the custom textbook, students receive a study guide which usually provides the course overview, direction for textbook reading, learning activities and self-tests. The greatest advantage of this new approach is that the time and cost of development can be substantially reduced. However, the effectiveness of this new approach and its acceptance by distance learners must be examined before it can be further adopted.

The following section first reviews the existing method of course development in the OUHK and then the rationale for the so-called custom textbook approach.

Course Development in the OUHK

In general, there are two main approaches to producing distance learning materials. The first is to develop comprehensive and self-contained study units, and the other is to write a study guide which assists learners to study existing material(s), such as a textbook (Commonwealth of Learning, 2005). A self-contained course is believed

to be a better option since developers can optimise every aspect of the course to meet the needs of a particular group of learners (Commonwealth of Learning, 2005; Lockwood, 1998). In the OUHK, most of the courses provide self-contained study units which are developed from scratch.

Self-Contained Study Units

Since the study units serve as the key component of the learning support in the University, the quality of the learning materials is crucial for the success of distance learners. In order to ensure the quality of the materials, the development of all the course study units in the OUHK has to undergo a meticulous scrutiny process involving various forms of expertise. A course team is set up for the development of a new course, and major revision of existing courses goes through similar procedures. Each of the course teams includes at least a course developer, a course team coordinator and an instructional designer. Course developers can be internal or external teachers who have both subject expertise and teaching experience in the related subject, and they are indeed the key content writers. All the materials, including the drafts of blueprints—which provide the course outline and learning outcomes—and subsequent study units are sent to other course team members for their review. The course team coordinator is usually the course coordinator who actually manages the course when it is launched. As an experienced subject teacher, he or she will give content-related comments and advice on the drafts, to make sure the materials are in line with the course learning outcomes and programme requirements. Instructional designers are responsible for the pedagogical issues in the distance learning materials, including the instructional methods adopted, the design of learning activities and effective use of online and multimedia components, as well as the formative and summative assessment (Commonwealth of Learning, 2005).

It is not uncommon to find an experienced teacher who is a novice in developing distance learning materials. If the developer is not a member of the internal staff, he or she may not be familiar with the learners' profile. The other course team members, who are both internal staff, can provide advice or assistance during the development process.

Distance learning materials have certain pedagogical features. Martens (1998) identifies a total of 23 "embedded devices" which instructional designers will include in their distance learning materials. The most common items are learning objectives, advanced organisers, activities and feedback, examples, self-tests, summaries and lists of key points, study tips, animations and hypertext links (in online materials) (Commonwealth of Learning, 2005). Of course, with the rapid development of information and communication technologies, modern distance learning materials have incorporated more online and multimedia components, such as animation and video (Moore, Dickson-Deane, & Galyen, 2011). Besides the embedded devices mentioned above, there are various pedagogical concepts in the field of distance learning which influence the design of self-instructional material, e.g.

tutorial-in-print, reflective action guides and dialogue (Rowntree, 1974, 1990; see also Lockwood, 1998). All these devices and instructional concepts are widely adopted in distance learning materials. However, these specific features were not common in traditional textbooks which were written for teachers or trainers rather than learners (Lockwood, 1998).

The self-contained distance learning materials, on the one hand, can maintain a high quality and meet the specific needs of the particular group of distance learners. On the other hand, the development of such learning materials is costly and time-consuming. In the case of the OUHK, it usually takes more than a year to prepare a 10-credit course, and the materials need updating or revision after a few years of use.

Reconsideration of the Study Guide Approach

The high cost and long preparation time are not the only incentives to make a change. In recent years, the quality of commercial textbook in the market has been improving (Government Accountability Office, 2005). In order to attract textbook users, publishers of college textbooks have invested heavily in enhancing the quality of the textbooks and related support. For example, textbook publishers have develop additional materials for instructors and students, including websites, multimedia components and other instructional elements, to ensure that the content they provide is updated with the most current pedagogy and learning support. This heavy investment is a way of responding to the changing needs of the higher education community and remaining competitive in the marketplace (Lepionka, 2008). As a result, some of the important features of distance learning materials mentioned above have been incorporated into the textbooks, which have become more suitable for independent study. Table 12.1 below shows some of the pedagogical features identified in recent college textbooks.

Under such circumstances, the idea of replacing the self-developed study units with high-quality textbooks becomes feasible and attractive. The OUHK would like to try out the "custom textbook approach" in producing distance learning materials for its students. This approach is not an innovation in developing distance learning

Table 12.1 Pedagogical features in recent college textbooks

For learners	For teachers
Advanced organisers	A teacher manual
Learning outcomes	A summative test
Case studies	PowerPoint files
Formative tests	Video cases
Learning activities	Online support (e-version of text, multimedia)
Summaries	

materials. For example, Lockwood (1998), Rowntree (1994a, b) and other scholars of distance learning discussed it decades ago. The major difference in adopting this method now is the existence of high-quality college textbooks in the market, which make the development a comparatively easier task.

A Trial of the Custom Textbook Approach

In the custom textbook approach, book chapters from one or more textbooks in the market are selected by the course team and, with the help of publishers, are compiled into a tailor-made edition for a particular course. In addition to the custom textbook, a study guide is developed by the course team members. The study guide, unlike the study units, is slim in size, providing only an overview of the course, directions for textbook readings, study guidelines, learning activities and self-tests. The custom textbook and study guide are standard learning materials for students, replacing the comprehensive study units, and they are covered by the tuition fee. All the other learning supports, such as face-to-face sessions and online learning platform, are also provided as before.

Starting from early 2015, four courses from the School of Business and Administration (B&A) were selected for a pilot run of the new approach of course materials development. The four courses are listed in Table 12.2.

As shown in Table 12.2, two of the courses are at undergraduate level, and another two are at postgraduate level. Three of them are 10-credit courses which last for two semesters; and the other one is a 5-credit, one semester, course. The study materials of the four courses are the first batch of courses adopting the custom textbook approach; and the effectiveness of the learning materials and how students perceive this new approach are both issues of considerable concern. The present study is designed to evaluate the new approach to see whether it is appropriate to extend it to other courses in the OUHK.

Table 12.2 The four courses chosen for the pilot run

Course code	Course title	Credits	Level
MGT B102	Introduction to Services Management	10	Undergraduate
MKT B362	Marketing Research	5	Undergraduate
MKT B890	International Management Strategy	10	Postgraduate
MKT B891	International Marketing Strategy	10	Postgraduate

Table 12.3 Number of interviewees in each group

Course code	Number of interviewees
MGT B102	5 (2 males +3 females)
MKT B362	5 (3 males +2 females)
MKT B890	4 (2 males +2 females)
MKT B891	6 (3 males +3 females)

Research Objectives and Methodology

As mentioned above, the main objective of the present study is to evaluate the effectiveness and students' acceptance of the custom textbook approach to the development of distance learning materials. The feedback from students could provide suggestions on how to further enhance the new approach and identify its weaknesses.

The three 10-credit courses commenced in September 2015 and ended in May 2016, while the 5-credit course started in January 2016 and ended in May 2016. Four focus group interviews were conducted in early May 2016, when the students had completed all their coursework and were preparing for the examinations in early June. An invitation email was sent to all students in the four courses, and interested students could reply on a voluntary basis. A small monetary reward was offered to the students who agreed to take part in the 1-hour interview session. As a result, a total of 20 students attended the interviews, and they were grouped according to the course they were studying (see Table 12.3).

In each group, there were two or three interviewers, including at least one of the present writers and a member of the academic staff in the School of B&A. The interviews were semi-structured, and the main objective was to find out the effectiveness of the new custom textbook and study guide as the key distance learning materials. Since all the interviewees were experienced OUHK students and had studied courses with study units in the past, they were asked to compare the study units and custom textbook in terms of their effectiveness as distance learning materials. The focus group interviews were recorded and transcribed for later analysis.

Results

The feedback of the interviewees from the four courses was compiled and is reported below.

Usage of the Custom Textbook

When the students were asked how they used their custom textbook in their studies, the answers varied. Some students declared that the main learning material in their distance learning was not the custom textbook, but the PowerPoints given in the supplementary lectures and/or tutorials—the custom textbook was referred to only

when they were tackling their assignments or online quizzes. Nevertheless, some students reported that they relied mainly on the custom textbook and they went through the assigned readings suggested in the study guide.

Among the students in the four courses, more undergraduate students seemed to view the PowerPoints or tutorial notes as the most important learning materials, and the custom textbook served only as supplementary material for them. One of the reasons for this is that many of the undergraduate students found the custom textbook to be too lengthy and they just could not afford the time to read it. Another problem was that the language in some of the textbooks was quite complex and they could not grasp the meaning effectively. Some students stated that they had to refer to a dictionary quite often if they wanted to read the textbook seriously. As a result, most of the non-frequent users of the custom textbooks reported that they just scanned through them before the tutorials. They also claimed that the focus of the content in the custom textbooks was not clear, and they needed their tutors to highlight or clarify the key points in the text. Another weakness of the custom textbooks, which originated mainly from Western countries, was that there were no local cases or examples. Also, in one particular postgraduate course, students complained that the font size of the textbook was a bit too small.

Comparatively, the custom textbooks were appreciated more by the postgraduate students who said that they were useful resources and provided detailed discussion and explanation of theories and concepts. They also commented on the organisation of the textbooks which, they felt, presented the content in a systematic manner.

Since the publishers provided both printed and e-copies of the custom textbooks, students could access and download the e-version of the textbooks into their own devices. Most of the students found this to be very convenient for their studies as they could study anywhere, while the printed textbooks were quite bulky to carry about. With the e-version of the text, they could also search the key words in the text and find the information they needed with ease.

However, the e-version was appreciated more by the younger undergraduate students who were in general more familiar with technologies. A considerable number of the postgraduate students asserted that they preferred to read the printed copy of the textbook, on which they could make notes. The advantages and disadvantages of using a custom textbook are summarised in Table 12.4.

Although the comments on the custom textbooks were not consistent among interviewees, most of the students appreciated the introduction of the custom textbooks. In fact, most of the negative comments were textbook-dependent. For example, one of the undergraduate textbooks was considered difficult to read, but another textbook at the same level was highly regarded.

Table 12.4 The advantages and disadvantages of a custom textbook

Advantages	Disadvantages
Nice outlook	Too bulky
Ownership (with the OUHK logo)	Too much information (can't complete)
Resourceful	Too complicated language
Well-organised	Lack of local examples
Comprehensive	Lack of total coherence between the lectures and the textbook
e-version can be searched/translated/copied	Not a good choice of textbook
	Font size too small
	Not straightforward and tailor-made
	No glossary

Usage of the Study Guide

In the custom textbook approach, the study guide is intended to give students an overview and directions for textbook reading, supplementary discussion on related content, learning activities and self-tests for informative assessment (Duchastel, 1988). Some students found the study guide to be very useful for effective learning. However, other students said that they did not spend much time on it. A couple of students even went to the textbook content straightaway and believed that the textbook was the most useful material; but these students only realised later that some of the textbook chapters were marked "optional" in the study guide and would not be included in the final assessment.

Most of the students only scanned the study guide at the start of the course to get a rough idea of what it contained; and most of the learning activities and self-test were skipped to save time.

After some explanation about the role of the study guide, most of the students agreed that it was useful and suggested that it should be incorporated into the custom textbook, making the two components more integrated and the study guide more important.

Comparison Between Study Units and Custom Textbook

When the students were asked which approach to the course materials they would prefer, study units or custom textbook, many students stated that they preferred the custom textbooks, though their answers were not expressed very strongly.

Some students, especially the undergraduates, still preferred comprehensive study units, which they believed could provide more tailored and straightforward learning materials for them. The comparatively plain language used in the self-developed materials was certainly beneficial for most of the students in Hong Kong who learned English as a second or foreign language. Obviously, students who

opted for study units would like to have more effective study materials and did not want to struggle with the vocabulary and sophisticated sentence structures.

Many students, especially those studying postgraduate courses, were more concerned about the content of the textbook, not the language used. They argued that it was the quality of the learning material which really mattered, not its format or approach; and they felt that the custom textbooks, which were carefully selected by the course team, did provide very comprehensive learning materials for them. Most of the students agreed that, in preparing for assignments or online quizzes, the custom textbook was the most useful material to be consulted as its content was well-organised and they could find most of the information they needed in one single source.

Moreover, many students appreciated the OUHK's inclusion of the custom textbook in the learning materials package as it was free of charge. In the courses with study units, the study units are included in the package but students have to buy their own textbooks when they are needed. Lastly, the covers of the custom textbooks were designed by the OUHK, and there was an OUHK logo on them. Many of the students appreciated the design and found that it gave them a sense of ownership of the materials.

Discussion and Conclusion

In general, the custom textbook approach was quite acceptable to the students at different levels, and a majority of the interviewees considered it reasonable that this new approach to development should be used in other courses. Although the custom textbooks of the four courses involved in the study were not all highly regarded, this approach to distance learning materials seemed to be endorsed by most of the respondents. No student in the four focus groups complained seriously about the new approach, although they gave many suggestions for improvement.

As mentioned by some of the interviewees, the quality of the study materials is the most important concern, regardless of the format or approach adopted. In order to provide a better-quality custom textbook for distance learners, the selection of the textbook or textbook chapters is of paramount importance. Based on the opinions and suggestions of the students interviewed, the following criteria are worth serious consideration.

- The language used must be plain and easy to understand.
- It should be concise, with a clear focus.
- The structure should be well-organised.
- There should be learning support features, such as a glossary and visual elements.
- The font size should be suitable.

It seemed that the students are not concerned very much about the embedded devices of instructional design in the learning materials, which might reflect that the custom textbooks do provide basic pedagogical support and fulfil learners' requirements.

Another two suggestions from the students can also be considered. First, the study guide can be combined with the custom textbook so that they are integrated into one volume. This would not only be more convenient for the students but also put a greater emphasis on the role of the study guide. The custom textbook could also be split into smaller booklets so that it would become less bulky and more convenient for students.

The custom textbook approach, according to the focus group interviews, is a feasible and well-accepted way of providing distance learning materials. However, the selection of the textbook or textbook chapters becomes the most important task in preparing course materials for distance learners. However, the development of the study guide cannot be overlooked, because it can serve as a useful supplement and enhance the existing custom textbooks.

The present study focuses only on the students' feedback and level of acceptance of the custom textbook approach. In order to investigate the effectiveness of adopting this approach, the opinions of the tutors and the students' performance in their assignments and examinations should also be investigated, as they are meaningful indicators that should be considered in future studies.

For the custom textbook approach to be widely applied, the copyright and fair use issues, which have long been posing great challenges to higher education (Crew, 1993), should also be considered. Since commercial textbooks are adopted in custom textbooks, the communication with copyright holders and the relevant costs (Yuen, Chow, Cheung, Li, & Tsang, 2012) have to be taken into consideration using this approach. Besides, the fair use of materials, particularly those generated in digital environments, for custom textbooks may involve ambiguity (Kingsbury, 2018), revealing the needs for future studies for clarification and resolution.

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Chapter 13
Web Streaming of Lectures: Experience of the University of the Philippines Open University

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Abstract The advances in information and communication technologies have encouraged educators to develop new teaching methodologies. Many universities worldwide have taken various initiatives to reach learners whose characteristics and needs in a wider, borderless community are continuously changing. Whether on-campus or through open and distance learning (ODL), educators are searching for ways to enhance the teaching and learning processes. Various studies have pointed out the effectiveness of video as an educational tool (Garcia & Alfonso, 2012). With the Internet, video lectures and tutorials can now be delivered in real time via streaming. Web streaming makes it possible for e-learners, especially those who cannot attend face-to-face lectures, to view and review streamed sessions anytime, wherever they are. At the University of the Philippines Open University (UPOU), web streaming of lectures, study sessions, fora, and seminars have been held since 2010. This chapter shares the experience of the team that provided technical support for web streaming activities.

Keywords Web streaming · UPOU · e-learning

Introduction

Streaming is the compression and buffering technique that allows videos to be broadcast on the Internet in smaller-sized files and, at the same time, allows the files to be opened and played as they are downloading (McCrohon, Lo, Dang, & Johnston, 2001). Pan et al. (2012) said that video streaming phenomenon indicates a change

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_13

in the way learners acquire new knowledge and skills. This change may also have effects on how learners read and review texts and how they listen, observe, watch, and comprehend lectures and presentations.

Various studies have pointed out the benefits of videos and web-streamed video lectures in teaching and learning. In many universities, online lecture recording has become an increasingly common supplement to physical lectures (William, Birch, & Hancock, 2012). Wang, Mattick, and Dunne (2010) argued that web streaming helps to save the resources of the university, teachers, and learners. Pan et al. (2012) pointed out the following merits of using online video lectures. Video is a multisensory medium; images, colours, texts, sound, music, and speech are combined together to gain students' attention and concentration more effectively than any other media. Videos streamed online support self-paced and self-directed learning. Learners have the freedom to choose what, when, where, and how long to watch the video lectures. Other benefits of the use of video streaming are that it can free classroom time for student participation, interactive learning, and collaborative learning (Coughlan, Lister, Seale, Scanlon, & Weller, 2019; Ronchetti, 2012), enable learners to learn complex concepts and procedures visually and aurally which is especially useful for practising lab-based skills (Hartsell & Yuen 2006; Scanlon 2019), allow broadcasting of videos at real time in multiple sites (Griffith, 2019), and be combined with mobile technology (Darmawan, Suryadi, & Wahyudin, 2019). Brockfeld, Müller, and Laffolie (2018) state that video lectures have been found to be as effective as face-to-face live lectures. Over the years, various practices on video streaming have also been developed (Darmawan, Suryadi, & Wahyudin, 2019; Griffith 2019; Hartsell & Yuen, 2006).

The University of the Philippines Open University

The University of the Philippines Open University (UPOU), established in 1995, is an open and distance e-learning institution in the Philippines. It is one of the eight constituent units of the University of the Philippines System and the only unit mandated to offer degree and continuing education courses through distance education. From 1995 to 2000, the university basically used stand-alone printed modules in teaching its distance learners. The modules were complemented with audio and video materials in VHS, cassettes, and CD formats. Learning support service was the once a month face-to-face study session held in UPOU Learning Centers located in several cities or towns in the Philippines.

By 2002, the university went fully online through its MyPortal, the UPOU's online classroom. It is in MyPortal that learners do the following: access all course materials, discuss with teachers and fellow learners, submit assignments and projects, and take online quizzes and examinations. The holding of once a month face-to-face study/tutorial session was no longer mandatory.

However, for its skills-based continuing education courses, blended learning approach was adapted. Course delivery was primarily online, while the monthly

tutorials or study sessions remained face-to-face and were conducted in the university's headquarters. However, not all learners were able to participate in the face-to-face study session due to various reasons. To prevent marginalising learners who cannot attend the face-to-face sessions, lectures and tutorial sessions were web streamed. Through web streaming, students were able to view the sessions synchronously or asynchronously.

The Multimedia Center is the unit of the university that is tasked to design, develop/produce, and evaluate multimedia materials for use by its distance learners. Included in these tasks are the designing, developing, and testing of innovative procedures for delivery of instruction. Web streaming technology is the easiest and cheapest way to address the concerns of those learners who cannot participate in the face-to-face sessions.

During the early part of its adoption, Justin.tv was used as the site for web streaming of UPOU's study sessions. The equipment employed was an external wireless microphone and a high-definition video camera connected to MacBook Pro using a FireWire and Wi-Fi Internet connection. The set-up was very simple as the sessions covered only talks and discussions.

However, learners watching the lectures online were not able to participate in the discussion on real time, which was one of the major comments of learners that surfaced during an evaluation conducted about web streaming. To facilitate real-time interactions, learners were encouraged to send their comments, questions, and/or clarifications via emails as the web streaming is being done. A staff member was assigned to check on the emails and give the questions to the course facilitator. Later, a chat room facility was added to the university website where learners can post their queries, clarifications, and comments.

Alongside with equipment upgrade, several formal or degree courses have also adopted web streaming for selected sessions. The university also used web streaming for fora, lectures, and training programmes intended for capability building of its own academic and administrative personnel, orientation seminars for new students, university graduation programmes, and public service programmes.

Organising Web Streaming Activity

Through the last 5 years, the production group involved in the operation and management of web streaming in the university had documented various challenges, experiences, and lessons learned from the diverse activities that had been web streamed in the university. From all of these, the production team also came up with techniques, approaches, and methods not only to address the challenges that had happened but also the possible concerns that may crop up during the production, post-production, and distribution of the learning materials that can be produced from the web-streamed sessions.

The experiences documented by the group are organised in three phases — pre-production, production, and post-production.

Pre-production Phase

1. *Hold a pre-production meeting with lecture/fora/study session organisers.*

During the meeting, the following issues are presented and discussed: programme flow, guidelines, and the requirements of both the organisers and the technical team. Compromises/agreements between the groups are worked on when the original requirements cannot be met. Programme guidelines agreed on by the groups are then relayed by the organisers to the speakers/lecturers/facilitators. There should be no surprises (at least for the production team) during the actual web streaming of the event. Detailed organisation of the event is essential to avoid showing online what should not be shown and committing "dead air".

2. *Conduct ocular inspection of the venue.*

Included in the ocular inspection is the checking/testing of the Internet connection; the venue size, layout, and lighting; and the audio and video equipment available. A dedicated Internet connection, with at least 3 Mbps, should be provided through a local area network.

3. *Test all presentation materials to be used by the speakers/lecturers*.

Presentation materials should be submitted to the technical team at least 3 days before the actual event. The technical team checks the audio and video quality of the required software for the presentation materials and the copyrights of the materials used. Materials are returned to the owner if revisions are necessary. It is also recommended that the materials included in the presentation are original creation of the speaker and should have a Creative Commons licence or open educational resource.

4. *Run a rehearsal or walk-through of the event, if possible.*

The rehearsal and walk-through will give a glimpse not only of what will be done during the event but also of other requirements and possible glitches that were not foreseen during the pre-production meeting.

5. *Set up and carry out technical testing a day before the event.*

The technical team sets up and prepares the venue a day before the event, and so there should be ample time for technical adjustments and troubleshooting.

Production Phase

1. *Technical testing*

Another technical testing is conducted at least an hour before the event. Our past experiences have shown that technical changes and adjustments can still happen even a few minutes before the actual web streaming.

2. *Briefing for teachers/lecturers/trainers/facilitators and the on-site audience*

The teachers/lecturers/trainers/facilitators are requested to be at the venue at least an hour before the event. Apart from having a last-minute briefing on the "dos and don'ts" when giving a presentation that will be web streamed, they can also practise/rehearse.

The members of the on-site audience are informed/reminded that the lecture will be web streamed. They are also briefed about the rules they have to follow when participating in the open forum.

3. *Digital capturing*

The event to be web streamed is also recorded or captured digitally. This serves as backup in case of an Internet disconnection. The recorded video is edited and uploaded on the web after the event.

4. *Traffic control*

It is important that there are people assigned to control the "traffic" on the floor and provide assistance to the speakers and audience during the live web streaming.

5. *Flexibility and sense of humour*

Human and technical errors can happen anytime, no matter how much control there is in the web streaming session. There should be room for changes/adjustments. The teacher and students should be put as ease, as the main purpose of the web streaming is to enhance the teaching and learning processes.

Post-production Phase

1. *Video editing*

The captured video is edited. Unwanted footage (i.e. dead air) is removed. Necessary graphics and text are also added. If the lecture is too long, it will be edited and divided into chunks or short videos. The chunked videos are uploaded on the UPOU Networks, where viewers can watch them anytime and anywhere.

2. *Evaluation*

The technical team evaluates the good and weak points of the concluded streaming session. Possible solutions to the weak points are pointed out so that they can be avoided in the future. If there were equipment malfunctions during the event, they will be repaired or replaced.

Evaluation is an important activity as it will guide the technical team to further improve its practices for web streaming.

Views of Teachers and Students

A study on the views of UPOU course coordinators or teachers and online learners on the use of web streaming for their online classes was conducted. The respondents were from the continuing education courses where web streaming was first applied. Data were collected through a self-administered online questionnaire emailed to all the 64 students enrolled in course "Organic Agriculture, New Enterprise Planning, and Simplified Accounting for Entrepreneurs". Besides, a focus group discussion with the course teachers was conducted. A total of 37 target respondents answered the questionnaire, while two (out of the four) teachers participated in the focus group discussion. Descriptive analysis and thematic analysis were used for the data collected from the survey and the focus group discussion.

Results of the study showed that the teachers and majority of the students found web streaming to be efficient and helpful in the teaching and learning processes online. Web streaming afforded teachers to connect with learners who cannot attend the face-to-face study sessions. On the other hand, students were given the flexibility not only to view and listen to the lectures and tutorials on real time but also the chance to review the sessions more than once, anytime, and anywhere.

Issues/difficulties encountered during web streaming were also pointed out by the respondents, the most prominent of which was the poor/unstable Internet connection that affected the quality of the streamed audio and video. Students watching the live streaming also requested the incorporation or use of an app that would afford real-time interaction between the teacher/trainers/facilitator and on-site and off-site students. The teachers also pointed out the need for more information about web streaming for them to fully maximise its potentials for online teaching. They also would like to undergo training on projection, speaking, and teaching in front of the camera (Gelisan, 2014).

Another study was conducted to gather information that will help develop and put in place strategies for the Multimedia Center to further improve its services provided to the faculty members and students who have courses that are using video and other multimedia materials as learning resource and streaming these on real and reel time. Specifically, this study identified the faculties-in-charge's (FIC) reasons and purpose for using videos in their courses; the administrative, technical, and instructional support needs for using videos as a teaching/learning resource; and the recommendations on how they can further harness the use of video for online teaching and learning. The respondents of the study were all the FIC of the 110 courses offered during the second semester and third trimester of school year 2014. An online self-administered questionnaire was used to gather the data for this study. Descriptive statistics were used to analyse the data collected. Twenty-six FICs (43.3%), out of the targeted 60 respondents, participated in the survey, majority of them were full-time faculty members of the university.

The results showed that 22 of the respondents used and will continue to use videos and similar multimedia materials as one of the teaching tools in their courses and they also taught more than one course during the terms included in the study.

Only four of the survey participants did not use video or other multimedia material as teaching/learning tool, but three of them said that they were already planning to use videos in their future classes. The most cited reason for using videos for their online courses, whether streamed on real or reel time, is the medium's inherent qualities that can enhance online teaching and learning. The types of videos and multimedia materials they used and shall use vary, depending on the purpose and requirements of the courses they are teaching. The most cited purposes of using videos were as follows: to explain concepts, to teach skills, and to assess student's learning. The FICs said that they want to be provided with more capacity and capability training programmes for them to have active participation in the development/production/streaming of video materials they will use in their courses (Gelisan, 2015).

Conclusion

Web streaming of lectures and tutorials serves as one of the best alternatives for providing teaching and learning support to distance learners who cannot attend/participate in face-to-face lectures and tutorials. However, web streaming faces challenges that must be addressed for it to effectively enhance the teaching and learning processes through ODL. For the UPOU Multimedia Center, the challenges are to make web-streamed lectures/tutorials more engaging to online viewers, make the teaching materials used by speakers visible to online viewers, and minimise the use of Internet bandwidth for both the university and e-learners, to avoid, or at least minimise, Internet disconnection during streaming sessions.

The experiences documented in this chapter serve as a guide for producing quality web-streamed lectures and study sessions and learning objects. However, web streaming sessions are still not perfect. There were instances where the quality of the audio and video streaming was still compromised due to technical and human errors.

The most common problems encountered were as follows:

(a) Unstable Internet connection
(b) The tendency of some lecturers to equate web streaming of lectures with "regular" on-site lectures that are just being video recorded or broadcast
(c) Lectures which were too long
(d) Non-participation of on-site learners in the discussion because they are shy or apprehensive about speaking "on camera"
(e) Poor visual quality of multimedia presentations used by the lecturers
(f) Last-minute changes that the lecturer/teacher/facilitator incorporated in the lecture or the multimedia materials they use without informing the technical team

The production team started with the adoption of web streaming technology armed only with the knowledge, skills, and experiences in producing multimedia learning objects that were shoot and developed in a recording studio or on location

with opportunity for retakes. There was no available document that can give guides on what to do and what not to do when using web streaming technology.

Web streaming on real time is a whole new ball game. Not only the production team but also the persons delivering/facilitating the lecture/forum/training programme and the audience inside the venue must adjust.

The experiences shared here are open for changes and further improvement. Other countries, which are in similar situation with that of the Philippines, where the speed of the Internet connection is in itself a challenge – from web streaming on real time to making the multimedia learning objects available in an online repository – may learn from these practices.

The members of the team believe that evaluation and changes in the conduct and delivery of web streaming should be continuous to respond to the varying needs and circumstances of the learners and to keep up with the changes in the teaching/learning paradigms and developments in information and communication technologies.

Acknowledgements This work was supported by the Multimedia Center, University of the Philippines Open University. The authors also gratefully acknowledge the comments and suggestions of the reviewers, which have improved the presentation.

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Part III
Student Engagement and Support

Chapter 14
Learner Profiling Towards Improving Learner Success

Latifah Abdol Latif, Thirumeni T. Subramaniam, and Zainuriyah Abdul Khatab

Abstract There have been numerous research projects on learner attrition in open and distance learning institutions. Open University Malaysia (OUM) has introduced many interventions to mitigate the first semester attrition rate where the dropout is highest, but improvements have yet to be seen. This chapter aims at gathering learner profiles to be used as a guide in an attrition study. The research uses a survey methodology, with the instrument consisting of learners' demographic profile and three constructs of personality, attitude and motivation. The survey was conducted online. Out of the total population of 2970, 637 (21.4%) first-semester learners responded, but only 438 completed questionnaires were used for the analysis. Statistical analysis showed that the four-point scale inventory provided good reliability for all three constructs. Under the personality construct, more than 90%, 84.4% and 78.3% of the respondents were in the "high" category for openness to experience and conscientiousness; leadership; and the autonomous construct, respectively. In terms of attitude, more than 90% of the learners were "high" for both categories (attitude towards career and attitude towards education). Under motivation, affiliation and power had less influence on motivation compared to achievement. This outcome suggests that, while learners are generally open to experiences and conscientious, effort is needed to encourage and guide them in becoming more autonomous, which is a required characteristic for students in open and distance learning. The learners showed a positive attitude towards education and career. Programmes designed to meet working adults' needs may increase the likelihood of their being actively engaged.

Keywords Learner success · Open and distance learning · Learner profile · Attrition

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_14

Introduction

The need to develop good practice and understanding about learners' experiences has never been greater in the Malaysian higher education scene. All higher education institutions (HEIs), regardless of their nature, conventional or non-conventional, have learner success as a priority. For learners, whatever their age and background, making the decision to pursue their education at a university is a significant step. The non-traditional learners—largely working adults who have returned to pursue their education to obtain a higher academic qualification for various reasons (often with the hope of growth and movement up their career ladder)—require a greater level of perseverance in balancing the multidimensional aspects of their adult lives. This requires open and distance learning (ODL) institutions to be innovative in the ways in which they encourage learners to be engaged in their learning process to complete their studies in a timely manner. The demand for greater use of technology, innovative pedagogies and efficiency is foreseeable.

ODL institutions, in which the majority of the learners pursue their education from various locations, have relied on the use of technology to overcome not only the barriers of space but also dispositional barriers, by offering flexible study hours through asynchronous online learning (a feature added to the learning materials which has for long been practised in distance education). ICT brought about major advantages in the form of instructional designs that enabled the developers of self-instructional learning materials to use enriched media to support the diverse learning needs of ODL learners (Mooij, 2009). While in the midst of their multifaceted lives (career, parenthood and membership of a community or other social groups), ODL learners face new challenges as they move into a learning environment which requires a greater level of autonomy. The decision to pursue higher education must be made with due consideration, and they must persevere in pursuing their higher qualification. OUM has been aware of these demands and the rising competition among the HEIs in Malaysia by providing a rich learner experience. OUM hopes to explore ways to shape its learners to become more self-directed and has devoted considerable effort in institutional research for supporting them throughout their study cycle. It is also crucial for the optimisation of OUM's resources, especially its human resource.

Learner profiling is a useful means for enhancing students' self-regulation and autonomy through allowing them to identify their strengths and weakness for self-improvement. Learner profiles have been commonly incorporated in learning platforms and MOOCs for monitoring and enhancing learning progress (Cleveland-Innes, Wilton, Ostashewski, & Parker, 2016; Poce, Agrusti, & Re, 2016). Their use also helps in the personalisation of devices and services for students with special needs (Rodrigo & Iniesto, 2015). Research on this area also includes the evaluation of online learner profiling effectiveness (Shaiffadzillah & Omarali, 2016) as well as the use of learning profiling in specific academic subjects (Zou et al., 2017).

Literature Review

The specific issue faced by OUM has been the high dropout rate of learners after their first semester of study. While many activities and interventions have been identified and implemented, the final outcome has had little perceptible impact. This phenomenon is not only observed in OUM, but is also reflected in the findings of other researchers within the field of distance education, such as Herbet (2006) and O'Brien (2002). Moore, Bartkovich, Fetzner and Ison (2003) noted that distance education courses have significantly higher dropout rates than those within campus-based universities. The causes of high dropout rates in ODL institutions vary. Latifah, Sumalee and Ramli (2008) identified poor time management as a reason for dropout by learners at both OUM and Thailand's Sukhothai Thammathirat Open University (STOU). Time management is a feature of self-regulated learning (Kirmizi, 2013). Poor time management may be an indication of dysfunctional self-regulation which may have its roots in the learner's motivation to pursue learning activities, though this requires further exploration and reasoning. Scanlon, Rowling and Weber (2007) highlighted the link between learner motivation and resilience in relation to learner identity which has been researched in a number of studies. They also noted that, among the three areas on which recent research has concentrated, learner identity is more significant in terms of yielding a more holistic view of what brings about learner's persistence. The other two areas are institutional support and quality interaction between learners and staff (Frydenberg, 2007). Learner identities are working identities developed by the learners to make sense of the environment within which they find themselves, biographical elements and personal belief systems (Joseph, 2002). Just as professional identities link to motivation, emotion and feelings of doing a good job, a strong learner identity links to the extent to which learners are retained and progress within an education institution (Baxter, 2012).

According to Haller and Muller (2008), identity as a whole is shaped largely by personality characteristics. Among a number of theories associated with the personality traits of an individual, the Big Five Personality Traits has been widely used for a number of purposes, including evaluation of job performance, as well as performance in a number of education courses. Lounsbury, Levy, Leong and Gibson (2007) stated that the sense of identity was found to be significantly related to the Big Five Traits and Narrow Personality Traits. Randler, Horzum and Vollmer (2014) discovered that the Big Five Traits influences the willingness and the level of learning anxiety of distance learners.

This study reports OUM's initial effort in using learner profiling to study its learners in terms of their personality, attitude and motivation. Such understanding can help learners to improve their learning and personal management (time, work, family and other aspects) and take responsibility for their own learning. The profiling will also help learners to identify and consolidate their strengths and recognise their weaknesses which could help them to develop realistic goals and improve their academic performance. In addition, such profiling can assist the university in evaluating and revising its curriculum design, content and delivery to suit its learners.

The study aims to identify new learners' personality, attitude and motivation as they step into the open and distance learning environment. Studies have shown that certain traits and characteristics tend to have a positive influence in enabling adult learners to progress and complete their studies. This study focuses mainly on the development of the test instrument and uses its preliminary findings for improving the university's current curriculum design. The identification of each learner's profile, attitude and motivation, which creates a unique identity, can help OUM to discover the diversity among its learners, analyse learners who have persisted and progressed through their studies and attempt to discover common traits that could be nurtured.

Methodology

The research methodology is based on the survey method using an instrument that was developed based on the Big Five Personality Traits, attitude and motivation of learners. The instrument was adapted to the learning environment at the university.

Survey Instrument

The questionnaire comprises two parts. Part I covers the demographic profile of learners and consists of the following items: name, ID number, gender, age, faculty, intake, programme of study, income and entry qualification. Part II consists of 49 items grouped under 3 major constructs: personality, attitude and motivation. The instrument was adapted from the Personality Inventory (*Inventori Personaliti*) developed by the Malaysian Examination Board, the Ministry of Education, in 2013. The original instrument consists of 150 items that were clustered under 15 constructs. The adapted instrument, which consists of 70 items clustered under 11 sub-constructs, was then tested using exploratory factor analysis and a reliability test. The test led to the revision of 49 items (as described below). Learners were asked to respond to the items using a 4-point Likert scale, with 1, "Strongly disagree"; 2, "Disagree"; 3, "Agree"; and 4, "Strongly agree".

Sampling

The survey was targeted at all first-semester learners of the January 2016 intake. A total of 637 responses were received from a population of 2970, giving a response rate of 21.4%. One of the compulsory courses offered to new learners is *Learning Skills for Open and Distance Learners*. An announcement which contained the link to the survey URL was put up in the course portal requesting all new learners to fill

in the survey questions. After the standard data cleaning process, 438 complete responses out of the 637 (69%) were used in this study.

Data Analysis

The data analysis was carried out in two steps. Firstly, an exploratory factor analysis (EFA) was carried out to determine the factors for the 70 items of the instrument. The outcome shows 49 items clustered under 9 sub-constructs. A reliability test was carried out for the instrument. In the second step, descriptive statistics were used to describe, summarise and explain learners' characteristics that were measured. In addition, a frequency distribution was employed to build a basic attribute for each item. Cross-tabulation was used to examine the influence of age and personal income on the three major factors of personality, attitude and motivation.

Results and Discussion

The total response of 438 obtained in this study was sufficiently large for a factor analysis (as per the 300 minimum cases/respondents requirement noted by Tabachnick & Fidell (2007)). The sample-to-variable ratio was close to 6:1, which is a reasonable ratio for testing an instrument. A more important consideration was testing the instrument in terms of the strength of the inter-correlations among the items. The factorability of the correlation matrix found in this study suggested sufficient evidence that there were inter-correlations among the items. The correlation coefficient over 0.30 recommended by Tabachnick and Fidell (2007) for inspecting the correlation matrix was considered for this purpose. The two statistical measures that were used to assess the suitability of the data prior to conducting the exploratory factor analysis (EFA) were (i) the Kaiser-Meyer-Olkin or KMO Measure of Sampling Adequacy which was 0.98, a value much larger than the minimum 0.6 KMO Index (Tabachnick & Fidell, 2007), and (ii) Bartlett's Test of Sphericity, which indicated that the p-value was less than 0.05.

EFA was used to determine the smallest number of factors that best represented the inter-relationship among the set of variables in this study. The principal components analysis (PCA) suggested by Williams, Brown and Onsman (2012) was used in factor extraction. The extraction rule based on Kaiser's criteria whereby the eigenvalue must be larger than 1 reduced the factors or sub-constructs to 16. The cumulative percentage of variance was 63.6%. The Scree Test further reduced the sub-constructs to 15. The use of the orthogonal varimax method, as suggested by Williams et al. (2012), reaffirmed the identified 15 sub-constructs. Some sub-constructs were removed as there were too few items that remained, thus leaving a total of 9 sub-constructs and 49 items as listed below.

Personality construct was made up of four sub-constructs:

- Openness to experience (6 items)
- Conscientiousness (4 items)
- Autonomous (5 items)
- Leadership (4 items)

Attitude was divided into two sub-constructs:

- Attitude towards career (8 items)
- Attitude towards education (7 items)

Motivation was divided by its three different sources:

- Achievement (5 items)
- Power (5 items)
- Affiliation (4 items)

The reliability test using Cronbach's alpha coefficients confirmed the overall coefficient value of 0.956 as much higher than the minimum value of 0.7 suggested by Sijtsma (2009). Cronbach's alpha coefficients for each construct, as well as the sub-constructs, were also well above 0.7, except for Cronbach's alpha coefficient for conscientiousness which was 0.690. The analysis confirmed the construct validity as well as the reliability of the instrument. The data obtained for the 49 items of the instrument from this study were used to get the preliminary findings about the profiles of OUM learners.

Demography of Respondents

Six demographic variables (gender, age, income, entry qualification, faculty and programmes) were analysed. The ratio of male to female learners was 39:61, which is closely representative of the total learner population's gender ratio of 37:63. Almost half of the respondents (46.1%) were within the 25–34 age range, followed, respectively, by those ranging from 18–24 (33.1%) and 35–44 (17.1%). More than 95% of the respondents belonged to the 18–44 age group. It appears that OUM attracts a younger generation compared to the age group suggested by Cercone (2008). The largest group of learners were enrolled with OUM Business School (38.4%), followed by the Faculty of Education and Languages (21.0%), the Faculty of Science and Technology (19.6%) and the Faculty of Applied Social Sciences (16.8%). The Faculty of Nursing and Allied Health Sciences had the smallest number of respondents (4.8%). In terms of income, around one-third of the respondents earned between RM 1000 and RM 1999, while another one-third earned between RM 2000 and RM 2999. There were three groups of respondents of equal size (~12%): (i) earnings less than RM 1000; (ii) earnings between RM 3000 and RM 3999; and (iii) higher-income groups (above RM 4000). More than half of the respondents entered their programmes with STPM, Diploma or other equivalent

qualifications, such as A-level, while most of the remaining respondents started their programmes with an SPM (or other equivalent qualifications, such as O-level) qualification through either the normal or open entry mode.

Learner Profile

For the purpose of analysing the profile of respondents, the given ratings were categorised into "High" and "Low" using the following guide for each item.

% "High" = (Number of ratings 3 and 4)/total rating *100
% "Low" = (Number of ratings 1 and 2)/total rating *100

The survey outcomes depicted in Table 14.1 show that in general, a large majority of learners were in the "High" category. More than 90% of learners were in the "High" category for *openness to experience* and *conscientiousness*. While these observations are gratifying, there is some cause for concern with regard to the two sub-factors of *autonomous* and *affiliation*, which showed a higher percentage (above 20%) of learners in the "Low" category. Learners themselves should be aware of their individual degree of autonomy. Dabbagh (2007) stated that learners in online learning must possess "self" behaviours such as self-discipline, self-monitoring and self-initiative which are the characteristics of self-regulated learners. As such, the significant 20% of learners in the "Low" category within the *autonomous* sub-construct is rather worrying. Autonomous learners take a greater responsibility for their learning, which is the ultimate aim of education. This is especially true for ODL institutions that are committed to developing lifelong learning skills among their learners. Nevertheless, diversity among adult learners explains the reality that not all of them are autonomous, as discovered in this study. This compels OUM to review its curriculum design and learning environment to support and promote learners to become more autonomous, independent, self-reliant, self-directed and, ultimately, be responsible for their learning.

Table 14.1 "High" and "Low" categories by personality, attitude and motivation

Constructs	Sub-constructs	High (%)	Low (%)
Personality	Openness to experience	96.27	3.73
	Conscientiousness	90.36	9.65
	Autonomous	78.31	21.69
	Leadership	84.42	15.58
Attitude	Towards career	97.34	2.66
	Towards education	94.56	5.44
Motivation	Achievement	92.01	7.99
	Power	88.26	11.74
	Affiliation	78.20	21.80

New learners have the right attitude to embark on their journey as learners as soon as they step into OUM. Almost all of them are very positive towards their careers as well as education, and this finding speaks volumes about adult learners who have decided to return to their studies for a better qualification. This confirms the general observation that adult learners are highly motivated and task-oriented, as observed by Cercone (2008), which will go a long way to keeping them focused in their studies, and target completing their qualifications in order to perform better in their careers. Adult learners with a very positive attitude towards their careers will benefit from the type of knowledge applicable to their professional careers which will improve their skills, facilitate their work and boost their confidence. Since learning is usually voluntary, it is a personal choice to continue education to a higher level, to improve job skills and to achieve professional growth. This motivation is the driving force behind their learning, and thus it is crucial to tap into learners' intrinsic impetus with the right thought-provoking materials that will stimulate their minds. Achievement-oriented motivation can influence learners intrinsically (Elliot & Harackiewicz, 1994).

This study also discovered that 20% of the respondents fell into the "Low" category of *affiliation*. The need for affiliation can be interpreted as the need to be connected or belong to a supportive group. In a collaborative environment, learners with high affiliation will likely have a more positive attitude, as suggested by Brewer and Klein (2006). This study also showed that learners with low affiliation are also able to interact successfully in a collaborative environment to achieve their learning outcomes. The need for affiliation can be manifested in an online learning environment via community of practice (COP). COP is a pedagogical model grounded in a theory of learning as a social process. Dabbagh (2007) suggested that COP can be implemented online through asynchronous learning networks and other Internet and web-based collaborative and communication technologies. The new e-learning platform at OUM, known as MyInspire, has been developed to cater for this very need for enhancing collaboration in learning. Learners find the platform very useful for their study purposes, as has been reported in the importance-satisfaction studies carried out in OUM (Latifah, Ramli, & Afzhan, 2015).

The sub-constructs were also cross-tabulated against selected demographic variables in order to observe how personality, attitude and motivation vary with age and income. This study found that, in general, all three constructs did not vary significantly with age and income levels. However, there were a couple of exceptions. While all three factors of *personality*, *attitude* and *motivation* remained similar among the age groups, the 55–64 age group showed declining means in the aspects of *conscientiousness*, *autonomous*, *leadership*, *power* and *affiliation*. However, the group showed relatively higher means in *openness to experience*, *attitude towards career and education* and *achievement*. Older learners may require greater interaction and support to achieve their learning goals. There were also indications that learners in the low-income bracket of less than RM 999 showed slightly lower mean values, particularly in *autonomous* and *leadership*. This study will be repeated to determine whether or not these patterns reoccur.

Learners learning in an ODL environment are often considered different from conventional university learners (Cercone, 2008). This is largely due to the different age groups (also referred to as "adult learners"), whereby learners are prone to learning barriers that are associated with various responsibilities and situations that are a natural part of an adult's life. Adult learners are considered a diverse group who come from many different backgrounds. They enrol in ODL programmes voluntarily and need to progress through their education by managing their studies around work, family and other responsibilities. The interest in adult as learners has led to numerous studies on adult education and the birth of andragogy as a learning theory common among ODL institutions. Andragogy is based on several assumptions (Knowles, 1989). It assumes that adult as learners are autonomous, independent, self-reliant and self-directed. This assumption underlines the movement from the "teacher-centred" learning which occurs in most conventional education systems where learners learn from the teachers to "learner-centred" learning. In today's environment, where technology pervades every aspect of our lives, many adults (and HEIs) are driven to take advantage of the online learning environments to pursue their education. This move is also driven by personal factors such as busy schedules. Innovations in ODL and online learning offer flexibility and convenience that promote the movement towards online learning. However, the diverse backgrounds, situations and personal experiences may result in adult learners using technology with different sets of expectations. This is especially true for learners (and HEIs) from different parts of the world with different cultures being connected in the borderless online environment. A rich and diverse online learning environment is important.

The development of a personalised learning environment with an increasingly open and flexible learning framework to support the needs of diverse groups of learners is important. The following recommendations could bring about positive changes, particularly for learners with low levels of *autonomous* and *affiliation*.

- Develop an innovative curriculum design and learning environment that focuses on the achievement of course and programme learning outcomes to promote self-regulated learning.
- Identify new learning strategies that help to improve the development of lifelong learning and other skills that can enhance learners' self-directedness and autonomy. Existing strategies such as scaffolding could help to develop self-reliance and assist the learner to become more self-directed (Cercone, 2008); and short directed and concrete tasks could also provide a more encouraging "learning for experience" towards independent learning.
- Evaluate the effectiveness of the instructional strategies used in the university's self-instructional learning materials, as well as the quality of its educational support services aimed at enabling learners to become independent.
- Develop a rich and diverse online learning environment, using multiple scenarios and perspectives designed to support the diverse learners and engage them in exploring available educational resources independently.

- Improve the quality of services by reducing factors that make learners uncertain, to enable them to manage their programme administration independently (Baxter, 2012).
- Encourage learners to take an active part in becoming independent or self-directed through strategies such as (i) self-reflection; (ii) personalised learning goals; (iii) conducting self-checks; and (iv) monitoring their learning process and progress. This highlights the importance of formative assessment, whereby adult learners can assess their own progress and take the necessary steps towards achieving their goals.

Conclusion

Determining the characteristics of learners may not necessarily guarantee success in an ODL course or programme. It could, however, help instructors, teachers and instructional designers to understand who are most likely to participate in open, distance and online learning; what factors contribute to successful distance and online learning experience; and the potential barriers some learners may face in progressing and completing their courses. This chapter presents the findings of a preliminary study designed to discover OUM learner profiles in terms of their personality, attitude and motivation. The study suggests that a large majority of OUM's new learners are open to *new experiences*, *conscientious* and *autonomous* and have *leadership* skills. However, about a fifth of the learners do not consider themselves to be autonomous and did not have a high degree of affiliation. The most gratifying observation is that their attitude towards careers and education are very positive. A further encouraging observation is that the achievement orientation among all learners across the different ages and income groups is very high. One particular area of interest is to study the changing trends in learner age groups and how age affects learning behaviour.

Acknowledgements The authors gratefully acknowledge the assistance and support of Amalina Diyana Suhaimi.

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Chapter 15
Impact of Student Response System on Enhancing Active Learning

Suet Lai Wong and Sui Yu Yau

Abstract This chapter presents the results of an integrative review and synthesis of the literature to identify the impact of the student response system (SRS) as a tool to enhance active learning in higher education. An integrated review was conducted using multiple databases, including CINAHL, ERIC, LWW Nursing and Health Professions Premier Collection, MEDLINE, ProQuest Education Journals and SAGE Journals. Related articles from 2008 to 2017 were reviewed systematically. Four broad search categories were used: "higher education", "student response system", "teaching and learning" and "active learning". A total of 302 articles were retrieved, followed by an in-depth review by screening each of them. Finally, 14 articles were selected. They were analysed using an inductive approach to extract statements for categorisation and synthesis. This review confirmed that there was limited empirical evidence to investigate the SRS as a tool in higher education. These articles were focused on descriptions of the use of the SRS in the aspects of questioning strategy, expectation, reward and feedback. This chapter provides an essential guide on SRS implementation to enhance active learning in higher education.

Keywords Higher education · Student response system · Teaching and learning · Active learning

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_15

Introduction

There is an ongoing debate on the relative advantages of adopting educational technology or the traditional practice of instruction for enhanced teaching and learning in higher education (Keogh & Wang, 2010). For example, the University Grants Committee (2005) emphasises that the use of modern educational technology should fulfil two main criteria, viz. (1) the extent to which the technology can appropriately underpin teaching and learning and (2) the extent to which an educational development unit should be identified with technology-enhanced learning.

Student response system (SRS) is an educational technology which has become increasingly popular (Liu, Sands-Meyer, & Audran, 2019). It has also been named as "clickers", "audience response systems (ARS)" and "personal response systems (PRS)". The term "student response system (SRS)" is adopted in this study.

The use of SRS has been found to have various benefits for students and teachers. For example, Preis, Kellar and Crosby (2011) stated that the SRS allows instructors to ask routine questions in large classes, receive real-time responses from students and provide immediate feedback to them. This advanced educational technology facilitates ubiquitous teaching and learning to engage many students in active learning with improved learning outcomes (Berry, 2009; Bollmeier, Wenger, & Forinash, 2010; Cole & Kosc, 2010; Gauci, Dantas, Williams, & Kemm, 2009; Medina et al., 2008; Patterson, Kilpatrick, & Woebkenberg, 2010). In particular, Heaslip, Donovan and Cullen (2014) found that students become more participatory, interactive and engaged through the use of SRS because of the anonymity and ease of use. Liu, Sands-Meyer and Audran (2019) reported that students who used SRS showed a higher level of motivation, self-efficacy, participation and engagement. Wang, Ran, Huang and Swigart (2019) further introduced game-based elements to SRS and found that this is highly favoured by students. Bingen, Tveit, Krumsvik and Steindal (2019) also used SRS for nursing students and received positive feedback from them.

Active learning, with the instructor creating an interactive learning environment, encourages student engagement with the course material in small classes (Preis et al., 2011). However, given the reality of teaching large classes in lectures, university faculties face challenges in providing dynamic learning experiences for students. The use of lectures as a teaching strategy to convey and explain educational information to large groups is economical and efficient. However, they have the disadvantage of limiting students' active participation and instructors' teaching because the physio-psycho-social distance between instructors and students reduces the opportunities for interaction and in-depth feedback (DeBourgh, 2008).

Although research on the effects of the SRS has been conducted in previous years, given the advances in technology and their positive influences on students' performance, further research is necessary to understand how the SRS can enhance active learning. The increasing prevalence of using the SRS calls for pedagogical advice on its implementation and consideration of factors such as the quality of SRS-based instruction and the appropriateness of the educational practice.

This chapter presents an integrative literature review for summarising, analysing and synthesising existing studies (Pitt, Powis, Levett-Jones, & Hunter, 2012) to answer the following research question—How does the use of the SRS as a tool enhance active learning in higher education? This chapter is organised into three sections. The first section, the methodology, outlines the literature-selection process used in the integrative review. The second section describes and synthesises the findings from the selected literature, and the chapter concludes with a discussion of the implications of the SRS for practice.

Method

The integrated literature review was chosen as the primary lens for synthesising various streams of literature to generate new knowledge (Kable, Pich, & Maslin-Prothero, 2012). At the initial stage, multiple databases—including CINAHL, ERIC, LWW Nursing and Health Professions Premier Collection, MEDLINE, ProQuest Education Journals and SAGE Journals—were used to search for the relevant articles. Four broad search categories were used: higher students, student response system, teaching and learning and active learning. The keywords in each category were searched separately and then in combination with other keywords (e.g. audience/personal response system, clicker, instructional technologies, instruction, student performance, higher education and active/passive learning). A manual search for the selected articles from the reference items generated was made.

The criteria for article selection were as follows: (1) the search was limited to articles published between 2008 and 2017; (2) the study had to identify either useful instruction integrated into lectures with the SRS or the implementation of the SRS to enhance learning; and (3) the documentation should be full texts, written in English and peer-reviewed. The following studies were excluded: editorials, conference abstracts, inaccessible unpublished dissertations and studies where the sample characteristics or interventions of the SRS were not included.

Results

A total of 302 articles were retrieved in the initial search. They were then screened for relevance by an in-depth review of the abstracts of each of the articles. The articles were excluded if they only outlined the instructional strategies or the use of the SRS; and duplicate publications were also eliminated. Eventually, 14 out of the 302 articles met the criteria for inclusion. All these articles were empirical studies. The process of analysis and synthesis focused explicitly on how the studies presented the relationship between active learning and the application of the SRS, with particular attention paid to the impact of using the SRS as a tool for active learning.

Of the 14 articles retained, 8 used non-experimental survey methods, and 6 used a quasi-experimental design. In the non-experimental studies, a self-reported questionnaire was used for collecting perceptions of the SRS among undergraduates (Cain, Black, & Rohr, 2009; DeBourgh, 2008; Denker, 2013; Hwang, Wong, Lam, & Lam, 2015; Morling, McAuliffe, Cohen, & DiLorenzo, 2008; Preis et al., 2011; Short & Martin, 2012; Sternberger, 2012). The quasi-experimental studies were evaluative in two group post-test designs (Christopherson, 2011; Habel & Stubbs, 2014; Jones, Antonenkot, & Greenwood, 2012; Shaffer & Collura, 2009; Vana, Silva, Muzyka, & Hirani, 2011). One of the reviewed studies adopted a single group experimental design (Lin, 2015). A summary of the reviewed studies is presented in Table 15.1.

With the advances in educational technology, the SRS can be efficiently implemented with less hardware required. The SRS consists of three operational parts, viz. (1) a mobile phone device with an app (used by students as remote control to send and receive signals to the server via Wi-Fi or the Internet); (2) the web-based programme on the instructor's computer (used by the instructors to present information and to control actions via the central server); and (3) the central server (used by the SRS developers for managing data collection, analysis and dissemination) (Hwang et al., 2015). The SRS has to register individual users before obtaining and delivering responses, and so instructors and registered users can provide and obtain feedback on both an individual and collective level on the overall student performance (Preis et al., 2011).

The findings of this study revealed that the use of the SRS was widespread in the fields of arts, social science and science education. The SRS is a useful technology to enhance active learning by being incorporated in lectures and providing feedback even in classes of a substantial size. The findings of this research showed that half of the reviewed studies had shifted the focus of lecture interaction from comprehension (Cain et al., 2009; Hwang et al., 2015; Lin, 2015; Vana et al., 2011) to higher cognition in application and analysis (DeBourgh, 2008; Jones et al., 2012; Short & Martin 2012; Sternberger, 2012) in the level of the questions being asked.

The results of DeBourgh's study (2008) suggested that, when questions were asked every 20 min about a progressive clinical nursing case study during lectures, nursing students became more aware of their thinking strategies for practising various cognitive skills to solve clinical problems before exams. The nursing students were profoundly satisfied with the operational and instructional effectiveness of using the SRS in the class (DeBourgh, 2008). Similarly, Sternberger (2012) suggested that a maximum of four questions posed during each lecture via the SRS would be associated with students having positive attitudes towards the use of the SRS. Also, students perceived that the use of SRS could improve their exam performance.

Table 15.1 Reviewed studies on SRS-based instruction

Author (year)	Purpose and design	Sample and setting	Instruction based on the SRS	Impact on learning
Cain et al. (2009)	To explore perceptions and effectiveness of SRS during lectures	111 pharmacy students enrolled in a physiological chemistry and molecular biology course	*Questioning strategy*: Practising test questions with multiple discrete options for comprehension of lecture materials	93% of the students preferred the course with an SRS comp"nent
	Non-experimental survey, plus a focus group interview		*Time interval*: Six to seven questions posed in each lecture	An independent student-liaison focus group reported that students favoured the use of the SRS
			Rewards: Credit for the course grade	
			Feedback: Individual correct answer explained and why each distracter was wrong	
Christopherson (2011)	To determine whether the use of the SRS in the classroom can improve exam scores and engage students by using the engagement	40 undergraduate students enrolled in a developmental psychology course, with 21 students in the experimental group and 19 students in the control group, conveniently divided into identical morning and afternoon sections	*Questioning strategy*: Probing opinion questions and practising test questions with multiple discrete options of prior to reading for comprehension of lecture materials	No significant difference in the responses to the examination and student engagement scale was found between two groups
	Quasi-experimental design		*Time interval*: A maximum of seven questions asked on the prior readings initially; at least one question on the concepts, opinion poll or discussion in each of the lecture series	The author highlighted that the advantages of SRS use may be due to the changes in pedagogy in the classroom rather than the use of SRS
			Rewards: Not mentioned	
			Feedback: Not mentioned	

(continued)

Table 15.1 (continued)

Author (year)	Purpose and design	Sample and setting	Instruction based on the SRS	Impact on learning
DeBourgh (2008)	To assess perceptions of SRS use in the classroom	92 students enrolled in a 15-week advanced nursing therapeutics course	*Questioning strategy*: Practising test questions with multiple discrete options for application in progressive clinical case studies	The students were highly satisfied with using the SRS in the classroom on both the operational aspects and instructional effectiveness
	Non-experimental survey		*Time interval*: Questions used about every 20 min in each of the lecture series	The students were more aware of the thinking strategies to apply in different approaches to complex problem-solving
			Rewards: Not mentioned	
			Feedback: Further discussion in class based on the histogram of responses	
Denker (2013)	To examine whether the SRS offers an effective means of participation in a sizeable lecture-based course	881 undergraduate student (63% of them in their first year) enrolled in a primary communication course	*Questioning strategy*: Probing opinion questions with multiple discrete options on a review of prior topics and those just covered in each lecture series	Participants perceived the SRS as engaging. The use predicted significant positive affective learning
	Non-experimental survey		*Time interval*: Not mentioned	
			Rewards: Not mentioned	
			Feedback: Further discussion in class based on the histogram of responses	

(continued)

Table 15.1 (continued)

Author (year)	Purpose and design	Sample and setting	Instruction based on the SRS	Impact on learning
Habel and Stubbs (2014)	To investigate the effect of a technological intervention (mobile phone voting)	202 and 146 students enrolled in large lectures on a first-year law course in 2010 and 2011, respectively	*Questioning strategy*: Probing opinion questions with multiple discrete options on two pages of prior assigned reading, plus collaborative responses with a self-selected peer group	There was broad agreement (84% of participants) that they were increasingly engaged in participating in lectures via the SRS
	Quasi-experimental design: Collaborative vs individual responses		*Time interval*: Three substantive questions developed from the assigned pre-reading after a short lecture introduction (5–10 min) to the topic	The higher self-reporting of engagement made it more likely that they both attended more lectures and completed the survey at the end of the course
			Feedback: Further discussion in class based on the histogram of responses	A total of 27 students (19% of participants) stated that SRS took too much time and suggested less use of it. They lamented the shortening of content or depth in the lectures

(continued)

Table 15.1 (continued)

Author (year)	Purpose and design	Sample and setting	Instruction based on the SRS	Impact on learning
Hwang et al. (2015)	To investigate the use of two types of SRS (a traditional clicker and a mobile device) Non-experimental survey design	318 students enrolled in a human physiology course 115 students enrolled in a human physiology courses with experience of using clickers	*Questioning strategy*: Practising test questions with multiple discrete options for comprehension of lecture material; allowed classmates' discussion *Time interval*: A maximum of five questions asked at the end of each topic in the lecture series *Rewards*: Not mentioned *Feedback*: Clarification of individual misleading concepts with immediate feedback	The students were positive towards the use of clickers and mobile clickers in class The students perceived that the use of traditional clickers in class had various advantages over mobile clickers, including for misconceiving identification, engaging in lessons and enjoying learning
Jones et al. (2012)	To investigate the impact of collaborative and individualised student response system-based instruction Quasi-experimental design	152 undergraduate students enrolled in an undergraduate science course	*Questioning strategy*: Practising test questions with multiple discrete options for application in lecture materials, plus a collaborative response with a self-selected peer group *Time interval*: At various points throughout each lecture section *Rewards:* Not mentioned *Feedback*: Correct answers revealed and proceeded to discuss the questions and responses with the whole class	A significant interaction was found between gender and the SRS strategy related to the regulation of cognition Female participants improved in the collaborative group, while males showed improvement in the regulation of cognition in the individualised responses

(continued)

Table 15.1 (continued)

Author (year)	Purpose and design	Sample and setting	Instruction based on the SRS	Impact on learning
Lin (2015)	To explore and evaluate students' concentration when the SRS was used	51 nursing students enrolled in an information	*Questioning strategy*: Practising test questions with multiple discrete options for comprehension of lecture materials	The results suggested that students' concentration on learning was improved after the SRS was applied in the teaching process as a whole
	Quasi-experimental one group pre- and post-test	technology (IT) literacy course in a technical college in Central Taiwan	*Time interval*: One question asked from the prior lecture initially; a maximum of five questions asked during each topic in the lecture series every 10–15 min; one question asked before the end of the lecture on each for a summary	Items under the "concentration capacity" and "concentration consciousness" categories were found to be significantly different
			Rewards: Not mentioned	
			Feedback: The concept was mentioned again, followed by a replay assessment, when the rate of correct answers was less than 80%	

(continued)

Table 15.1 (continued)

Author (year)	Purpose and design	Sample and setting	Instruction based on the SRS	Impact on learning
Morling et al. (2008)	To determine the effect of the SRS in term of exam scores	A total of 1290 undergraduate psychology students in 2 sections of introductory psychology with the use of the SRS or 2 sections without the use of the SRS	*Questioning strategy*: Practising test questions with multiple discrete options for comprehension of prior reading	The use of the SRS had a small, positive effect on exam scores
	Quasi-experimental design: The use of SRS vs conventional practice		*Time interval*: Five questions asked from the prior readings initially	Whether the use of the SRS could engage students' participation was controversial
			Rewards: Credit for all groups with or without the use of the SRS	
			Feedback: Misunderstood questions for elaboration	
Shaffer and Collura (2009)	To examine the effect of the SRS in the classroom in terms of student learning and reactions	177 undergraduate students enrolled in the introduction to	*Questioning strategy*: Probing opinion questions with multiple discrete options for subjective estimation of the objects' size psychologically	The students rated the lecture as more interactive, exciting and entertaining
	Quasi-experimental: The use of the SRS vs the conventional practice	psychology lecture on perceptual constancy with the use of the SRS or without the use of SRS	*Time interval*: Four questions posed in a 1-hour lecture	The students in the SRS lecture performed significantly better on exam questions when compared to the control group
			Rewards: Not mentioned	
			Feedback: Further discussion in class based on the histogram of responses	

(continued)

Table 15.1 (continued)

Author (year)	Purpose and design	Sample and setting	Instruction based on the SRS	Impact on learning
Short and Martin (2012)	To explore the value of formative multiple-choice questions with the SRS on exam performance	262 and 279 undergraduate psychology students enrolled in the memory, perception and attention module during the academic years 2007/2008 and 2008/2009 at Bangor University	*Questioning strategy*: Practising test questions with multiple discrete options for application in lecture material	Exam grades were significantly higher for students exposed to the SRS throughout the course
	Retrospective descriptive design		*Time interval*: A maximum of five questions at the end of each lecture	
			Rewards: Not mentioned	
			Feedback: Clarification of individual misleading concepts with further resources provided	
Sternberger (2012)	Post-course evaluation on the perception of the SRS use and a knowledge test	72 students enrolled in an undergraduate disaster preparedness course	*Questioning strategy*: Practising test questions with multiple discrete options for application in lecture material	The students actively favoured the use of the SRS in class
	Non-experimental survey design		*Time interval*: A maximum of four questions posed during each topic in the lecture series	Students perceived the SRS use as improving their exam performance
			Rewards: Not mentioned	
			Feedback: Correct answers revealed and proceeded to discuss the question and responses with the whole class	

(continued)

Table 15.1 (continued)

Author (year)	Purpose and design	Sample and setting	Instruction based on the SRS	Impact on learning
Vana et al. (2011)	To evaluate the use of the SRS in comparison to the sole purpose of multiple-choice PowerPoint slides on test scores and satisfaction	78 nursing students enrolled in a pharmacology course as an experimental group	*Questioning strategy*: Practising test questions with multiple discrete options for the comprehension of lecture materials	The test scores of the two groups were not significantly different
	Quasi-experimental 2-group comparison design	55 nursing students enrolled in the same course at the other campus of the same university as a control group	*Time interval*: Not mentioned *Rewards*: Not mentioned *Feedback*: Individual correct answer explained and why each distracter was wrong	Participants highlighted that the use of the SRS allowed them to comprehend course material and attain higher test scores

In the study conducted by Morling et al. (2008), the SRS was used for asking students questions on a controversial prior reading to engage them in participating. Also, the use of the SRS had a small effect on students' exam performance. The students who were not prepared to participate in class were passively obtaining information from lectures and memorising it for the examination. However, students can be habitually reading, thinking and practising how to study their subject before an exam through regularly questioning them in lectures via the SRS.

Providing continuous feedback (i.e. formative assessment) to students through monitoring their progress would be ideal for engaging them in learning (DeBourgh, 2008). However, large class sizes in which the instructor is physically and psychosocially far away from the students cannot establish student-teacher relationships. Christopherson (2011) found that using skillful questioning via the SRS is an important method for providing feedback to students without any amendment being required in the syllabi or lesson plans. There were two types of questions adopted in the reviewed studies, viz. (1) sample multiple-choice questions for practice and (2) questions which probed opinions with multiple discrete options (i.e. true/false, yes/no and Likert-type scales) via the SRS. The SRS is especially useful for assessing student comprehension of, and response to, material presented in lectures for science courses which always adopt objective-type questions.

The use of the SRS to practise the sample test questions regularly with multiple discrete options was adopted in 8 out of the 14 studies reviewed. Regular questioning as an instructional strategy for large classes can prompt further discussion, promote preparation for the class and facilitate active learning (Cain et al., 2009; DeBourgh, 2008; Hwang et al., 2015; Jones et al., 2012; Lin, 2015; Short & Martin,

2012; Sternberger, 2012; Vana et al., 2011). However, the instructors had to spend extra time explaining the wrong distractors in 8 of the 14 studies (Cain et al., 2009; Hwang et al., 2015; Jones et al., 2012; Morling et al., 2008; Preis et al., 2011; Short & Martin, 2012; Sternberger, 2012; Vana et al., 2011). Morling et al. (2008) also highlighted the fact that students responded less favourably when an instructor asked questions that were unrelated to the study topics.

The strategy of probing opinion questions was adopted in 5 out of the 14 reviewed studies. In these studies, the instructors had designed opportunities for students to provide their feedback or opinions on the lecture materials (Christopherson, 2011; Denker, 2013; Habel & Stubbs, 2014; Preis et al., 2011; Shaffer & Collura, 2009). The review of these five studies explored the preference for probing opinions question in arts and social science subjects, such as business administration and psychology. The feedback collected from the respondents was positive, highlighting that the lectures were interactive, exciting and entertaining. Furthermore, the SRS was appropriate for eliciting opinions anonymously, which students usually prefer, and led to discussion based on the overall responses reflected by the results of the SRS through histograms.

Shaffer and Collura (2009) provided an example showing that the SRS can be applied as a tool for surveying in lectures. However, Habel and Stubbs (2014) reported that, unexpectedly, 19% of the survey respondents recommended fewer instances of opinion questions to save time for explaining the lecture materials in a law subject.

A reward was awarded to students' responses on their course grade in 3 out of the 14 studies reviewed (Cain et al., 2009; Morling et al., 2008; Preis et al., 2011). Preis et al. (2011) noted that students would like to be acknowledged for how they were assessed in lectures or be rewarded with records of their learning process in an online grade book. It is suggested that instructors should consider giving a certain proportion of the course grade for engagement in the SRS to acknowledge students' effort in this assessment.

Discussion and Conclusion

With the advances in educational technology, the SRS is a commonly adopted tool nowadays in teaching and learning. The results of this study identified several factors that are essential for promoting active learning via the SRS. This review illustrated that no adjustment is required in the syllabi or lesson plans when using the SRS. The key aspect of an SRS-based questioning strategy is that it should include multiple discrete options, although this may put a limitation on comprehension or even factual recall when practising sample test questions. In the review, the study by Shaffer and Collura (2009) showed that the SRS merely assists instructors to recognise some useful teaching moments from the SRS implementation. With this view, the key considerations which should inform the educational planning and practice in using the SRS are described below.

First, the SRS aims to ask questions and provide real-time response and feedback to facilitate active learning. In adding interactive items, instructors cannot expect a significant improvement in students' performance immediately. Also, simply asking recall or memory-type questions might not provide enough information for instructors and students for appropriate feedback. The instructors should be aware of the right moment to ask appropriate questions via the SRS; and, in using different levels of questioning strategies, they should consider the types of questions appropriate for immersion in the learning context. Also, they should ask practice test questions to elicit comprehension of the concepts in the basic courses in the undergraduate programmes. The test questions need to be adjusted to elicit application and analysis of problems in the study topics. Probing opinion questions which use a Likert-type scale should be deployed in a theory-based course that requires students to apply theory to application. Instructors should also rely on anonymous responses provided by the SRS to assess the aspects where students may have a more conceptual misunderstanding. Finally, based on students' agreement, instructors should consider how to provide feedback on the general and controversial issues.

Since the review found that instructors had spent extra time on explaining the results of the SRS questions (Cain et al., 2009; Hwang et al., 2015; Jones et al., 2012; Morling et al., 2008; Preis et al., 2011; Short & Martin, 2012; Sternberger, 2012; Vana et al., 2011), they should closely monitor time management in lectures. Lastly, the use of the SRS should be planned carefully, with a diligent effort made to design a questioning strategy which caters for the need for active learning. Further research using an experimental design is needed. The findings from the reviewed studies showed that the SRS facilitated students' learning progress and motivated their engagement in lecture materials. More research should address the issue of whether the use of the SRS in assessment can yield better academic performance.

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Chapter 16
Students' Attitudes Towards School Subjects

Ken Hirata and Yoshihiro Hirata

Abstract This chapter investigates the differences and similarities in students' attitudes towards school subjects and the use of information and communication technology (ICT) in them. It focuses on the study of geography by secondary school students in Japan and New Zealand as a case study. The teaching methods and achievement goals for this subject are different in the two countries. Geography education in Japan is focused mainly on memorisation of the world's topographical, economic, and political facts and data, while in New Zealand, it is centred on sustainability education and the acquisition of key geographic concepts/skills. This study conducted a survey of students' understanding and feedback based on their self-evaluation. The results indicate that students' evaluation of their comprehension of the subject is lower in Japan, but its usefulness for their future is higher compared to New Zealand. Moreover, the advantages of ICT in geography learning are equally recognised by students in both countries, but their attitudes towards its use in geography learning are more positive in New Zealand. It is not possible to conclude that the geography education in either country is better than the other, but in both cases it can still be improved for better quality and achievement.

Keywords Geography · Japan · New Zealand · Self-evaluation · ICT

Introduction

Investigation on student attitudes towards the study of various school subjects helps devise appropriate teaching strategies tailored for the students. As a case study, this chapter focuses on the study of geography by secondary school students in Japan

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_16

and New Zealand. Previous studies have revealed the possible factors for student attitudes towards the subject. For example, Kidman (2018) found that students are more interested in hands-on skills such as land use and hazards but less interested in topics related to human and social interests. Another study by Akintade (2011) conducted in Nigeria showed students' dissatisfaction on teacher pedagogical methods.

Geography is the study of places and the relationships between people and their environment (National Geographic Society, 2018). The field of study includes natural settings, such as climate, land, and oceans, and human culture and activities including agriculture, industry, and energy. Not only is geography widely accepted as an important object of research, but it is also available as a subject offered to secondary school students in many countries. Although the basic principles of the subject should be similar, the approaches and goals of teaching and learning geography may vary in different national education curricula, causing gaps in students' motivation towards and understanding of the subject. Investigation of such differences and the reasons behind them can help teachers and curriculum-makers in each country to identify the specific features needed for students' better understanding of geography.

This chapter examines the differences in students' responses to the teaching methods and study goals in Japan and New Zealand. In both of these countries, students' performance has recently been ranked high among all nations (PISA, 2016), but the history and cultural backgrounds are significantly divergent. The chapter also addresses the potential of using information and communication technology (ICT) in geography education.

Geography Education in Japan

Geography is a subject which about half of Japanese high school students choose to take out of three elective-compulsory social study subjects (Japanese history, world history, geography) (Japanese Ministry of Education, Culture, Sports, Science and Technology, 2015). Because of its strong connection to natural science, it is often regarded as an easy subject, especially for students taking the science course. However, geography education at high schools in Japan is generally more focused on students memorising the world's topographical, economic, and cultural facts and data and less on acquiring key geographic abilities, such as map analytical skills and statistical skills (Takizawa, 2009). Students also do not have enough opportunity to conduct geographic research, to have discussions with classmates, or to present findings and opinions (National Institute for Educational Policy Research, 2005).

The Japanese Ministry of Education has stated the curriculum guideline for the high school subject Geography A as follows: "… to provide a global and local perspective on problems related to the environment, resources/energy, human manufacture, food, and housing/cities in order to foster an understanding that global issues extend beyond local areas and take different forms from one locality to the next, and to encourage reflections on the necessity of national efforts and international cooperation aimed at creating sustainable societies" (Japanese Ministry of Education, Culture, Sports, Science and Technology, 2009, 2014).

In 2015, 42.5% of the prospective high school graduates in Japan applied for the National Center Test for University Admissions (National Center for University Entrance Examinations, 2015a), and about a quarter of those who took the test chose to take a geography test as one of their social study subject selections (National Center for University Entrance Examinations, 2015b). The question booklet for the geography test is paper-based. Each question usually has four to six choices of answer, and the examinee is expected to pick one and mark all the answers on an answer sheet (Fig. 16.1). The past examinations are available from the Center's web

地理

問１ 次の表は、りんご、みかん、米、小麦の生産上位３都道府県を示したものである。りんご、みかん、米と A～C の組み合わせとして正しいものを①～⑥から一つ選べ。

順位	A	B	C
1	新潟県	青森県	和歌山県
2	北海道	長野県	愛媛県
3	秋田県	山形県	静岡県

	りんご	みかん	米
①	A	B	C
②	A	C	B
③	B	A	C
④	B	C	A
⑤	C	A	B
⑥	C	B	A

(English translation of the above example question)

Geography

Question 1. The table below shows the rankings of the prefectural productions of apples, oranges and rice and each of them corresponds with either A, B or C. Choose one correct combination from 1. to 6.

Rank	A	B	C
1	Nigata	Aomori	Wakayama
2	Hokkaido	Nagano	Ehime
3	Akita	Yamagata	Shizuoka

	Apples	Oranges	Rice
1.	A	B	C
2.	A	C	B
3.	B	A	C
4.	B	C	A
5.	C	A	B
6.	C	B	A

Fig. 16.1 An example exam question of geography based on the National Center Exam

site (National Center for University Entrance Examinations, 2015a, b). Each question is usually worth 2 to 4 points, and the examinee gets a score out of 100. The total scores of all the subjects are then summed up to be used for university admission, which makes students strive to get as many points as possible. Although some of the questions also require the examinee to have geographical viewpoints and skills to analyse statistical charts and figures, most of the questions mainly ask for the basic knowledge and understanding outlined in the geography curriculum guideline. This trend in examination questions is a good example of geography education in Japan where students are expected to acquire knowledge before they learn geographical skills.

Geography Education in New Zealand

About 17% of Year 11–13 students in New Zealand studied geography in their secondary schools (New Zealand Ministry of Education, 2018). The New Zealand Curriculum indicates that in Level 6, which is one of the levels covered in senior secondary education in New Zealand, students will gain knowledge, skills, and experience to understand that natural and cultural environments have particular characteristics and how environments are shaped by processes that create spatial patterns and understand how people interact with natural and cultural environments and that this interaction has consequences (New Zealand Ministry of Education, 2018). The geography achievement objectives in the New Zealand curriculum are based on conceptual understandings, and the key concepts are "environments, perspectives, processes, patterns, interaction, change, and sustainability" (Fastier, 2013, p. 245). These key concepts are all derived directly from the Level 6–8 achievement objectives for geography (New Zealand Ministry of Education, 2013). Students often confront these concepts in regular geography classes, and the understanding of the key concepts is tested in examinations.

Many geography students take the National Certificates of Educational Achievement (NCEA) examinations at the end of the school year (New Zealand Qualifications Authority). Geography examinations consist of several papers, and each of them is marked at one of four achievement levels (N not achieved, A achievement, M achievement with merit, E achievement with excellence). The answers are written in various lengths of text, graphs, diagrams, and annotated sketches and are expected to demonstrate understanding of the key concepts (Fig. 16.2). The past examinations are available from the NZQA's web site (New Zealand Qualifications Authority, 2015). Students are expected not only to understand the concepts but to be able to effectively demonstrate the skills acquired over time.

Level 1 GEOGRAPHY
Demonstrate geographic understanding of environments that have been shaped by extreme natural events

In the space below, name one extreme natural event which you use to answer all the questions in this exam.

Extreme natural event:

QUESTION ONE: The Human Response

Read the geographic concept below and refer to it when answering the questions.

Geographic Concept
Change is a process of alteration and can be found in any natural/cultural environments. Changes can be predictable or unpredictable and can occur in different rates, times, and places.

In the space below, fully explain how TWO different groups of people changed their reactions after the extreme natural event.

In your answer, include the geographic concept of change and relevant, concrete supporting evidence from the extreme natural event you studied.

Fig. 16.2 An example exam question based on the NCEA exam

ICT in Japanese and New Zealand Education

The use of ICT in education is another aspect that is different between Japan and New Zealand. Japanese schools have been relatively slow in adopting devices into regular classes. The Ministry of Education in Japan has proposed a plan to let all the students use computers in class when necessary, but even in 2017 there were 5.9 times as many students as computers available in schools (Council for Advancing Structural Reform, 2018). In contrast, students in New Zealand have more opportunity to use ICT in schools. In addition, the BYOD (Bring Your Own Device) policy is widely adopted in schools in New Zealand. In 2015, 61.5% of New Zealand schools which responded to a survey reported that they were "either using or thinking about using a device programme" (The Network for Learning Limited, 2015, p. 2). Although there are significant differences between Japanese and New Zealand geography education and the implementation of ICT in the classroom, few studies have recently been conducted on their different teaching methods and students' feedback on them between these two countries.

Methodology

The subjects of this study were high school students from both Japan and New Zealand. Twelve male students were randomly chosen from a geography class in the first grade (mainly aged 15 and 16) in Hokurei High School, Japan. The class, which consisted of 1 teacher and 45 students, was organised in a traditional face-to-face style with frequent use of paper-based textbooks/references and no chance to utilise ICT devices. All the students in the class chose geography from three elective-compulsory social study subjects—Japanese history, world history and geography—and had been studying it for more than 10 months when the survey was conducted. Another 12 students (10 male, 2 female) were chosen from a geography class in Year 11 (mainly aged 15 and 16) in Rangitoto College, New Zealand, which had 1 teacher and approximately 30 students and offered them many opportunities to utilise their own devices and a few paper-based booklets. All the students who took geography chose this elective subject out of more than 20 subjects of different kinds and had been studying it for more than a year when their responses were collected.

For the students at Hokurei High School, printed question sheets were given out manually, and then the answers were handwritten and returned within a day. Some students also made some comments both orally and on the sheets. For the students at Rangitoto College, a link to an online survey service was sent via Messenger, and the responses were collected within a day.

The questions set were the same, although the ones for students at Hokurei had brief explanations below some of them as it was expected that the students would not have enough background information to answer them. Each sheet contained one multiple-choice question and five 10-Likert scale questions where "1" represented "Not at all" and "10" represented "Extremely"; and at the end there were two questions in which students could make comments. The questions were as follows:

1. Why did you choose to take geography?

   A. Because you like/are interested in geography
   B. Because geography is better than other subjects
   C. Because geography is required for university entrance
   D. Other

2. How do you find studying geography? (1 "Not at all" to 10 "Extremely")

   A. Interesting/fun
   B. Easy
   C. Important

3. Do you understand?

   A. Class work/exam material
   B. Words and terminology
   C. Concepts and backgrounds
   D. Maps/statistics analysis skills

4. Do you think the use of the Internet and devices is useful for?
   A. Having fun/keeping motivated
   B. Understanding class work/exam materials
   C. Understanding words and terminology
   D. Understanding concepts and backgrounds
   E. Understanding maps/statistics analysis skills
5. Do you wish to use the Internet and devices for your future geography study? (1 to 10)
6. Do you think studying geography will help you with your future life? (1 to 10)
7. Do you think the current studying environment of geography needs improving? If yes, how? (Comments)
8. If you have any comments on geography study, please type them below. (Comments)

Findings

Figure 16.3 shows the reasons why students chose geography. Most students in Rangitoto selected the subject because of a personal and active reason, but those in Hokurei did so because of an external, passive reason. Eighty-three percent of the students surveyed in Rangitoto College chose geography because they were interested in it, while only 33% at Hokurei did so. In contrast, half of the respondents at Hokurei answered that they had decided to take geography because it seemed better than other subjects, whereas only a minor proportion (8%) of students at Rangitoto selected this reason.

Figure 16.4 presents the average scales of ratings on how interesting, easy, and necessary students had found their previous geography study. The results indicated that the two groups of students did not differ much and that they found the subject fun/interesting and necessary but not very easy. The average scales on "fun/interesting" were 8.4 in Hokurei and 8.0 in Rangitoto, on "easy" 5.8 and 6.7, and on "necessary" 8.2 and 7.5.

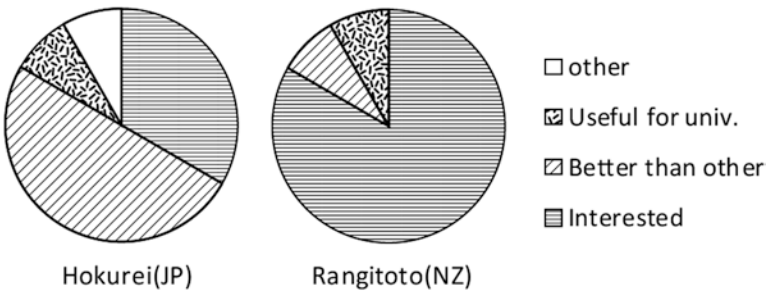

Fig. 16.3 The reasons why students chose geography

Figure 16.5 reflects the students' self-evaluation of their understanding of the contents of the subject. The average scales of responses by students at Rangitoto excelled those by students at Hokurei in all four questions. A significant gap was found in the question asking about the understanding of maps/statistics analytic skills; the average scales were 4.8 in Hokurei and 7.7 in Rangitoto.

Figure 16.6 presents students' self-evaluation on the usefulness of using the Internet and devices. The results showed small differences in all five elements, all average scales falling between 6.5 and 8.5. This indicated that students at both schools had relatively the same impression about the advantages of using the Internet and devices.

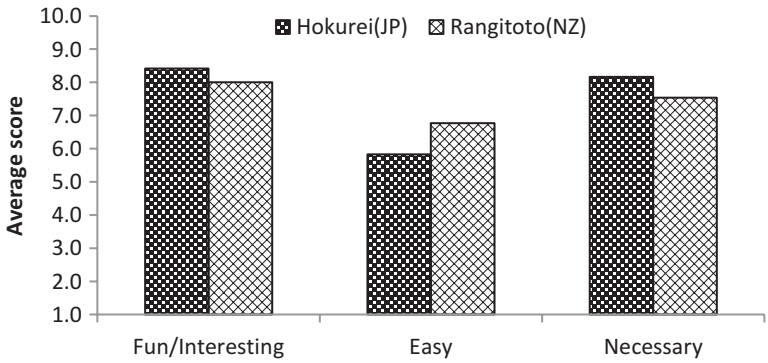

Fig. 16.4 The average scales of ratings on how interesting, easy, and necessary students found their previous geography study

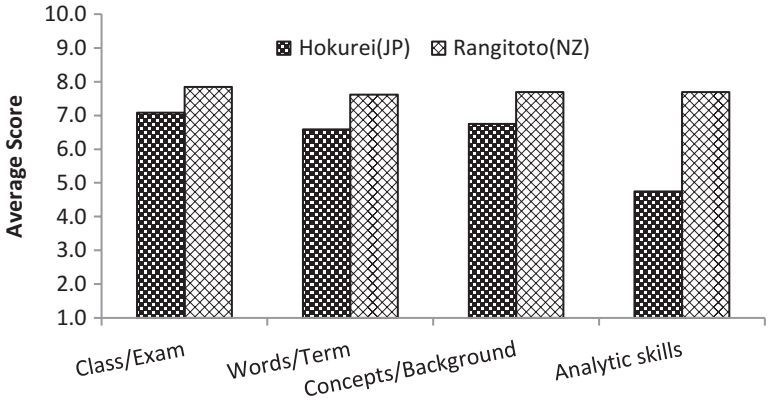

Fig. 16.5 Students' self-evaluation of their understanding of the contents of the subject

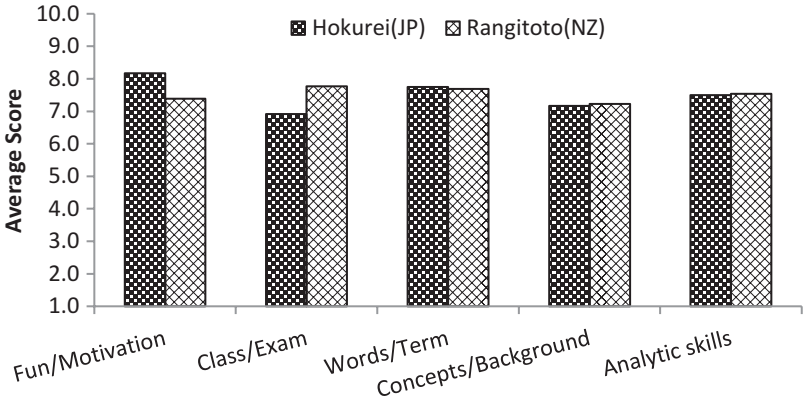

Fig. 16.6 Students' self-evaluation on the usefulness of using the Internet and devices

Fig. 16.7 The average scales of students' desire to use the Internet and devices for geography study

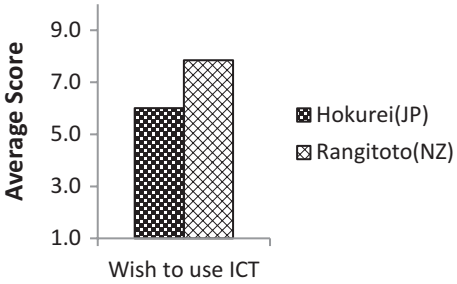

Figure 16.7 shows the average scales on students' desire to use the Internet and devices for geography study. The results showed that students at Rangitoto had a stronger desire than those at Hokurei. The average score at Hokurei was 6.0 and that at Rangitoto was 7.8.

Figure 16.8 presents the average scales of the overall usefulness of geography for future life from the students' perspective. The results showed that students at Hokurei thought the subject was more useful for their future lives than those at Rangitoto. Their self-evaluation scales were 8.3 at Hokurei High School and 7.2 at Rangitoto College.

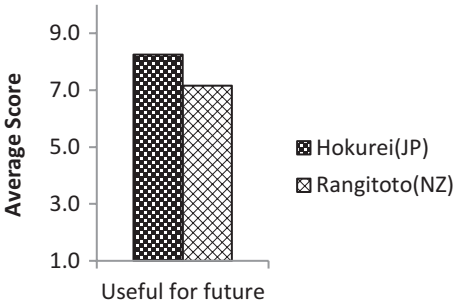

Fig. 16.8 The average scales on the overall usefulness of geography for future life from students' perspective

Discussion

Although the number of students who answered the questionnaire was limited to only 12 from each group, this study revealed some facts related to the attitudes and achievements of students at 2 schools, Hokurei High School and Rangitoto College, based on the contrasts in students' self-evaluation.

One of the findings was that, although students in Hokurei High School thought they had less understanding of the subject contents than those in Rangitoto College, their expectation of the subject being useful for the future was relatively higher than that of students in Rangitoto College. The results of the survey showed that students in Rangitoto thought they had understood the contents very well overall, including the maps/statistics analytic skills—which they understood as well as the other contents of the subject—while Hokurei students thought they did not understand them so well. These differences were almost certainly caused by the differences in curricula in the two countries. For a long time, Japanese education has been knowledge- and memorisation-based as a basic principle. This has been inherited in high school education and is the basis of the university entrance examinations in Japan, although the government is currently planning to change the system. This apparently has led to memorisation of a very large number of geographic facts and words to be produce in the annual entrance examinations, which students find difficult and feel under pressure to complete. In New Zealand, on the other hand, the curriculum is centred on learning geographic/environmental concepts using a limited number of topics. Those concepts and topics are simple and are all listed on the nationwide syllabus (Ida, 1995, p. 5). Also, there is not much to memorise and the examinations are separated into topics, which may make it easier to understand the study contents. The total comprehension expected may differ between the two countries so that students' actual comprehension levels are different, but this does not guarantee that this difference is directly relates to their final achievements.

Despite Rangitoto students' high self-evaluation on understanding, the results of the survey showed that students at Hokurei thought that geography was useful for their future more than those at Rangitoto. This result suggests that the Japanese way of educating, knowledge-based learning, is better than New Zealand's concept-based education in terms of its usefulness for future life. This is very likely to be

because knowledge of the world topography, economy, and culture is more helpful in everyday life than the ability to apply geographic concepts and skills, although this is important for deeper understanding of the subject. From the students' perspective, the subject may be useful when what they learn can be applied to everyday life, whether or not it is a significant factor in academic study.

Another finding was that, although both groups of students similarly evaluated the advantages of the use of the Internet and devices, students at Rangitoto College wished to use them more than those at Hokurei High School. The results showed that students recognised equally the benefit of using them whether or not their schools had introduced them. However, their attitude towards using the Internet and devices as study tools differed. This was almost certainly because Rangitoto College had introduced high-quality ICT, whereas Hokurei High School had not. Students at Rangitoto were accustomed to studying with devices connected to the Internet and already knew the benefits, and they therefore wished to keep on using them. As students at Hokurei had never experienced an ICT environment before, they may have been satisfied with the current environment or may not have felt the need to have a new system.

The final finding was the difference in the reasons for choosing geography between the two groups. Students at Hokurei chose the subject mainly because it seemed better than other subjects, while those at Rangitoto did so mostly because they liked/were interested in geography. This was very likely due to the fact that Hokurei students had to choose 1 subject from 3 elective-compulsory social study subjects, while Rangitoto students had more than 20 subjects to choose from. This shows that allowing students to choose from a wider range of subjects can lead to higher motivation and engagement in the subject, which results in positive attitudes.

Conclusions

This study examined the differences and similarities in attitudes and achievements in geography learning between Japanese and New Zealand secondary schools. The survey of students' understanding and feedback based on their self-evaluation revealed that Japanese memorisation-based education makes it challenging for students to achieve and comprehend the study content, but the knowledge they acquire makes the subject useful for their future lives. The teaching method in each country has its own advantages, and it is not possible to conclude that either of them is better than the other. However, the results of the survey showed that each individual aspect—such as comprehension level and usefulness—is better in either country's education. The fact remains that geography education in both countries needs improvement for a better quality and achievement.

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Chapter 17
Student Support Needs for Wellness in Distance Learning

Billy Tak Ming Wong and Beryl Y. Y. Wong

Abstract Among the key areas of student support, wellness has been regarded as crucial. While student services for wellness are commonplace in face-to-face teaching institutions, distance learning (DL) students have far fewer opportunities to access such services for the constraints of the DL context, and the services for conventional institutions do not suit their needs. This chapter presents an exploratory study on the needs of DL students for support related to wellness. The study was built on the premises that the choices and foci of service provision should be guided by relevant principles and a thorough understanding of students' needs. It adopted a six-dimensional framework covering the occupational, physical, social, intellectual, spiritual and emotional dimensions of wellness. An online survey and 3 focus group interviews were conducted, with 133 and 16 participants, respectively. Findings reveal that career development was most important for the students among the wellness dimensions. A diverse range of student support specific to the DL context was suggested by the participants, such as development of an enhanced social network to alleviate students' feeling of alienation and isolation, an online channel for delivery of student affairs information, academic advisory services, extended hours for facilities and student services and effective communication among the Student Affairs Office, students, alumni and academic staff. The results, contributing to the field as empirical evidence, highlight that wellness support should be seen as integral components of higher education regardless of the modes of education delivery.

Keywords Student support · Wellness · Distance learning · Student development

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_17

Introduction

In distance learning (DL), student support plays a vital role in increasing student retention and promoting meaningful learning experiences (Gil-Jaurena, 2014). It is recognised as essential for students' success and is included as one of the quality indicators in a broad range of quality frameworks for distance education, such as the Institute for Higher Education Policy's Benchmarks for Success in Internet-Based Distance Education (Phipps & Merisotis, 2000), the Australasian Council on Open, Distance and E-learning's Benchmarks for Technology Enhanced Learning (ACODE, 2014) and the Model for Quality in Distance Education (Jung, 2012). Scheer and Lockee (2003) surveyed the student support services offered to distance learners, which covered nine major components, including orientation to DL, access to library resources, academic advising and personal counselling.

Among the key areas of student support, wellness has been regarded as one of the most important (American College Health Association, 2012). Wellness refers to 'an active process through which people become aware of, and make choices toward, a more successful existence' (National Wellness Institute, n.d.), which highlights the balance of the body, mind and spirit, as well as their interrelatedness as none of them is truly separate and independent (Edlin & Golanty, 2016). It is widely regarded as an indispensable part of holistic student development and is seen as an integral component of higher education (Kupchella, 2009).

The importance of wellness to DL students has also been suggested in relevant studies. For example, Li and Wong (2019) found that students' psychological attributes, such as self-motivation, self-efficacy, personal drive, resiliency and locus of control, contribute to student persistence in DL. Dampson, Owusu-Mensah, Apau and Osei-Owusu (2019) also identified that inadequate counselling services for promoting students' self-confidence and motivation is a concern for DL students in Ghana. These findings indicate the potential significance of emotional wellness to DL students.

Wellness has, however, rarely been addressed in student support in DL, despite its being widely integrated into standard student services in conventional face-to-face teaching institutions. Thompson and Porto (2014) noted the lack of attention paid to this area in the literature and the lack of effort by DL institutions to provide wellness support to students. The present situation overlooks the needs of DL students for certain types of social or wellness support (Aslanian & Clinefelter, 2012; LaPadula, 2003). To design and deliver proper services for students' wellness, an institution has to be selective, with an emphasis on specific service areas. The choices and foci of service provision should be guided by relevant principles and a thorough understanding of students' needs.

This chapter presents an exploratory study on the needs of DL students for support related to wellness. It identifies the students' preferences on facilities and services and investigates their particular needs on the dimensions of wellness. It also compares the findings with related studies to show what needs to be considered in developing wellness support.

Wellness and Student Development

Promoting holistic student development has been a common goal in higher education (Ludeman, Osfield, Hidalgo, Oste, & Wang, 2009). Ludeman et al. (2009, p. 6) point out that 'higher education must address the personal and developmental needs of students as whole human beings'. Today, educational institutions encourage students to develop an interest in, and enthusiasm for, wellness programmes. Integrating and extending student services to cover their wellness support will enhance their well-being and help them to develop a balanced lifestyle.

As the foundation of student support services, Hettler's wellness model (1980) has been widely applied for holistic student development. It focuses on six dimensions of wellness, viz.:

- *Occupational wellness* – personal satisfaction and enrichment in one's life through work and using one's talents to create a meaningful and rewarding work experience
- *Physical wellness* – a combination of regular physical activity and good eating habits, together with limiting the consumption of harmful products (e.g. tobacco, drugs and alcohol)
- *Social wellness* – contributions to the environment and community and having a healthy life and good communication with the people around one
- *Intellectual wellness* – creativity and stimulating mental activities, inside and beyond the classroom
- *Spiritual wellness* – searching for meaning and purpose in human life, which includes the appreciation of the depth and expanse of life and nature, and making one's actions consistent with one's beliefs and values
- *Emotional wellness* – awareness and acceptance of one's feelings and the capacity to manage these feelings and related behaviours, including the realistic assessment of one's limitations, the development of autonomy and the ability to cope effectively with stress

This model has been adopted for the design of wellness programmes by a wide range of institutions, most of them traditional face-to-face ones. For example, the University of Pittsburgh delivers student support services through its HealthyU programme, adding medical, financial and environmental wellness to Hettler's six dimensions (University of Pittsburgh n.d.). The Student Wellness Center at the Ohio State University (OSU) (n.d.) has developed its wellness model by including financial, environmental and creative wellness to categorise its services and activities. Also, the Center for Wellness of Harvard University (n.d.) provides students with guidance on the six dimensions of wellness.

Previous studies have also suggested the possible relationship between students' wellness and academic development. For example, Botha and Cilliers (2012) demonstrated this relationship in Stellenbosch University in South Africa. Following Hettler's wellness model, the university adopted an institution-wide approach to systemically assist students to develop their overall wellness, with the aim of

discovering and unleashing their potentials to develop themselves into 'balanced' people. It was found that students who were academically weaker needed further development in wellness-related skills, such as interpersonal skills for social wellness, and therefore enriching students' out-of-class experiences for their academic success and all-round development is recommended. Hart (1999) suggested ways to become an effective distance learner, among which guidance on wellness was regarded as useful and beneficial.

Many of the problems encountered by DL students are related to their wellness. For example, Galusha (1998) showed some common barriers which DL students face, such as (for intellectual wellness) trouble in self-evaluation due to the lack of feedback or contacts with their teachers and (for social wellness) the feeling of alienation and isolation in the learning process since they could not interact with fellow students easily for social life. Also, Almăşan and Alexe (2015) realised students' problem in emotional wellness – anxiety arising from learning difficulties or adapting to academic requirements at the beginning of study and fear of the future after graduation. For such reasons, institutions should provide DL students with relevant support for their wellness.

Supporting the Wellness of DL Students

Hettler's wellness model not only fits the needs of face-to-face students but also DL students. Relevant studies have shown the need for DL students to be supported for wellness. For example, Scheer and Lockee (2003) reported DL students' need to access wellness resources, and Hettler's wellness model can serve to address their needs. Thompson and Porto (2014) also highlighted wellness services as a critical component of student support in adult online education.

However, DL students' need for wellness support has not been adequately addressed in practice. It has been widely observed that student support for wellness is an underdeveloped area of distance education, and there is a lack of related empirical studies (LaPadula, 2003). DL institutions rarely provide wellness resources to their students (Thompson & Porto, 2014), despite their need for such services (Aslanian & Clinefelter, 2012; LaPadula, 2003). For instance, Quintiliani, Bishop, Greaney and Whiteley (2012) noted that DL students, who are usually adult learners, were more susceptible to specific health issues than younger students; and Almăşan and Alexe (2015) stressed the necessity of a well-designed psychological counselling service for them as 'they need it even more than regular students, because they face a more complex reality' (p. 520).

So far, only a few studies have investigated the non-academic support for DL students. Without covering the whole of Hettler's wellness model, some dimensions in the model have been addressed.

Hannum, Irvin, Lei and Farmer (2008) examined the effectiveness of having facilitators to support DL students. The authors argued that 'many distance education courses push contents to learners via the internet, but failed to provide students

with necessary support for learning' (p. 213). This study adopted learner-centred psychological principles (LCPs) (APA Task Force on Psychology in Education, 1993; APA Work Group of the Board of Educational Affairs, 1997) to design the DL environment and practices. The LCPs focused on human thinking, learning, motivation and social presence in personal and interpersonal relationships. The facilitators applied the LCPs in handling common issues faced by DL students, for example, that 'students feel they cannot discuss with the instructors' (p. 218). It turned out that students supported by these facilitators stayed significantly longer in their studies and had a higher completion rate than those who did not.

Almăşan and Alexe (2015) addressed the importance of tutoring and psychopedagogical support for the personal and professional development of DL students in Romania. They observed that DL students in general worry about their employment after graduation. The tutors therefore also acted as counsellors, offering guidance and advice to the students which increased their awareness of job opportunities and helped them to acquire relevant skills for their future professions. The counselling service addressed students' occupational, social and emotional wellness by '[helping them] to practice and develop responsibility, and independence; [offering] the opportunity to identify social emotional and learning difficulties of students; [and building] a bridge for easier adjustment and transition from active professional and social life' (p. 521). In addition, the tutors gave psychological support for 'all kinds of problems not only those concerning … ability of learning a certain academic subject' (p. 523) to increase students' motivation to achieve preset goals. Thus, DL students do not have less of a need for wellness support than do face-to-face learning students (Almăşan & Alexe, 2015; Hannum et al., 2008; Sookdeo & Ramphal, 2013).

Taking into account the setting of distance education, however, what and how support for wellness has to be provided is different from in a face-to-face setting. A major challenge is the 'distance' between students and university staff, as DL students do not come to the campus frequently and access on-campus facilities and services. They have a more urgent need for support than face-to-face counterparts which have to be addressed in a timely manner (Almăşan & Alexe, 2015; Hannum et al., 2008; Sookdeo & Ramphal, 2013). According to a student survey by Smith (2004), DL students valued both the availability and accessibility of off-campus support.

As DL students may have specific wellness needs, what has been provided for face-to-face students may not be appropriate for them. For instance, Smith (2004) found that learners who are more independent would prefer academic-related support to non-academic support. Jones (2006) and Thompson and Porto (2014) argued that there is no single service model for wellness in DL – each institution has to identify the specific support services based on the demographics and unique needs of its DL students.

Assessing students for their preferences and expectations should take place before the provision for student support. Botha and Cilliers (2012, p. 246) noted we should 'align what [we] do with what [we] know' as a backup for support. Despite the positive impact of wellness support on DL students as reviewed above,

understanding the wellness needs of students is crucial for informing the prioritising and delivery of support services.

Methods

An exploratory study was conducted to understand DL students' needs for support services in a university in Hong Kong which provides both face-to-face and DL programmes at different academic levels. The DL students are provided with a wide range of academic support services, including regular optional face-to-face tutorial sessions in the campus for students to meet their tutors. The tutors and course coordinators can also be reached by phone, email and online channels. In addition, there are various campus facilities such as library, self-study centres and computer laboratories for DL students to use.

Given this context, the study aimed to address the following questions:

- How important is each dimension of wellness to the DL students?
- What are the needs of the DL students for student support?
- What student support services and resources are suggested by the DL students and staff?

The study included a questionnaire survey and three focus group interviews. The survey was conducted through an online questionnaire distributed to student participants. The questionnaire consisted of three parts: asking participants to rank the six dimensions of wellness and the types of support services and facilities based on their levels of importance. The support services and facilities were selected according to those provided by other universities in Hong Kong. There was an open question for the participants to suggest other services and facilities not included in the questionnaire. Information on student demographics, such as their employment status and weekly study hours, was also collected. The questionnaire was reviewed by an expert panel from the fields of student affairs and open and distance education to verify the suitability of the content. A total of 133 DL students were recruited for the survey, with 87 valid responses. All participants were anonymous. They were first introduced the background of the study and the wellness dimensions before conducting the survey.

The focus group interviews were organised about 3 months after the survey to collect in-depth opinions about DL students' needs for support services. A total of 16 participants were recruited, including DL students and university staff, offering their views from different perspectives. First, the six dimensions of wellness were explained, and then they were asked about the specific needs of DL students for each dimension and the reasons behind this.

Results

Survey

Table 17.1 presents the demographic information of the DL students who participated in the survey. They were almost equally distributed by gender, and most of them had either full-time (77%) or part-time (6.9%) employment. They tended not to meet frequently with their classmates/tutors/instructors, with about 80% of them having meetings twice a month or less. Most students spent not more than 6 hours per week on their studies.

Figure 17.1 shows students' ranking of the importance of the six dimensions of wellness. Career development was on average ranked the most important, followed by intellectual development, emotional management, moral development, social development and physical development.

Figure 17.2 indicates the average ranking of facilities according to the students' perceived level of importance. The student service centre (providing non-catering retail services such as stationery, notes binding and photocopying) was on average ranked the most important. A convenience store, bookstore and bank were also ranked highly.

The students also made other suggestions for university facilities which were lacking or were regarded as inadequate. Most mentioned is the need to enhance the canteen facility by providing more choice of food and greater space. A few of them also indicated their wish to have a café and student residence hall.

Figure 17.3 shows the support services students needed most. The students had a major need for academic advisory services, financial assistance and career development services.

Table 17.1 Students' demographics

Gender	
Female	49.4%
Male	50.6%
Employment status	
Full-time	77.0%
Part-time	6.9%
No employment	16.1%
Number of times meeting classmates/tutors/instructors	
Less than twice a month	35.6%
Twice a month	43.7%
Once a week	13.8%
More than once a week	6.9%
Study hours per week	
Less than 3 h	27.6%
3–6 h	52.9%
More than 6 h	19.5%

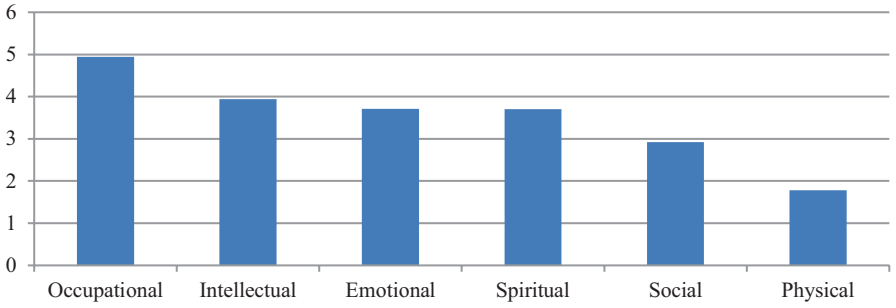

Fig. 17.1 Average ranks of the wellness dimensions (the higher, the more important)

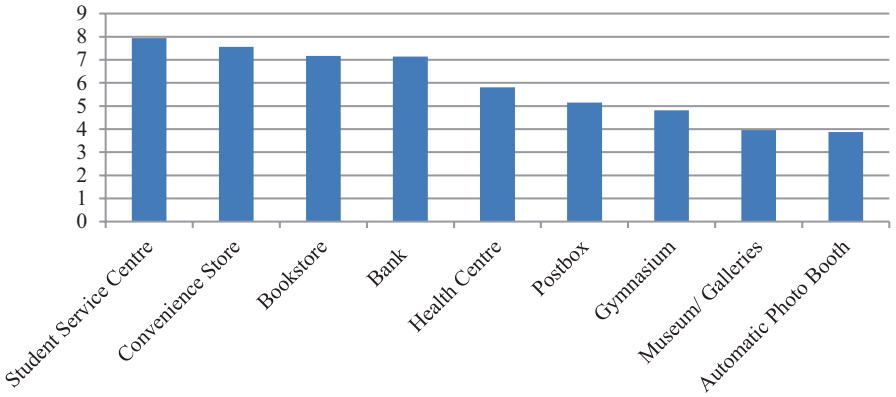

Fig. 17.2 Average ranks of facilities (the higher, the more important)

Focus Groups

Table 17.2 presents the types of student support suggested by the focus group participants, which were classified into the corresponding dimensions of wellness. It is worth noting that no support was suggested for spiritual and emotional wellness.

Other than the above views, the participants also suggested the inclusion or improvement of particular support so that students' needs could be better served. Table 17.3 shows the suggestions which were predominantly service-based rather than development-based and could be classified into four aspects – academic issues, student welfares and free services, financial services and the delivery of information.

The different backgrounds of the focus group members led to an emphasis on various areas of student support. The DL students expressed their need for support more in the intellectual and social dimensions. They indicated their preference for access to more library resources including those in other local university libraries.

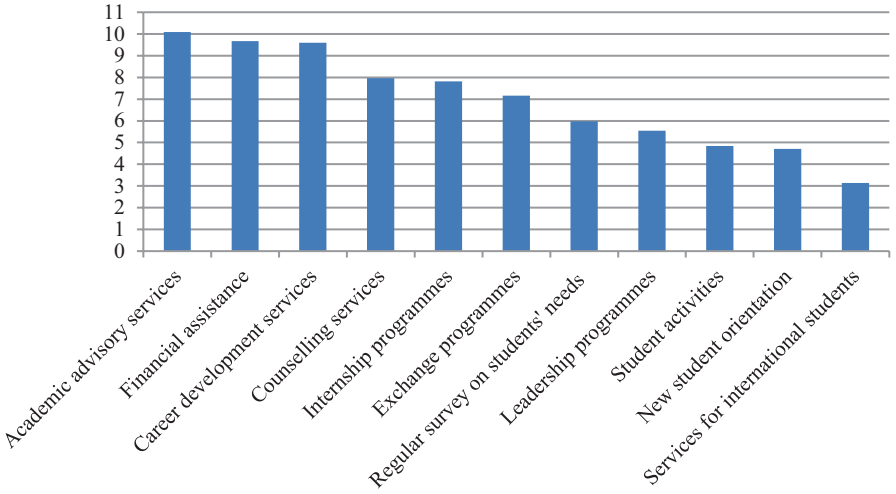

Fig. 17.3 Average ranks of student support services (the higher, the more important)

Table 17.2 Suggestions of student support on wellness

Dimension	Suggestion
Physical wellness	
Delivery of health-related information	Deliver more information on physical activities and health tips
Occupational wellness	
Career services	Organise more recruitment talks and form a greater recruitment network
	Increase the advertised posting for senior position jobs
Intellectual wellness	
Study materials	Collaborate with other local universities to allow students to access other libraries' resources
Study areas	Provide more study areas with longer opening hours
Tutorials	Provide more tutorial sessions for meeting with tutors
Academic seminars	Organise seminars given by recognised speakers
Social wellness	
Social activities	Organise more events or social activities for students to build up their relationships with each other
	Organise study groups or field trips for DL students
Social organisations	Provide more support to DL students in setting up student organisations
	Set up an alumni association specifically for DL students

Table 17.3 Suggestions of other types of student support

Aspect	Suggestion
Academic issues	Provide a complete version of in-class learning materials online
Student welfare and free services	Take the class schedule of DL students into consideration when planning the provision of services and facilities
	Provide printing and catering services at times that fit the class schedule of DL students
	Set up a store(s) to facilitate the provision of reference study materials, stationery and daily essentials
Financial services	Provide scholarships to DL students as a form of encouragement
	Accept more payment methods for various types of fees
Delivery of information	Use more media types (apart from email) for the promotion of student activities and services
	Develop a webpage for DL students providing them with information about the student services and university facilities they can use
	Provide information on further study

They also mentioned that DL students were quite 'lonely' since they studied independently and had few contacts with classmates and therefore suggested that the university could support setting up student organisations, organising study groups and field trips for them to build up a social network and a sense of belonging to the university. They also expressed the need for clear information on the kinds of facilities and support services available for them and pointed out that the facilities had already closed when they were in the campus as most of them worked in the day time on weekdays.

The staff participants were primarily concerned with the administration of student affairs. They felt that communication among the different parties was of the greatest importance and gave a number of suggestions on this area. They mentioned three types of communication that should be made more efficient and effective – the contact between the Student Affairs Office (SAO) and DL students and alumni; the communication between the SAO and the academic staff; and the general promotion of SAO activities. They suggested measures such as establishing a group of student ambassadors, having a staff representative from each academic unit and using more types of media for promoting student services and activities.

A common challenge that nearly every focus group raised was the inadequacy of the medium for delivering information on student affairs. Emails had been used as the major channel of information delivery, but students expressed their preference to have more channels to receive relevant information, so that they would not easily miss the promotion of student activities. Staff participants reported that, not knowing where they should refer their students to, they sometimes also had to play the role of counsellors and career advisers.

Discussion

The findings of this study suggest the dimensions of wellness that DL students value most and their need for student support. Among the services students suggested were necessary, academic advisory services was ranked the most important. If feasible, they also wanted the university to establish a student service centre; provide them with discounted stationery, printing and binding services; and develop other aspects of student welfare. Students' expectations also called for additional resources to be provided for career development and financial assistance schemes.

The responses collected in the focus groups provided further insights on the needs of students on various dimensions of wellness. It is worth noting that many of their suggestions are off-campus or can be delivered online, e.g. the provision of information on physical activities and health tips for their physical wellness. Their suggestions also reveal the desire of DL students to enrich their study life, such as organisation of social activities and study groups. These results correspond to our understanding of the barriers faced by DL students, such as a feeling of alienation and isolation (Galusha, 1998).

The concerns of DL students seem to be related to their background. As most of them are adults with full-time employment, this can explain their high ranking of occupational wellness and career development services. They usually worry about their employability and the uncertain labour market after graduation (Almăşan & Alexe, 2015), an issue which would be particularly relevant for those without an academic degree prior to their DL studies.

Completion of their degree is a practical objective of DL learners, and the chance of success is strongly related to taking the correct decisions on enrolment and suitable study planning. The students' preference for more advice and guidance on academic issues suggests that the current provision is insufficient, possibly due to the limited opportunities for interaction with classmates and teachers (Almăşan & Alexe, 2015). Other relevant studies (Tresman, 2002) also suggest academic advisory services to help DL students to make informed course choices and fine-tune their expectations.

The high ranking of finance assistance, in addition to showing DL students' needs in this area, also suggests how wellness support can be extended. The financial dimension is not included in Hettler's model (1980), though some face-to-face teaching institutions already cover this aspect in their extended wellness models (e.g. the University of Pittsburgh (n.d.) and Ohio State University (n.d.)). What should be provided in the DL setting remains unexplored.

The results also challenge existing views in the literature. For example, personal counselling is the most recommended wellness service for DL students (LaPadula, 2003; Müller, 2008; Scheer & Lockee, 2003), but it was ranked fourth in the present study, after academic advice, financial assistance and career development.

Despite the limitation in the relatively small sample size, the results complement that of relevant studies by suggesting the needs of DL students for wellness support. It is worth noting that the results may also be affected by the DL setting in question.

For example, the DL students in this study could physically access the campus resources and meet with tutors face to face, though their employment status may be a constraint. This is different from the setting of some other studies on DL students of fully online programmes (Scheer & Lockee, 2003; Wilkinson, Turrentine, & Scheer, 2001).

Conclusion

This study sheds light on the student support services that can suitably serve the wellness needs of DL students. Based on a thorough understanding of students' needs, effective support services should be devised to satisfy their needs and promote holistic student development. This research provides empirical evidence for the claim that, including distance education, wellness support services should 'be seen, not as unnecessary luxuries, but as integral components of higher education' (Kupchella, 2009, p. 2).

This chapter indicates the DL student priorities on wellness dimensions and the specific student support services mentioned by them – both of which are different from those in the face-to-face learning context. The provision of wellness support based on the students' preferences would address the difficulties they encounter and some of their chief concerns, such as student retention and course completion. As can be seen, including wellness in student support is one of the core aspects for advances in distance education.

Acknowledgement The work described in this paper was partially supported by a grant from the Research Grants Council of the Hong Kong Special Administrative Region, China (UGC/IDS16/15).

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Chapter 18
Career Planning Support for Students Using Neuroscience-Based Assessment with Machine Learning Evaluation

Sin-Chun Ng, Andrew K. Lui, and Ka-Yin Poon

Abstract Hong Kong students nowadays face many pressures, especially in their academic studies, but their inner talents have been disregarded. Hong Kong is short of career guidance services and life planning education. This chapter presents a system – Career Profile – for providing career planning support for students. The system aims to provide a lifetime profile for every student in Hong Kong to determine their intellectual abilities and holistic thinking patterns and advise them on their appropriate career paths. Parents and teachers can also get clear information about their children/students through the Career Profile and so can enhance their communication and relationships with them. There are four main parts in the Career Profile. The first part is on assessment, which adopts Holistic Thinking Pattern Assessment as the neuroscience-based tool to collect data from students and their parents. The second part makes use of machine learning algorithms to identify the thinking pattern of individual students from the data collected. The third part advises students and parents on appropriate career choices. The last part is about the management system used by schools and teachers to centrally manage all the students' profiles with certain useful functions. The design of the system was tested by three groups – students, parents and teachers. The results indicated the importance of implementing the Career Profile and the advantages of using machine learning evaluation.

Keywords Learning style · Career planning

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_18

Introduction

Hong Kong's economy and population have grown at a fast pace in the last 20 years, and the levels of studies and qualifications have become inflated – and as a result, there's been an increase in the number of "monster" parents. These parents have started to rely on tutorial classes to enhance their children's academic performance and often have unrealistically high expectations while disregarding the children's capabilities. They have the misconception that the more intensive the training their children receive, the more likely a successful future can be guaranteed. In fact, this can have adverse effects on students' discipline, attitudes and character, and their inner talents may have been buried. Not until recently did the Education Bureau increase the funding and human resources to provide holistic support to schools in providing career guidance services and life planning education. An extended workload and extensive administrative work have left many teachers exhausted; and the lack of a comprehensive planning and records system for students has made the effectiveness of their efforts questionable.

The aim of this project is to implement a lifetime system – Career Profile – to provide career planning support for students. The system helps to determine a person's intellectual ability, holistic thinking pattern, natural preferences and progress. It provides a comprehensive gauge for the qualities that help students to choose the appropriate academic stream and career path, from gaining admission to higher education to acquiring a suitable job. The system updates and advises parents on their children's progress and development, helps them to understand their children better and reinforces their relationships. The system also aims to ease teachers' workload by assisting them in providing appropriate counselling to students. Through these measures, the next generation can be competent, competitive and have well-balanced characters.

The system features the use of machine learning techniques which have been experimented in various related initiatives. For example, He et al. (2019) adopted a neural network model to address the problem of career trajectory prediction. Nazareno, Lopez, Gestiada, Martinez and Roxas-Villanueva (2019) developed an artificial neural network approach to predict the career development of senior high school students in the Philippines. Their findings have demonstrated the effectiveness of the techniques to support career planning services.

Background

Assessment Method

How do we make choices? Why are we civilised? What differentiates us from animals? Why are machines just machines? It's because we are human beings and have a brain and can think.

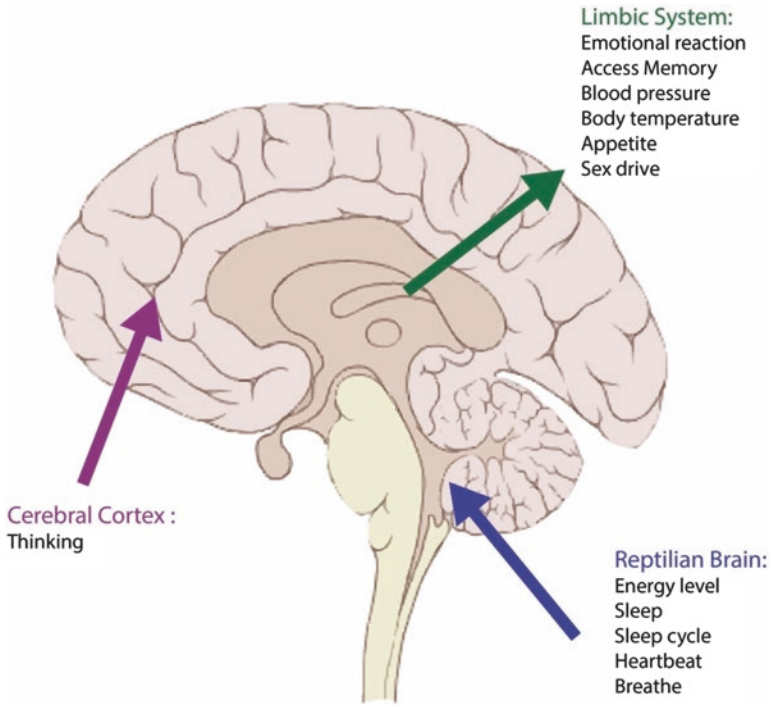

Fig. 18.1 Brain anatomy

As shown in Fig. 18.1, the cerebral cortex plays a key role in memory, attention, perception, awareness, thought, language and consciousness, that is, it dominates our thinking patterns, which affect our behaviour, decisions, personality and learning style.

Imagine that Steve Jobs or Bill Gates had studied music first or Albert Einstein had studied art? Would they be the same people we know? Most of our failures are caused by making wrong decisions or being forced to do something that does not match our thinking patterns.

A survey from Hong Kong Sheng Kung Hui Welfare Council Limited in 2015 stated that 75% of Diploma of Secondary Education (DSE) students are worried about making appropriate decisions about their careers and 78% of them are apprehensive about not being successful in the future. Therefore, a neuroscience-based assessment is needed to identify their thinking patterns for making appropriate decisions.

Table 18.1 outlines a list of psychometric instruments commonly used in Hong Kong. NLP (Dilts et al., 1980) and Enneagram (The Enneagram Institute, n.d.) are mainly used in social, family and work areas. MBTI (The Myers & Briggs Foundation, n.d.), Career Map (Career Map, n.d.) and PRISM (PRISM Brain Mapping, n.d.) are also used in career exploration. However, most of them were not

Table 18.1 A list of psychometric tools

Methods	Application area	Target users
Left and right brain thinking	IQ, EQ	All
NLP™	Family, work	Adults
Enneagram™	Social, love, marriage, work	Adults
MBTI™	Social, love, marriage, work, education, career exploration, parenting	Students, adults
Career Map	Career exploration	Students
PRISM	Recruitment, career exploration, education	Students, adults
HTPA	Education, career exploration, communication, social, love, marriage, family, work, recruitment	All

developed in Hong Kong. They did not know the actual need and thinking patterns of the students in Hong Kong.

Among them, HTPA (Holistic Thinking Pattern Assessment, n.d.) in Hong Kong was based on the work of the following people and organisations:

Dr. Katherine Benziger's BTSA
Dr. Carl Jung's Psychological Type and Falsification of Type
Dr. Hans Eysenck's EPQ
Keirsey & Bates's Temperaments Sorter
Neuroscience and Physiology's MEG, EEG, fMRI and FAB

HTPA covers many application areas and can be used to assess children's natural preferences. Its results are accurate and comprehensive, and therefore, it was chosen as the assessment method for this Career Profile.

Machine Learning

In HTPA, a total of 45 types of thinking patterns can be classified according to the test results. In the process of mapping the test results with the type of classification, machine learning can be applied. When labelled training examples are put into an artificial neural network, a rule is set through a machine learning algorithm; and so, when new test data are input into the system, it generates a preferred result according to the rule. If the result is incorrect, the test data can become training data and be put back into the neural network again until the result is satisfactory.

When compared with the traditional programmatic way to map the score to the result, it has several advantages:

- Developing an algorithm to convert a test score into a type of thinking pattern is complicated, because it has many possibilities and variations. However, by using a machine learning algorithm, we do not need to know how the rule is set – we

just have to provide a large amount of scores and mapped types as training data to train the neural network.
- The accuracy of the mapping result will eventually grow towards 100%, since more data will be accumulated for the system to learn to set a more accurate rule.
- The rule set by the neural network is data driven, in case there needs to be a change in the rule. There is no need to change any system codes – just reset the neural network and train again, which can ease the maintenance effort of the system in the future.

In fact, in this project, since the evaluation rule of the thinking pattern is confidential, we cannot develop an algorithm directly. Fortunately, we were provided by "Give and Take HK" (Holistic Thinking Pattern Assessment, n.d.) with sufficiently large evaluated cases as our dataset, and so using the machine learning algorithm is the suitable method.

Methodology

The Career Profile is a revolutionary IT solution for the purpose. Firstly, it uses the HTPA method for thinking pattern assessment and the machine learning algorithm to evaluate results. Secondly, it stores the records of students from kindergarten to tertiary level, so that comparisons can be made throughout their lives. Thirdly, it provides an advice system to map the thinking patterns to suitable items such as courses and jobs which are totally tailor-made in Hong Kong. Lastly, an advanced user interface is provided to take the assessment, review the results and obtain advice from the system. The career profile consists of several subsystems illustrated in Fig. 18.2.

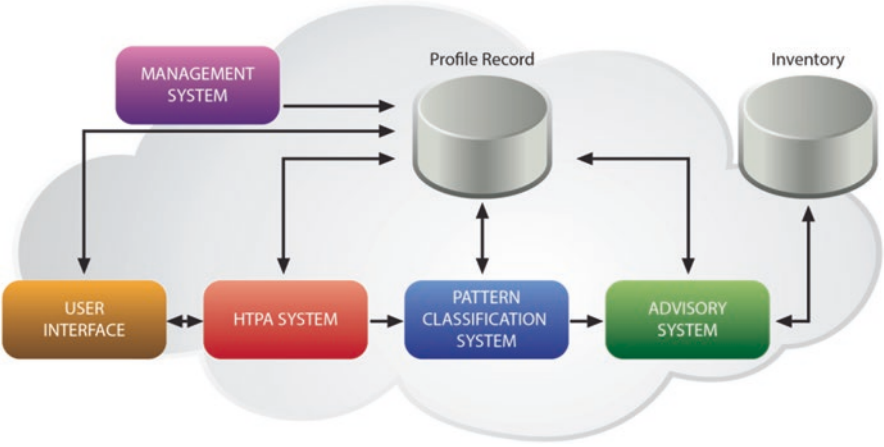

Fig. 18.2 System overview of the Career Profile

HTPA System

Users who are students or parents are able to access this subsystem. The system first gets assessment questions from the database and displays them to the users one by one until all the questions are answered and submitted. The answers are then saved to the user's profile as a record. The system then calculates six sets of scores from the results: for frontal left (FL), frontal right (FR), basal left (BL), basal right (BR), extroverted (EV) and introverted (IV). The scores are saved in the user's profile. The system then triggers the Pattern Classification System to recognise the brain pattern of the user based on the scores just saved. Finally, the system triggers an Advisory System to give recommendation to users based on their brain patterns. Note that the HTPA subsystem collects three data parts which contribute to the final HTPA scores for pattern classification, viz. the HTPA assessment of students, observation assessment for parents and the academic results from students. However, the main proportion and most important part is the assessment of students; and therefore, only the student who has finished the assessment can trigger the Pattern Classification System and the Advisory System.

For students and parents, each question in the HTPA assessment was predefined to a special brain area by an HTPA neuroscientist. For example, if the individual answers "true" to a particular question, the score will be added to the corresponding score for that brain area. Each set of scores from the parent assessment is added to those from the student assessment. For the academic result scores, this subsystem collects the most recent and best grades in subjects from the students. However, it is not necessarily useful if all the grades are good or poor, so only the noticeably better than average grades in all subjects are taken into account, and this step is filtered. In the six sets of scores in the HTPA assessments by students and parents for FL, FR, BR, BL EV and IV, subjects can be selected out by the filtering process, and then adjustment scores are added in the following way: add 1 to the FL if the subjects are science- and mathematics-related; add 1 to the FR if they are design-related; add 1 to the BR if they are related to art or music.

Pattern Classification System

This subsystem first gets the user's profile record from the profile database, retrieves the scores and passes them into the neural networks for pattern classification. The resulting pattern is then saved back to the user's profile for another stage.

The neural network requires input data and output data to perform back-propagation training. Figure 18.3 illustrates the design of the neural network. S1 to S4 are the input data corresponding to the scores on FL, FR, BR and BL calculated from the HTPA system. From the four sets of scores, 15 base types of thinking patterns can be identified. These 15 base types of thinking patterns are firstly converted to binary representation; therefore, R1 to R4 are either 0 or 1, representing a specific

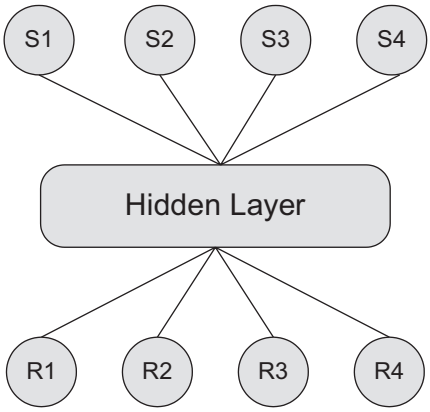

Fig. 18.3 Design of the neural network model

thinking pattern. For example, an input of 18, 3, 5, 7 would have an output of 1, 0, 0, 0, if there were around 30,000 input and output sets of training data to train the neural network. While the neural network has identified 15 base types of thinking pattern, the extroverted and introverted scores from the HTPA system need to be considered separately. Let IV be the score on introverted and EV the score on extroverted, so that X = IV – EV, for (X > 6), (X < -6) and (-6 >= X <= 6). You can derive three more types, so each base type will have three variations and, in total, there are 45 types of thinking patterns, with this rule set according to HTPA neuroscientists.

Advisory System

This subsystem first gets the user's profile record from the profile database and retrieves the brain pattern result generated from the Pattern Classification System. The system then loads the recommending items from the inventory database corresponding to the user's brain pattern. It depends on the age and study level of the user. If the user is below Secondary 3, then the system will recommend high school subjects; if the user is below Secondary 6, it will recommend university courses; and if the user is an adult, it will recommend common types of work.

Management System

This subsystem is used by schools, institutes or other education companies, to centrally manage all the student profiles. Through a web interface, they can perform competence-based class grouping or access an individual student profile for counselling. They can also choose suitable students for specific events based on their profiles.

Results

As noted above, the Career Profile evaluates students' brain patterns and provides recommendations on their careers; and it is a lifetime profile, from kindergarten to university. It may take years for people to realise its full potential, effectiveness and impact, and it cannot be evaluated quantitatively in a short time.

Apart from evaluating the whole concept, two aspects of the Career Profile can be evaluated, viz. the user's experience of using the system and the accuracy of the Pattern Classification System, which utilises the machine learning algorithm.

User Experience

Three groups of testers were invited to participate in the study. Group A had 20 students, half of whom were in Secondary 3 and the other half in Secondary 6, and they played the student role. The Group B participants were Group A students' parents, and they played the parent role. Group C involved three teachers from a tutorial school, who acted as testers of the management system. (It proved difficult to find a larger number of teachers because of their limited spare time.) Three different surveys were given to each participant in the three groups. The surveys contained several "true or false" questions and one open question for comments, so that the results would give a very clear indication of the effectiveness of the system's design. Tables 18.2, 18.3 and 18.4 show the survey questions for Groups A, B and C and the percentage of the participants who answered "true".

Obviously, the results above were positive. The Career Profile boosted students' self-understanding and can help them to make correct decisions about their careers.

Again, the results were clearly positive. The Career Profile allows parents to understand their children better and provides a common ground for enhancing their

Table 18.2 Group A survey results

Questions	Percentage answering "true"
1. This system is easy to use.	90
2. You like the interface design.	80
3. You don't need any help to complete the assessment.	75
4. This system lets you understand yourself more.	90
5. The advice given by the system is helpful.	80
6. You will use this system again.	75
7. Overall, this system is innovative and practical.	100

Table 18.3 Group B survey results

Questions	Percentage answering "true"
1. This system is easy to use.	80
2. You like the interface design.	80
3. You don't need any help to complete the assessment.	80
4. This system lets you understand your child more.	95
5. You will follow the advice on communicating with your child.	100
6. Overall, this system is innovative and practical.	100

Table 18.4 Group C survey results

Questions	Percentage answering "true"
1. This system is easy to use.	100
2. You like the interface design.	66.7
3. You can perform operations on students without any problems (create, import, delete, find).	100
4. The function of the thinking pattern statistics is useful.	33.3
5. The thinking pattern matching function is useful.	100
6. Through this system, you understand your students.	100
7. You will follow the advice to communicate with your students.	100
8. Overall, this system is innovative and practical.	100

communication. From the open question, their comments revealed that the Career Profile has more impact on parents than on students. Some said that this system is so helpful that it should have appeared earlier; and some mentioned that they would accept their children's potential and would not force them to study beyond it.

Most of the results were positive, the exception being Question 4. Afterwards, when we asked them about their responses to this question, they said that they did not know the meaning of each thinking pattern, and so it was meaningless to have a statistic based on that. After thinking about this issue for some time, we considered their comment to be correct, so an improvement should be made which provides explanations or some suggestions for teachers based on the statistics.

Evaluation of the Pattern Classification System

Before using machine learning evaluation of thinking patterns, scores from HTPA assessments were calculated manually by professionals and then analysed to identify the thinking pattern of an individual – a process which normally took 5–10 min for each case. Now, with our IT solution, all cases can be evaluated instantly, which saves considerable time and effort. Note that the only time-consuming task is the

training time of the neural network in the Pattern Classification System, but it is just one-time training; and once the system goes online, it can give an instant response.

Even the system's user interface (UI) is excellent, with many useful functions and quick evaluation. However, it would still be useless if it evaluated all the thinking patterns incorrectly. Therefore, the accuracy of the Pattern Classification System that uses a machine learning algorithm was investigated.

There are around 30,000 real evaluated cases, 3,000 of which are reserved as testing data to test accuracy, while the remaining cases are used as training data to train the neural network.

The Pattern Classification System is written as a web service which receives four scores as request parameters. So, for every case in the 3,000 test cases, the corresponding four scores are extracted by a custom test programme written in Python, which makes HTTP requests to the Pattern Classification System; and the result from the response is then compared with the expected result to see if they match.

The outcome was that 2,879 out of the 3,000 cases were matched correctly, meeting an accuracy of nearly 96%. This percentage looks good, but according to the HTPA professionals, the actual numbers reveal that more than 100 individuals were identified wrongly, and so when in its real operation, this may cause an extra effort to make corrections. But at least it has already saved a great deal of time, and the results just need to be double-checked before releasing them to individuals.

Since it is a machine learning approach, the accuracy can be gradually improved by putting the failed cases into the neural network as training data. Ideally with more and more cases accumulated, the accuracy will eventually climb up to 100%; and at that point, no more double-checking is needed – the clear advantage of using a machine learning algorithm.

Conclusion

The lifetime Career Profile was implemented successfully. It can determine students' intellectual abilities and holistic thinking pattern, with suggestions given to them on their careers. Their parents are also able to understand their children's talents better through the Career Profile. Teachers at school can centrally manage all the students' profiles and perform various functions through the Career Profile. All the objectives were satisfied, and the following list summarises the achievements:

- The HTPA system was implemented and integrated with the user interface system. First, it contains a question-based HTPA assessment as the main tool to determine the thinking pattern of students, and it is designed to be mobile-friendly; and as the results showed, it is easy for users to use it.
- The best and most recent academic results can be collected from students to make a fine adjustment to the scores on the HTPA.
- Parents' observations on their children's behaviour can be collected through question-based assessment on the user interface.

- The HTPA system was successfully integrated with the Pattern Classification System to identify the thinking patterns and save them in the student profile.
- The Advisory System was successfully implemented and integrated with the HTPA system to get the corresponding suggestion items from the inventory database according to the thinking pattern. The advice is given according to the student's study level, extracurricular activities, results in all high school and university subjects and major types of jobs in Hong Kong.
- The result scores and thinking patterns of the students can be viewed in both the student view and the parent view.
- The Pattern Classification System was implemented using a machine learning algorithm. The thinking patterns can be identified from four input scores through the neural network with an accuracy of 96%.
- The management system was implemented for schoolteachers to use, and it can centrally manage all the student profiles. Common operations – such as import, create, edit, delete, search, sort and filter – can be performed on the students. A statistics function is included to show the distribution of thinking patterns across the students, and there is a student mapping function to allow teachers to find suitable students for specific events according to their thinking patterns.

The results revealed that the Career Profile concept was feasible, and there is a big demand for it in Hong Kong. The Career Profile provides an opportunity for students, parents and teachers to choose the career path. With more communication and guidance from parents and teachers, students are no longer alone in fighting for their careers.

The results also showed that using a machine learning algorithm for pattern classification was successful. Although it is not 100% accurate at the moment, the "learning" ability of the neural network can increase the accuracy in the future.

However, this prototype is not yet perfect. Initially, the concept of a lifetime profile actually included assessments for kindergarten and primary school students, but HTPA cannot provide this at present, and so the prototype system for these younger students is not yet available. However, once they are ready, it will not be difficult to add them to the HTPA System, so that the Career Profile will be more comprehensive.

In terms of identifying talents, just using the HTPA has limitations, because it is evaluating how you use your brain, but there is no way to assess physical fitness. Some cases may exist where the students only have potentials in sports-related activities, but they cannot be identified through the system. If physical fitness has to be taken into account, the assessment should include questions that ask for students' physical status, but standards have to be defined on how good or poor it is. Also, because there are many kinds of sports, it may take some time to carry out research on this aspect.

In conclusion, the concept of the Career Profile has been shown to be useful and necessary for implementation in Hong Kong. After more testing and improvements have been made, the Career Profile will be ready to be launched locally. Imagine the situation where the Hong Kong Education Bureau adopted it and every school used

it. In such a situation, it would become a standard for admission offices in schools, and companies' human resources departments could easily check people's profiles and find suitable staff for jobs. With the Career Profile, the next generations will be completely different, and one can foresee a whole new world.

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Chapter 19
Meeting Diverse Student Needs for Support Services: A Comparison Between Face-to-Face and Distance-Learning Students

Billy Tak Ming Wong and Kam Cheong Li

Abstract Student support, as a crucial part of educational delivery, is closely related to many aspects of students' lives. Catering for students' diverse needs for support services poses challenges for all education providers; and for institutions offering courses in different educational modes, the challenges are even greater. This chapter addresses the diverse needs of face-to-face and distance-learning students for student support services. It presents the experience of the Open University of Hong Kong, which caters for both face-to-face and distance-learning students. The provision of these two modes of education calls for a comprehensive assessment of students' needs in order to develop and provide effective support services. This study aimed to (1) examine the need for student support services and facilities among student groups and (2) identify the major differences in this regard between face-to-face and distance-learning students. Both quantitative and qualitative methods were employed. An online survey was conducted to evaluate student preferences for various services and facilities; and valid responses were collected from 461 students, including 374 face-to-face and 87 distance-learning students. Also, eight focus groups were organised to collect student and staff opinions on student support services. The findings from the survey reflect the dimensions of services and facilities that the different groups of students valued most. For example, career development, which was ranked as the most important dimension by both student groups, shows the huge demand for relevant support in this area. Students' expectations also call for additional resources to be put into internship programmes for face-to-face students and academic advisory services for distance-learners. The responses collected in the focus groups provided further insights into the needs of students – such as the provision of a gymnasium, residential halls, exchange programmes and social events – to enrich their learning experiences. Based on the results, the selection and provision of student support services are discussed.

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_19

Keywords Student support · Face-to-face learning · Distance learning

Introduction

Student support has become a broad concept covering a wide range of services from personal counselling and financial assistance to sports and recreational activities. It has been changing over time to cope with societal developments and students' needs (Shutt, Garrett, Lynch, & Dean, 2012). Despite its broad and dynamic nature and the fact that educational institutions may emphasise certain service areas, student support generally shares similar objectives, such as enhancing students' learning experience, facilitating their academic success and promoting all-round development for their well-being (Evans, 2001).

Given the wide diversity of individual student needs, no single support system can suit all students equally. For instance, Okopi and Ofole (2013) showed the varied needs of students at a university for counselling at different stages of their studies. An institution therefore has to assess the needs of its students in order to prioritise and rationalise the resources it allocates to support services and facilities. Such a needs assessment may cover aspects such as identifying indicators of student satisfaction (Islam, Jalali & Ariffin, 2011; Martirosyan, 2015; Schreiner & Nelson, 2013); evaluating the outcomes of support (Okopi & Ofole, 2013); and addressing inadequacies in support provision (Adegbile & Oyekanmi, 2009; Gujjar, Chaudhry & Chaudhry, 2009).

The support needs of students can be influenced by their mode of study. Students studying in face-to-face (FF) and distance-learning (DL) systems are different in many respects – for example, in age, employment status, frequency of visits to the campus and contact with instructors and classmates. The divergence in their support needs has not been adequately addressed in the literature. This issue has become more salient in recent years as there are a growing number of dual-mode institutions offering both FF and DL programmes (ICDE, 2015), where the student support services need to cover both groups of students accordingly. For example, Paniagua and Simpson (2018) report the work of the European Association of Distance Teaching Universities on employing technology-enhanced means such as webinars to provide student support. Lionarakis, Niari, Apostolidou, Sfakiotaki and Ligoutsikou (2019) developed a digital platform for student support at an open university in Greece.

This study focuses on the experience of the Open University of Hong Kong (OUHK) in catering for its diverse student needs. As an institution which provides open and flexible learning, covering both FF and DL programmes, it has to offer support services to these two groups of students from very different backgrounds and with different expectations for their learning experience. The proper selection and provision of student support has been challenging and is very important for the university.

This chapter, which illustrates the support needs of the FF and DL students in the OUHK, involved both quantitative and qualitative feedback from students and staff. The similarities and differences between these two groups of students are highlighted and provide a relevant reference for institutions in a similar situation for planning their support provision.

Literature Review

The foci of student support have been changing with time. Shutt et al. (2012) examined the historical development of student affairs and found that the student affairs profession has shifted from focusing on student services to student development, student learning and the assessment of learning outcome. This suggests a change in student needs for support and the assessment needs for service prioritisation and development.

Studies of student support needs cover different areas involving students' experience, perceptions and preferences for support services. For example, Douglas, Douglas, McClelland and Davies (2015) studied undergraduate students' experiences of teaching and learning and support services and how these experiences can influence the tendency to continue their university studies and recommend their university to others. Nichols (2010) assessed the university experiences of DL students with different academic performance so as to evaluate the outcome of a retention intervention programme. The assessment could also help to address the inadequacies in a university's student support (Adegbile & Oyekanmi, 2009; Gujjar et al., 2009; Rumble, 2000) and planning specific student services (Perron, Grahovac, Uppal, Granillo, Shuter & Porter, 2011).

Face-to-Face and Distance-Learning Students

The mode of education is a factor which affects the needs and expectations of students for support services. FF teaching institutions usually provide a broad range of services. For example, Shi, Drzymalski and Guo (2014) listed 14 service items which commonly contribute to students' satisfaction, as a subjective evaluation of education outcomes (Elliott & Shin, 2002). They covered the dimensions of academic issues (e.g. varieties of courses, curriculum organisation), facilities (e.g. residence facilities, computer access) and administration (e.g. healthcare services, career planning). Also, Wilkins and Balakrishnan (2013) found that the factors which influence students' satisfaction with their institution included the quality of lecturers, facilities and social life and the effective use of technology. In addition, O'Driscoll (2012) identified the significant determiners of students' perceptions of service quality as academic support, welfare support and course communication structures. Overall, Islam et al. (2011) reported that academic services that can

develop and instil good values, attitudes, character and a strong personality were more important for students' satisfaction with an education institution.

Attention to DL student support has centred mainly on the use of education technology to enhance their learning outcomes and prevent dropout (Agorogianni, Zaharis, Anastasiadou & Goudos, 2011; Chatpakkarattana & Khlaisang, 2013; Luo, 2014). According to Smith (2004), academic support is far more important than the other types of support for DL students. Also, Sookdeo and Ramphal (2013) investigated the difficulties encountered by DL students, such as a lack of efficient feedback on their learning problems and social isolation, and proposed a set of guidelines for effective teaching and learning support. Tresman (2002) stressed the importance of raising DL students' satisfaction level for improving their retention rate. Strategies have been recommended, including having advisory and guidance staff to help students make informed course choices and giving them easy access to their academic records to assess and manage their study progress. Forming a learning community to gather students online for interaction and collaboration has also been suggested (Chatpakkarattana & Khlaisang, 2013; Luo, 2014; Tresman, 2002), as such a community can provide mutual support and enrich students' learning experience in the online learning environment.

According to Tait's (2000) illustration, student support services in the context of DL can be summarised and categorised into 11 types including enquiry, admission and pre-study advisory services, tutoring, guidance and counselling services, assessment of prior learning and credit transfer, study and examination centres, residential schools, library services, individualised correspondence teaching (including in some cases continuous assessment), record keeping, information management and other administrative systems' differentiated services for students with special needs of one sort or another (such as disability, geographical remoteness, prisoners) and materials which support the development of study skills, programme planning or career development. LaPadula (2003) stated that the student support services of traditional higher education institutes have not changed dramatically. LaPadula's (2003) studies did not focus on commenting about the quality of student support services offered by traditional higher education institutes, nor criticising those traditional higher education institutes that did not take student support in their consideration. Instead, the studies focused on the issue that distance educators seem to be more driven by the concerns for planning customer care and support than those traditional education institutes. Most of the time, student's distance learning experience is constructed by the quality of the support services that support the education process. Online learners benefited from student support services particularly designed to meet their needs. Institutions conventionally dealt with services for distance learners as an add-on to procedures on campus, a situation that was satisfactory when the enrolment of online programs was relatively smaller (LaPadula, 2003). Furthermore, LaPadula (2003) suggested a wide range of online student services which were identified and placed into three categories: academic advising/career counselling, personal/mental health counselling and services that promote a sense of community.

Sewart (1993) suggested that the principles which are hidden under higher education before the rapid change of this century were, for the majority, those of personal treatment tailored to the individual students' requirement and needs. This is categorised nowhere more clearly than in the Oxford tutorial tradition in the UK but is no less apparent in the USA as well as other developed countries. In this system the role of the tutors was to figure out the needs of individual students who were assigned to them, give advice of the pattern of learning which each of these students was able to undertake and advise on further reading and the whole pattern of study. This kind of relationships was likely to become personal individual relationships between the tutors and students and could take on an advisory capacity well beyond the strictly academic development of the student. Generally, it is clear that the early principles of higher education were student centred and individualised. Potter (2013) stated that the term 'student support services' is used in various ways. Particularly in the world of distance education, it has been limited to the description of the learning resources which are needed by students to meet the course requirements. In the context of distance learning, it has a relatively broader meaning as it includes the many kinds of assistance intended to remove barriers (situational, institutional, dispositional and informational) and promote academic success. For example, such support services can be pre-admission counselling, academic advising, financial aid, learning skills instruction, child care and much more.

Reasons for the Differences

Tait (2000) proposed that the elements comprise the main relevant features of student identity in assessing student characteristics for a particular cohort. He introduced features which include gender, age, employment or unemployment, disposable income, educational background, geographical situation, special needs (such as disability), language, ethnic and cultural characteristics and communications technology connectedness. Rumble (2000) states two reasons for the differences of the student support of DL institutions and traditional FF institutions. Firstly, according to the experience in education, students need support if they aim to succeed. Distance educators are generally conscious of their roots in correspondence education. In the 1960s, correspondence education had a bad image; the main reason is that it did not help students succeed. The focus on student services in the 1970s, which has been driven to a large extent by the adult educators who work at the British Open University, was motivated by the wish to avoid the dropout rates of correspondence education, by the knowledge that evidence of high dropout rate would reduce the reputation of the University, and by a recognition that provision of a package of materials was not an adequate support for students. Secondly, a system for distance education is embedded in the literature. It is a part of our culture, and it includes student support. Course development, materials production, materials distribution, materials reception, course delivery, student administrative and support services, logistical systems and decision-making systems are mentioned a lot.

Somewhere under student administration and support, we will focus on advisory and guidance services, counselling services, financial assistance and support for the disabled, among other assistance to students.

Recent Development

LaPadula (2003) stated one of the biggest gaps in online and distance education is that institutions are unable to provide time- and location-specific access to a complete array of student support services. According to Keller (1999), in Japan, a recent development provides a simpler and more effective approach to design of motivation and has regularly been adopted in two innovative applications to the improvement in the context of self-directed and distance learning.

Related Studies on Comparison of Student Support in DL and FF Institutions

Richardson (2009) has done a study investigating the experience of students who took the same course by distance learning when tutorial support was provided conventionally (using face-to-face lessons with contact by phone and email) or online (using computer-mediated conferencing and email). Neuhauser (2002) has also carried out a study concerning DL and FF courses. In Neuhauser's (2002) study, the same course offered online and face to face is examined. This study investigated the factors including gender, age, learning preferences and styles, media familiarity, effectiveness of tasks, course effectiveness, test grades and final grades of students who enrolled into the course.

The Present Study

The findings of related studies reveal a research gap on the support needed by FF and DL students. First, these two groups have rarely been assessed and compared in the same context. Second, studies on student support, in particular for DL, appear to have focused on academic services, with non-academic support not being adequately examined. Third, as the roles and functions of the student service profession have changed with time (Shutt et al., 2012), it is important to keep abreast of these changes and understand current students' needs and expectations for support. An assessment of the support needs of FF and DL students is thus of great value to an institution for devising and providing effective support for both groups.

Methodology

A study was conducted to gain a comprehensive understanding of the FF and DL students' support needs in the OUHK, so that suitable and timely support could be provided. It aimed to answer the following questions:

1. What are the needs of FF and DL students for student support services?
2. How important are the support services and facilities for students?

The study followed Hettler's (1980) wellness model which covers six dimensions of student development, viz. the occupational, physical, social, intellectual, spiritual and emotional dimensions. This model has been widely applied in the design of student support by higher education institutions – for example, the University of Pittsburgh (n.d.), the Ohio State University (OSU) (n.d.) and Harvard University (n.d.) – for promoting students' holistic development.

Both quantitative and qualitative methods were employed in the research. Quantitative data were collected through an online questionnaire completed by a total of 374 FF and 87 DL students. The questionnaire evaluated students' preferences for the dimensions of development and a broad range of services and facilities that were not offered in the university.

The FF and DL student respondents were different, mainly in terms of their employment status and frequency of contact with classmates and teaching staff. More than half of the FF students (57%) had no employment; 41% of them worked part-time; and only 2% had full-time jobs. Comparatively, 77% of the DL students worked full-time and 7% part-time, and only 16% had no employment. On the frequency of contact, 80% of the FF students had face-to-face contact with classmates or teachers at least once a week, in contrast to only 21% of the DL students, with the other 79% having face-to-face contact twice a month or even less.

A total of eight focus group interviews were also held to collect students' and staff's opinions on student support services. The participants included 25 FF students, 6 DL students, and 10 university staff. The student interviewees were recruited from different programmes and different academic years. They shared their views and experiences of students' needs for support facilities and services according to the six development dimensions.

Results

Survey

The survey explored students' ranking of the development dimensions and support facilities and services according to their level of importance.

Figure 19.1 shows the average ranks of FF and DL respondents on the importance of the six development dimensions. On average, career development was

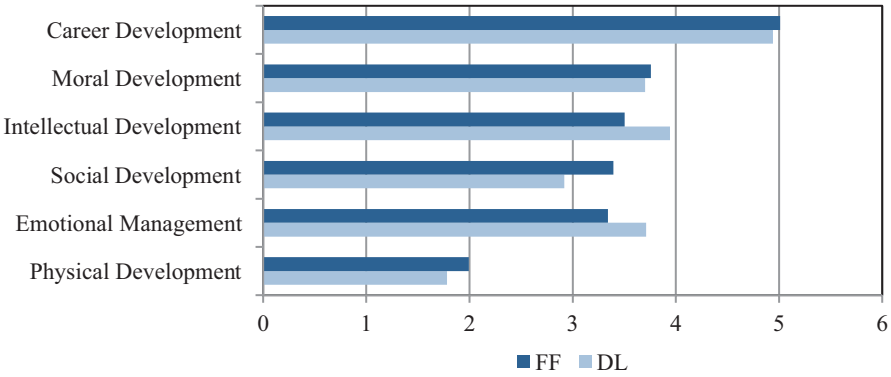

Fig. 19.1 Average ranks of the development dimensions (the higher, the more important)

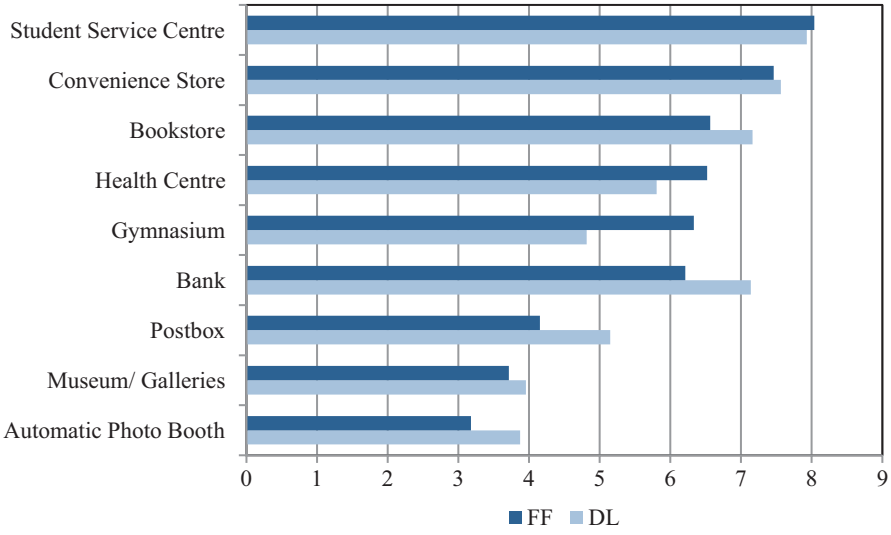

Fig. 19.2 Average ranks of facilities (the higher, the more important)

ranked the most important for both FF and DL students. FF students ranked the moral, intellectual and social development and emotional management similarly on average, while DL students ranked social development clearly lower than the other three. Physical development was ranked the lowest by the majority of respondents.

Figure 19.2 shows the average ranking of the facilities. A student service centre (providing non-catering retail services, such as stationery, binding and photocopying) was on average ranked the most important by both FF and DL respondents,

followed by a convenience store and bookstore. However, there were also discordant needs between FF and DL students. For example, the former ranked a health centre and gymnasium higher, while the latter ranked a bank and postbox as more important.

Students also suggested other facilities which were not provided by the university or were regarded as inadequate. As shown in Table 19.1, both FF and DL respondents mentioned the need to enhance the canteen facilities by providing more dining space and a greater variety of food. FF students also expressed a need for other facilities, especially a residential hall and café.

Figure 19.3 shows the average ranks for support services. Financial assistance was considered by FF students as the top priority; and they ranked internship programmes, exchange programmes and student activities clearly higher than the DL students did. Compared with FF students, DL students had a greater need for

Table 19.1 Other facilities suggested by students

Facilities	Frequency (FF)	Frequency (DL)
Canteen	25	6
Café	23	1
Residential hall	38	1
Swimming pool	7	0
Sport complex	6	0
Library	3	0

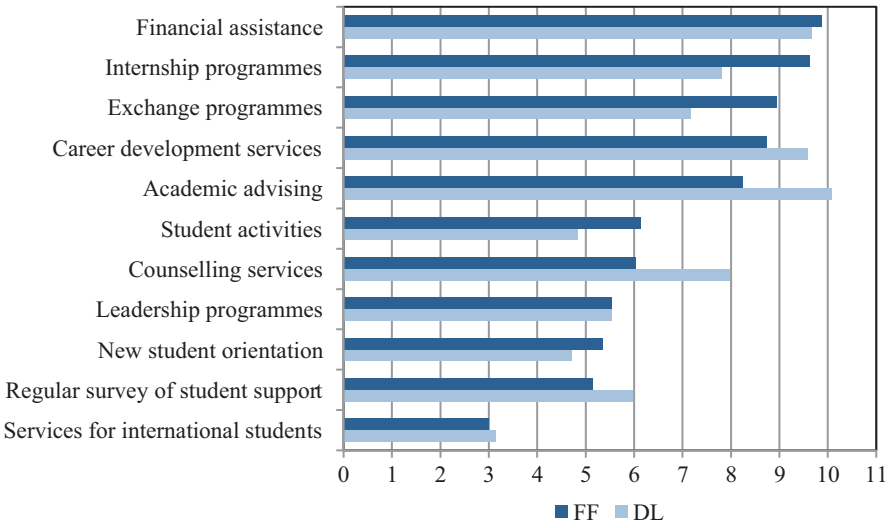

Fig. 19.3 Average ranks for student support services (the higher, the more important)

services related to career development, academic advice and counselling. It is worth noting that an academic advisory service was ranked as the most important by the largest proportion of DL students.

Focus Groups

Table 19.2 lists the suggestions from students and staff for student support services and facilities according to the six development dimensions.

As shown in Table 19.3, the students and staff also suggested other kinds of student support services and facilities and raised some administrative issues.

Various areas of student services and facilities were emphasised by FF and DL students. The needs of FF students were focused more on facilities and activities that could enhance their career development, physical wellness, spiritual values and social relationships. For instance, they wished to have a medical service, a gymnasium, residential halls and more common areas. They also talked about their needs in what they considered as student welfare, such as subscription discounts on publications. They mentioned a number of activities that they saw as important, viz. internships, exchange programmes, recruitment talks, short courses, social activities and community services. Most of them viewed career development as the most important dimension since they needed relevant guidance and support.

DL students were concerned more about support in the intellectual and social aspects. They highlighted the need to have academic advisory support and to buy reference books and required readings in the university. They also mentioned that DL students were quite 'lonely' since, for most of the time, they studied in isolation and had little interaction with classmates. They suggested that the university should expand student organisations, study groups and social activities for them to build up a social network and a sense of belonging to the university. While agreeing that DL students would not use campus services and facilities as frequent as FF students, they expressed their wish to have the opening hours of the services and facilities extended as most of them work during the day on weekdays.

The administration of student affairs was also a concern for the participants, especially the university staff, who saw communication among different parties as of the utmost importance, e.g. the contact between the Student Affairs Office (SAO) and students (especially international students, students with special needs and alumni); the communication between the SAO and the academic staff; and the general promotion of SAO activities. They suggested measures, such as establishing a group of student ambassadors, having a staff representative from each academic unit and using more channels for delivering related information on the support services and facilities.

Table 19.2 Suggestions for student support services and facilities

Suggestions	FF students	DL students
Physical		
Health services		
Provide a university medical service	✓	
Give more information on physical activities and health tips		✓
Sport facilities		
Provide a gymnasium in the university	✓	
Provide a borrowing service for sports equipment	✓	
Provide free venues for sporting activities	✓	
Sport activities		
Organise sports teams	✓	
Offer yoga courses	✓	
Occupational		
Career services		
Provide more internship programmes	✓	
Organise more recruitment talks and form a greater recruitment network	✓	
Organise alumni-sharing of work experience	✓	
Set up a database of common interview questions and related resources	✓	
Disseminate more job advertisements to students	✓	✓
Support on future studies		
Provide a consultation service for further studies	✓	
Organise information sessions on further studies		✓
Support on examinations for professional qualifications		
Set up a database of sample examination papers	✓	
Provide talks on examination skills	✓	
Intellectual		
Academic-related activities		
Organise more academic exchange programmes with local and overseas universities	✓	
Provide short courses on various disciplines	✓	
Provide an academic advisory service		✓
Organise talks and seminars on social issues		✓
Study facilities		
Provide more study rooms	✓	✓
Learning resources		
Share library resources with other universities	✓	
Provide a subscription discount on publications	✓	
Sell reference books and required readings in the university		✓
Emotional		
Provide a comfortable environment for the counselling service	✓	✓

(continued)

Table 19.2 (continued)

Suggestions	FF students	DL students
Give information related to the counselling service to academic staff so that they can refer students to the service	✓	✓
Spiritual		
Organise cultural exchange programmes	✓	
Organise more community services	✓	
Social		
Social activities		
Organise student forums for students to voice their views	✓	✓
Organise more social activities for students to develop closer relationships with each other	✓	
Organise activities for enhancing social skills	✓	
Organise more leadership programmes	✓	
Organise activities for helping international students to adapt to the local culture	✓	
Organise study groups or field trips		✓
Organise more social activities for alumni		✓
Social organisations		
Provide more variety in student organisations	✓	
Provide more venues and facilities for student organisations	✓	
Allow DL students to join student organisations		✓
Facilities that promote social interaction		
Provide student residential halls	✓	
Provide more common areas for students	✓	

Discussion

The findings suggest that both FF and DL students have a need for all-round support, despite the fact that their different educational modes may affect their preference for particular types of services and facilities and ways of service provision.

A notable difference between the preference of FF and DL students was whether the services and facilities are 'campus-oriented'. FF students preferred to have more types of services and facilities provided on the campus, as they would usually stay longer there. For example, the FF students ranked a health centre and gymnasium as more important than the DL students did. They also wished to have a student residential hall and additional catering services, indicating their need to experience a full campus life during their studies. On the other hand, the DL students valued more a collection of convenient services not directly related to study, such as a bookstore, bank and postbox, that they could access given their limited time at the campus. It was also apparent that the DL students preferred support services that can be delivered online. For example, they suggested having more information on health tips instead of the FF students' preference for a medical service. However, they also argued that the opening hours of the university facilities could be extended

Table 19.3 Suggestions for other student support services and facilities

Suggestions	FF students	DL students
University facilities		
Provide venues for study that are open for 24 h	✓	
Provide more electric sockets in the campus for notebook computers	✓	
Provide more canteens	✓	
Extend the opening hours of university facilities to cope with DL students' class schedules		✓
Student welfare services		
Provide welfare support by setting up a student service centre	✓	✓
Provide a postal service	✓	
Financial services		
Provide scholarships as a form of encouragement		✓
Delivery of information		
Use more channels for the promotion of student services and activities	✓	✓
Provide a direct channel to students for enquiries	✓	
Administrative issues		
Provide a channel for international students to seek help	✓	✓
Select a group of student ambassadors as a bridge between the university and students	✓	✓
Develop effective communication channels among students, academic units and the Student Affairs Office	✓	✓

to cope with the DL students' availability. This suggests their potential need for using campus facilities and services that may be met by having relevant coordination of service provision.

The FF students did not indicate academic support as their top priority, which differs from findings in some related studies that teaching and learning support is one of the most significant factors accounting for student satisfaction (O'Driscoll, 2012; Shi et al., 2014; Wilkins & Balakrishnan, 2013). For the DL students, academic advice was deemed important, showing that they need additional assistance on academic matters. This may be because relevant information and advice could not be obtained as a consequence of their limited interaction with classmates and teachers. Relevant studies (e.g. Tresman, 2002) also reported the significance of academic advisory services for helping DL students to make informed course choices and fine-tune their expectations.

Both the FF and DL students regarded 'career' as the most important aspect of development, but their related support needs were different. The FF students expressed their preference for a wide range of services from internship programmes to recruitment talks and support on examinations for professional qualifications. In contrast, the DL students showed less of a demand for these services, but indicated an interest in having more job postings and information for further studies. Such difference may be due to their different employment status, with most DL students already having full-time jobs.

The DL students indicated a greater need for counselling services than did the FF students. Almăşan and Alexe (2015) explain that DL students experience psychological and emotional difficulties in their studies, such as worrying about their employability after graduation. Although more attention has been paid to this issue in the past decade (Kangai, Rupande & Rugonye, 2011), counselling support still appears to have been underemphasised for DL students compared with FF students.

The administrative issues raised in the focus groups highlighted the importance of effective communication among all the relevant parties in student support. It is crucial for students to be aware of the support available and for the university to identify the students in need and the nature of their needs.

Conclusion

This study has revealed the needs of FF and DL students for support services and facilities. Despite their different learning environment, the two groups of students demonstrated a similar pattern in their choice of development dimensions. Such findings suggest the importance of all-round development for both groups, whereas the provision of relevant support has been mainly oriented towards FF students. Non-academic support, such as the areas covered in Hettler's (1980) wellness model, has yet to be widely provided for DL students (Scheer & Lockee, 2003; Thompson & Porto, 2014).

The different needs of FF and DL students, which lie mainly in the types of services and ways of service delivery, pose challenge in selecting and prioritising the provision of support services for an institution. The findings of this study suggest possible ways to make effective use of the support services and campus facilities, one of which is to extend the opening hours of the services to cope with the schedule of DL students. The provision of information about health tips and further study, as suggested by the DL students, can also be extended to the FF students at minimal cost. Given the growing number of institutions offering both FF and DL programmes (ICDE, 2015), it is time to address the challenge of delivering proper support for both groups of students cost-effectively.

Acknowledgement The work described in this paper was partially supported by a grant from the Research Grants Council of the Hong Kong Special Administrative Region, China (UGC/IDS16/15).

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Part IV
Pedagogy and Curriculum Development

Chapter 20
Implementing Computer Game-Making Across the School Curriculum: Innovative Practice from Europe

Helen Boulton, David Brown, Thomas Hughes-Roberts, and María Eugenia Beltrán

Abstract This chapter focuses on the innovative use of computer game-making across the curriculum in primary (5–11 years) and secondary (11–18) schools across Europe. It contributes knowledge on emerging pedagogy related to the integration of computer game-making in school classrooms. It utilises developments from a 3-year Horizon 2020-funded research project, "No one left behind", involving over 600 children and 20 teachers. The project developed an inclusive approach to use game-making in schools across Europe: Spain worked with children who were travellers; Austria worked with girls; and the United Kingdom (UK) worked with children who were identified as at risk of social exclusion, many of them with learning difficulties. Game-making is increasingly being used in schools by computing teachers and STEM (Science, Technology, Engineering and Mathematics) teachers to engage learners. This chapter presents a framework, based on research, that teachers globally can utilise to introduce game-making within their classrooms, whatever the subject area or age of the learners. The game-making mechanics and dynamics for the research were provided by Create@School, free-to-download game-making software, which can be used on android mobile technologies. However, other software such as Scratch, also free to download, would provide a similar environment. At the end of this chapter, the website to download the software and teaching resources referred to in the chapter is provided.

Keywords Game-making · School curriculum · Innovative practice · Create@School

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_20

Introduction

Game-making is increasingly being used in schools by computing teachers and STEM (Science, Technology, Engineering and Mathematics) teachers to engage learners. This chapter presents a new framework, based on research, that all teachers globally can utilise to introduce game-making within their classrooms, whatever the subject area or age of the learners. It contributes new knowledge on emerging pedagogy related to the integration of computer game-making in school classrooms.

Research suggests that cognitive and behavioural skills can be improved through making games in learning, so that learners can achieve higher levels in different curriculum areas. It is suggested that playful learning through computer games can stimulate students' intrinsic motivation (Garris, Ahlers, & Driskell, 2002) and that knowledge creation can emerge through the construction of artefacts in a playful learning environment via the co-creation of games (Kangas, 2010). In a more recent study, Bowden (2019) found empirical evidence for the effectiveness of collaborative game design in enhancing the problem-solving capacity of children.

Connolly, Boyle, MacArthur, Hainey, and Boyle (2012), in their systematic literature review of 7392 papers, showed the potential of computer games and serious gaming for learners aged 14 and above, identifying the impact not only on motivation but also on knowledge and understanding. However, what was lacking in their review of these papers was an explanation of how games are integrated within the learner's experience in the classroom.

Game-based learning in general has the power to simulate real-world complexity and make learning more connected to learning both within and beyond the classroom, particularly where STEM subjects are concerned (Spires, Rowe, Mott, & Lester, 2011). Furthermore, video games can be used as therapeutic treatments for autism spectrum disorder (Malinverni et al., 2016) and can potentially be effective in engaging learners with special education needs due, in part, to games being ubiquitous in children's leisure environment (Boulton et al., 2017a, b).

There is an increased focus on computational thinking, defined by Wing (2006, p. 33) as "solving problems, designing systems, and understanding human behaviour using computer science techniques". Wing (ibid.) argued that computational thinking is related to cognitive development and thus has a place in all classrooms (Allan, Barr, Brylow, & Hambrusch, 2010; Holt, 2011; Zhou et al., 2011). In developing games in class, learners are developing computational thinking skills which are applicable across the curriculum.

The benefits of making games include enhanced problem-solving skills, fostering of creativity, interest and the ability to learn programming skills (Gee & Tran, 2016; Robertson, 2013). The constructivist approach provides game challenges that help players to solve problems in the game environment. These challenges can be solved through players' experiences in previous game levels (Zaibon & Shiratuddin, 2010). Modern theories of learning suggest active and experiential learning, which involves problem-solving and immediate feedback, have a positive impact on student learning (Boyle, Connolly, & Hainey, 2011). Recent developments in

game-making involve the use of tools such as Game Maker to foster programming skills (Johnson, 2017), the application of game authoring in school subjects (Lye & Sabri, 2013) and distance learning contexts (Li & Li, 2019) as well as the evaluation of the effectiveness and impact of game-making tools and projects (Boulton et al., 2017a, b; Earp, Dagnino, & Caponetto, 2016; Gabriel, 2019; Yildirim, 2018).

Classrooms, as creative spaces where co-construction of learning and collaboration take place, provide a rich environment for the creation of games and exchange of knowledge. The theoretical framework for this study is based on the theory of constructionism, which emphasises design and sharing of artefacts (Parmaxi & Zaphiris, 2014). Constructionist learning is inspired by the constructivist theory that individual learners construct mental models in order to understand the world around them. It advocates student-centred, discovery learning where students use information they already know to acquire more knowledge. Students learn through participation in project-based learning where they make connections between different ideas and areas of knowledge facilitated by the teacher through coaching rather than using didactic teaching or step-by-step guidance (Alesandrini & Larson, 2002).

Jonassen (2000) describes how, in creating a constructivist learning environment, a teacher nurtures the learning of concepts and problem-solving within computational thinking which aligns to the use of game-making in this project. The opportunity to co-construct learning through creating games reflects Vygotsky's (1980) theory of constructivism which provided an alternative theory to the widely accepted behaviourist approach to learning, resulting in a less isolating learning experience (Liu & Matthews, 2005). Vygotsky (1978) argued that co-constructing knowledge would move students from a zone of what is already known to a zone of proximal development. Constructivism has been developed by others who recognise the role of social environments in learning, such as the classroom (Lave & Wenger, 1991; Wenger, 2009).

However, while research has thus far examined gameplay and game-based learning in education, there is limited work focusing on the process of game-co-creation as a method of classroom teaching. This is a prospect which is increasingly possible with the introduction of visual programming languages such as Scratch (Resnick et al., 2009) and Pocket Code (Boulton et al., 2017a, b). Such a pedagogic approach would also allow games to be used in other curriculum areas as the topic of the game is no longer fixed and tailored to specific curricula or learning needs. For example, the goal of a teaching session could be to create a quiz and populate it with relevant subject knowledge, the process of which informs the learning both in terms of developing the cognitive ability of the students and also their required curriculum-based knowledge. Game-making as a learning activity could also offer a means of providing inclusive teaching for students, including those with profound disabilities.

There are, however, barriers to introducing technologies into classrooms. For example, Boulton and Hramiak (2014) identified barriers including lack of senior management support, insufficient time for teacher planning, lack of access to technologies and school network management. Murray, Nuttall and Mitchell (2008) and Bingimlas (2009) also identified barriers such as lack of teacher confidence,

resistance to change, negative attitudes, lack of time, accessibility, poor training and lack of technical support. Gaffney (2010) grouped barriers into specific areas of research and policy; school context; teacher skills, attitudes and beliefs; student skills and knowledge; and technology. Other studies also indicate access to technology in schools as a potential barrier (Hammond et al., 2009; Pelgrum & Doornekamp, 2009).

The research presented in this chapter was carried out in three geographical sites in Europe: Spain, Austria and the United Kingdom (UK). Over 600 learners and 20 teachers took part over 3 years. The project developed an inclusive approach to using game-making in schools across Europe: Spain worked with children who were travellers; Austria worked with girls; and the UK worked with children who were identified as at risk of social exclusion, many of them with learning difficulties. The framework presented here has been piloted and refined through the project. At the end of this chapter, the website to download the software and teaching resources referred to in the chapter is provided. Create@School, a game-making software app, was used in the project. This is a visual, "LEGO-style" programming environment which allows learners to create, play, share and remix (Boulton et al., 2017a, b). It can be downloaded from Catrobat.org onto android mobile devices. While this is the software developed from the project, any game-making software, including Scratch (Gülbahar & Kalelioğlu, 2014), could be adapted.

The Evaluative Study

The project involved 600+ learners from ages 7 to 18 with differing levels of ability, in different curriculum areas, in 3 geographical sites across Europe as indicated in Table 20.1.

Over the 3 years, there were three interventions in each site. Some of the children had learning difficulties ranging from moderate, where they were taught in mainstream classrooms, to profound, who were taught in special schools. Identified learning difficulties of the learners involved in the project included:

- Autistic spectrum disorder
- Specific learning difficulty, including dyslexia
- Social, emotional and mental health
- Moderate learning difficulty, including speech, language or communication
- Other learning difficulty/disability including dyspraxia

Twenty-five teachers from different curriculum disciplines also took part in the project, with differing abilities in computing and game-making. The pedagogy and resources developed from the project, set out below, have all been tested in each of the countries.

Table 20.1 Participants

	UK	Austria	Spain
Schools participating	1 primary school	1 international school	1 primary school
	1 special school	1 secondary school	1 secondary school
	1 secondary school	1 primary school	
Location	United Kingdom	Austria	Spain
Curriculum areas (subjects)	Sciences, humanities, religious education, personal and social enhancement	Physical education, computing, music, fine arts, English, physics	Sciences, mathematics, PEMAR, free disposal
Number of teachers	7	11	7
Number of students	210	284	227
Risk of exclusion driver	Special educational needs and disabilities	Gender	Different sub-population communities

Data were collected as follows:

- A teacher questionnaire, which was adapted from one originally designed by Fraser, Atkins and Hall (2013). This questionnaire classifies teachers' skills into one of four levels: entry, core, developer and pioneer.
- The learners' prior use of a gaming questionnaire relating to game-making, game-playing and prior knowledge of programming.
- Observation of lessons (n = 30+) using game-making, with a bespoke observation tool designed and piloted in the first intervention and refined for the second and third interventions. This tool took measurements of class activity every 5 minutes. In order to gather data using this tool of engagement, observations were also carried out on the same students in lessons where game-making was not utilised.
- Subject progression data via a spreadsheet created to collect baseline data for each learner which was populated with data comprising literacy levels, subject-specific knowledge and national curriculum levels. This was linked to a data collection tool (DCT) within the game-making software to record changes over baseline measures (gameplay, completed game levels and time spent on the app).
- Interviews with teachers, which were semi-structured, with questions related to the engagement, persistence and achievement of learners. These were held at the end of each intervention.
- Computational thinking tests to measure the development of related cognitive skills. These tests were used prior to the first intervention and then at the end of each intervention.

Qualitative data were analysed using Braun and Clarke's (2006) theory of thematic analysis of qualitative data. Codes were initially identified from the literature and then expanded as part of the analysis process as the data were reviewed. The

qualitative data were coded, and patterns and relationships were identified and integrated into key categories to inform the development of the overall framework, which is set out later in this chapter. Quantitative data were analysed using formulae within the spreadsheet referred to above, including data from the computational thinking tests.

Findings

The findings presented in this chapter relate specifically to the development of an overall framework which is shared later in this chapter.

The questionnaire related to learners' prior use of gaming identified that 95% had experience of game-playing; 28% had experience of programming; and 22% had experience of game-making. Teacher responses indicated that the learners were more engaged when involved in game-making, with the majority of learners increasingly persistent when making and playing games; and the teachers believed that learners developed curricula knowledge at a deeper level when using game-making in lessons. The latter finding was corroborated by the results of the DCT analysis and computational thinking test analysis. The finding of increased engagement was also supported by the observation data – that is, engagement was increased noticeably when game-making was used in lessons.

In interviews, the teachers reported an increased confidence in game-creation in their subject discipline which they believed had an impact on their learners and improved their computational thinking. This was supported by the analysis of the computational thinking tests.

The findings also identified emerging pedagogy, which has enabled the development of a pedagogical framework for use when utilising game-making in lessons (see below). Interviews with teachers identified that the lack of programming skills of the majority of teachers required careful thinking about the planning of lessons and also the presentation of modules using different games genre, leading to the development of a module plan, lesson framework and lesson plan, each of which is presented below. Finally, feedback from interviews with teachers and lesson observations identified the importance of ensuring a common structure for the development of games, thus enabling a sense of achievement and progression, and ensuring that the learners follow an appropriate "flow" in developing their games. This structure is also presented below.

From analysis of the data, the greatest challenge was the lack of teacher familiarity with programming. However, as the team created the support material and frameworks and the teachers engaged with these, it was identified that they became increasingly confident and learners became more engaged and improved their computational thinking skills as well as subject knowledge.

Teaching Framework

The teaching framework that has been developed through the project is based on data collection and analysis. The framework comprises emerging pedagogy to support game-making across curriculum areas in school classrooms and a module and lesson framework, together with a game-making template which are presented below.

Emerging Pedagogy

The pedagogy that emerged from the research reported here focuses on three key steps, planning, teaching and improving, to facilitate learning by developing an inclusive creative and active learning environment. The pedagogy draws on and adapts existing pedagogical tools such as Maslow's hierarchy of learning[1]; the Universal Design for Learning (UDL)[2] which focuses on the what, how and why of education; and Deming's learning cycle.[3] These were embedded within a game-making classroom model which connects learning outcomes, teaching methods, learning materials and progress assessments within a flexible and customisable framework.

To support the developing pedagogy and introduce teachers to game mechanics and dynamic gaming concepts, the project developed three key tools, viz. a lesson plan template, a training guide for teachers based on different entry levels and a control panel. Each of these is discussed later in this chapter.

It was recognised early in the project that, while the majority of teachers had developed good digital literacy skills, most of them had not used game-making in their classrooms, and most did not have knowledge of programming, the exception being those teachers whose main subject was computing. Thus, it was important to identify a tool that would capture teacher's prior experience and then develop a range of training materials to support them in developing game-making skills they could confidently use in their classrooms.

The project designed the training materials drawing on the TPACK model (Mishra & Koehler, 2006), so that teachers could work through them all, or select those that were most relevant, depending on their level identified from the questionnaire results referred to above. For example, a teacher who is at entry level begins the training materials at the beginning of the guide. The training materials available for free download and use from http://no1leftbehind.eu/training/ included an interactive teachers' guide. These training materials, which can be adapted for all curriculum subject areas, are available in different languages and have been tried and tested in the three geographical sites of the project: Spain, Austria and the

[1] www.learning-theories.com/maslows-hierarchy-of-needs.html

[2] www.udlcenter.org/

[3] www.deming.org/

United Kingdom. Once the training was completed, teachers were able to support learning activities in game-making such as the basic concepts of game mechanics, focusing on four specific genres of game-making which the project identified as the most engaging for learners still in compulsory schooling, viz. action, adventure, puzzle and quiz.

The emerging pedagogic framework also took into account different learning styles and different approaches to learning, such as individual, small group and large group learning. This enabled teachers to design learning outcomes for active learners, supporting them to construct their own sequences of games within their subject discipline and at their level of working, while moving students beyond their zone of proximal development (Vygotsky, 1980). The teachers were able to measure the progression and achievement of learners through an analytic dashboard designed for the project, with their input from each of the geographical sites.

The resulting pedagogical framework is shown in Fig. 20.1. The planning phase involved the teacher in identifying appropriate learning outcomes and instructional strategies, both for the curriculum area and for developing game-making capabilities, thus integrating the curriculum with game-based methodologies. The learning outcomes might also include the development of non-academic cognitive skills, such as collaboration, thinking, problem-solving and communication; curriculum learning outcomes; and game-making learning outcomes, such as the objective of the game, and developing its shape, including the rules of the game and how to enable a playing environment. In this phase, the teachers planned the required curriculum adaptations and activities the learners were to complete, as well as identify

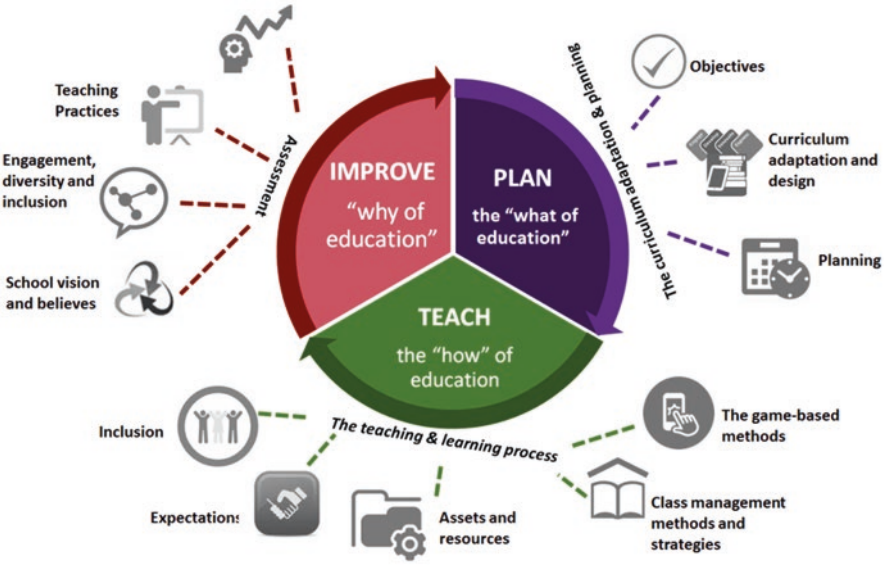

Fig. 20.1 No one left behind pedagogical framework, adapted by the authors from the content of UDL[2]

measurements of achievement based on the requirements of the country's education standards and the learner's individual needs and level of progress. The teachers were encouraged to use Bloom's taxonomy (Krathwohl, 2002) to demonstrate the development of the required skills, using Bloom's hierarchy of learning. This phase may involve the teachers in either creating assets and resources, downloading these from the project website or planning how the learners can create their own authentic and individual assets. Assets might include images, both still and moving, sounds, backgrounds, objects, characters, interface elements or special effects. The teachers were encouraged to differentiate the learning into at least three different levels to enable achievement and challenge.

The teachers then delivered the lesson in an inclusive and creative environment, checking progress and learning through planned assessment and measurement of motivation and engagement, which may include the development of games which are then played by class members, or peers outside the classroom. The learners should be encouraged to become creators of their own knowledge, with learning material developing a deeper level of knowledge. Where learners are encouraged to create their own assets, their individual preferences can be encouraged, thus improving motivation and engagement. The assessment phase was supported by the analytic dashboard, which provided data on the learners' developing knowledge, skills, motivation and engagement against established expectations.

Module Framework

A module framework, shown in Fig. 20.2, was created for the project, which supported the pedagogical approach and differing curriculum areas. The framework is sufficiently flexible to incorporate different game genres while facilitating skill development in game-making such as object grouping, object collision and scenes. The project website has short-term planning documents, lesson plans and resources for different curriculum areas, including humanities, science, mathematics, physical education, computing, music, fine arts, religious education, work and life skills and English.

Lesson Framework

The lesson framework, developed in the project, facilitated the creative inclusive learning environment by integrating the leisure games environment with pedagogical and content knowledge through the use of the game-making software as shown in Fig. 20.3. This framework encouraged learners to develop and adapt different game design elements.

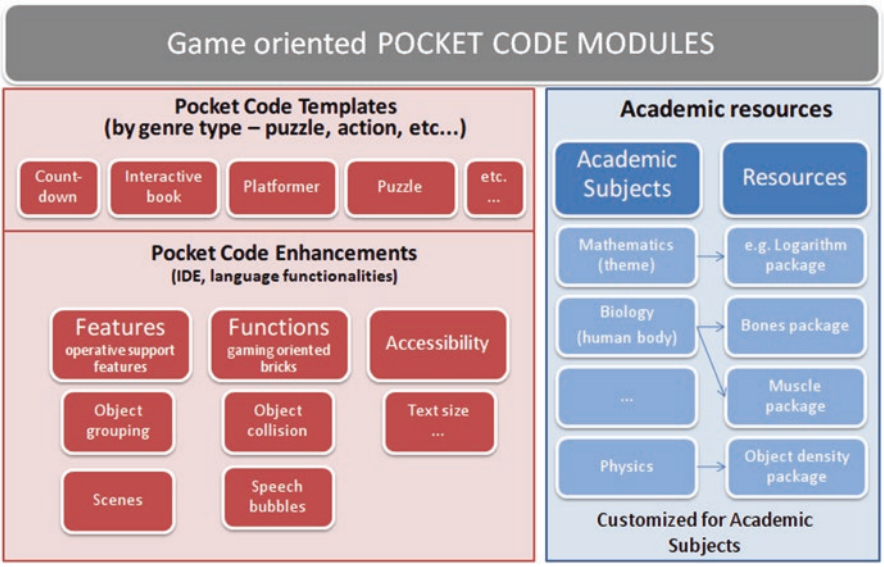

Fig. 20.2 Module framework (authors' own)

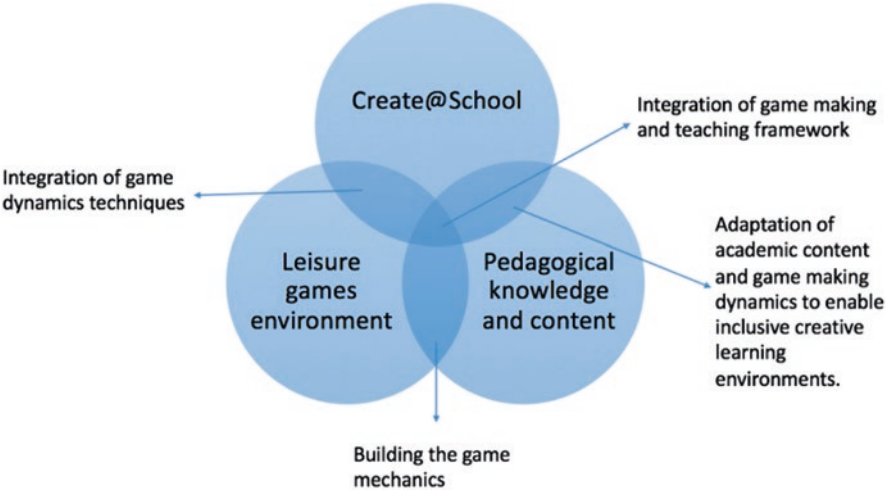

Fig. 20.3 Integrated lesson framework (authors' own)

Lesson Plan

A lesson plan template was developed which supported both the curriculum learning outcomes and the development of game-making learning outcomes. The template helped teachers to consider how game-making can support the development of

a range of different curriculum areas. For example, game-making can support the development of computational thinking and literacy and numeracy, as well as the specific subject discipline. In Fig. 20.4, the lesson plan template can be viewed, as well as notes on what the teachers may want to consider in completing the template.

The data from the project identified it as important that the teacher embedded game-making within the curriculum so that there was a clear purpose for its use as a pedagogy or learners can become unengaged. This template emerged through the project and facilitated the identified pedagogical approach, thus promoting a creative and inclusive learning environment.

Game-Making Template

Differentiation and challenge are central to the templates, which integrated schemas commonly used by commercial computer game developers. A range of game-making templates are available on the project website in a variety of different curriculum areas. The framework, which has emerged through the project, borrows from the "ceremony" of a game:

- A *title screen*, which was a graphically pleasing introduction/loading screen.
- An *instructions screen*, which convey both "goal" and "rules".
- *One or more levels:* Use of the word "level" creates an intuitive connection with the world of commercial games, a great majority of which still use the concept of a "level" in one form or another.
- A *game over screen*: "Game over" might be linked to success, or failure; the end of a story; the expiration of a time limit; the achievement of a target; the outcome of a competition; or any combination of those elements.
- A *pause screen*: Pause screens give players the opportunity to suspend gameplay, and this element became more relevant as the pupils and modules advanced in their use of Pocket Code, as well as:
    - Reminding the learner of active goals
    - Summarising progress
    - Enabling a restart

Overall Framework

The emerging project framework, set out in Fig. 20.5, therefore indicates the integration of game-making into the school classroom.

Context & Profile				
Author:	Title:	Timescale:	Year group/age:	No in group:
Relevant contextual information on learners:				
How does this lesson fit into the subject curriculum or the wider curriculum?		Prior learning of learners		
Main subject area: **Wider curriculum:**				
The Learning				
Groups	Intended progress (Learning objectives)	How will this progress be demonstrated?		Assessment of progress by…
Organisation				
Resources: Support:		Working with others: Learners:		

Timings	**Content**		
To start with …		**Cognitive / Behavioural**	**Learning scenario***
** mins		C/B	I/FG/SG
		C/B	
Main learning			
** mins		C/B	I/FG/SG
		C/B	I/FG/SG
Plenary / extension			
** mins	**Extension:**	C/B	I/SG/FG
	Plenary:		
	Homework:		

*Learning Scenario key: FG – Full group; SG – small group; I – individually
*Cognitive/Behavioural Key: c- cognitive; b – behavioural.

Context & Profile
Author: The creators of the plan
Title: Name/title of the lesson
Timescale: length of lesson
Year group/age: class year/age if appropriate
Number in groups: class size
Relevant contextual information on learners: overall simplified class levels
Subject/wider curriculum: Highlight which learning objectives the lesson will link with in the subject; include wider links, if appropriate.

Prior learning of learners: List what experience the pupils have with the themes and objectives within the lesson.

The Learning
Groups: Highlight groups with different learning objectives here if required.
Intended progress: the learning objectives for the lesson
How will this progress be demonstrated: expected progress by the end of the lesson
Assessment of progress by: pre-selected skills and forms of assessment on expected progress

Organisation
Resources: resource required to effectively teach the lesson
Support: resources used to support levels of ability, differentiation
Working with others: support staff working with individuals or groups
Learners: specific targeted children with details

Content
Timings: Break down the lesson into three subcategories with set timings in each.
To start with … details of class starter activities
Main learning: details of main teaching activities
Plenary/extension: final activities – extensions for higher ability, plenary to round up and assess the learning, and homework details, if required
Cognitive/behavioural: to highlight whether the activity / section of the lesson has a mental or emotional focus
Learning scenario: the expected scenario for the pupils to meet the objectives (working in small/large groups, or individually).

Fig. 20.4 Lesson plan template (authors' own)

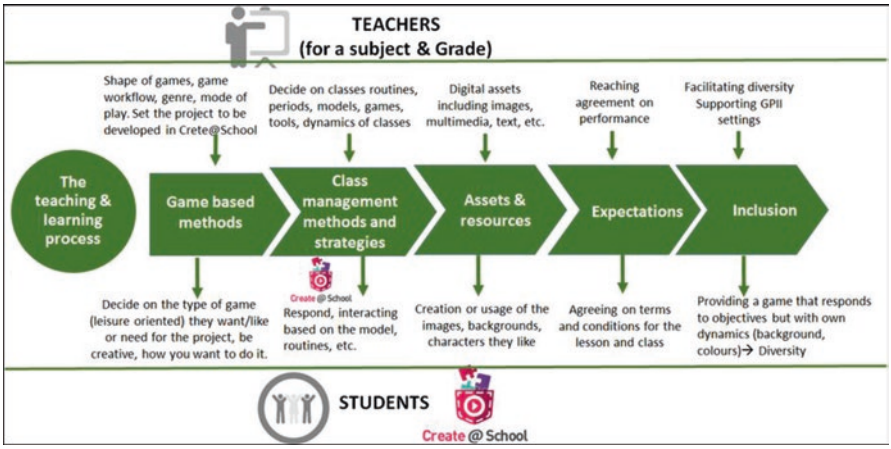

Fig. 20.5 Teaching and learning framework (authors' own)

Affordances and Challenges

The project identified important affordances and challenges when introducing game-making across different curriculum areas in school classrooms.

Affordances

The project identified a high level of engagement for all learners when using game-making, with no difference in ages. Improved behaviour was consistently commented on by the teachers, usually related to higher levels of motivation, engagement and persistence. Where learners were identified by their school as disaffected with their learning, game-making re-engaged them and increased their motivation, which had an impact on their achievement and progression. Higher levels of engagement were also identified when learners created their own assets, such as images and sounds within their games, rather than pre-prepared assets.

As noted above, learners with profound and multiple learning difficulties were involved in the project. These learners were not in mainstream education and attended special schools. The affordances presented above were all applicable to these learners, but it was found that they struggled to remember how to create the different stages of creating games. The project, therefore, identified a new methodology for using game-making for these learners to develop their own games using pre-set game templates to help to produce an inclusive and creative learning environment.

Inclusiveness was engendered via the freedom in creating, modifying or improving the coding blocks for the following:

- *Game mechanics:* Input from the player that causes a set response from the systemthe game rules. This comprises the agents, objects, elements and their relationships in the game. They define the game as a rule-based system, specifying what there is, how everything behaves and how the player can interact with peers and game-making globally.
- *Game dynamics:* What happens when the player's wants, goals and intentions meet the mechanics through gameplay and what triggers the emergent behaviour that arises from gameplay, when the mechanics are put to use.
- *Game aesthetics:* The customisation of the game context to create an emotion-driven game creating an emotional experience by developing in-game narratives, dialogues, special effects and/or user interfaces. This comprises the creation of a dynamic composition of the characters' shape, characters' animations, the environment's shape and chosen pathways.

Thus, whichever shapes are selected for the game's characters are part of, or in contrast with, the narrative tool, and by using intuition, children and game-makers can generate a rich and emotionally engaging experience. Therefore, through the mix of dynamics and aesthetics, learners can take created or modified characters with them through a drama or fun (a mix of social dynamics) path, with different backgrounds towards a final fun scene (through interaction) and engaging experience, where winning means to also have the correct path of knowledge in the assigned curriculum area.

Challenges

As with all innovative practices, there are challenges to implementation. The development of the teacher's guide was therefore demanding, particularly with the different backgrounds of teachers in terms of their experience of programming, game-making and game-playing set out above. Initially, training was held in schools at a time to suit the teachers, but was constrained by time.

Consideration of the potential to decrease knowledge acquisition during the process of familiarisation with the teaching tool by others introducing game- making into school classrooms included:

- The need for software developers to consider the design for children with special educational needs and disabilities
- The need for all learners to understand the purpose of game-making within curriculum areas
- The use of bricks converted to symbols for less able learners and those with severe disabilities

Conclusion

As mentioned in the introduction, this project aimed to produce a new framework, based on research, that all teachers globally can utilise to introduce game-making within their classrooms, irrespective of the curriculum area or age of the learners. This chapter contributes new knowledge on emerging pedagogy related to the integration of computer game-making in school classrooms. Also, the potential impact of game-creation in providing an inclusive learning environment for those with learning difficulties could provide a fertile area of research and offer a powerful new means of teaching.

The project developed the notion of co-construction of knowledge through the creation of games to enhance and develop subject knowledge, enabling learners to develop subject discipline knowledge and computational literacy. Diverse groups of learners took part in the research, with an inclusive game-making methodology and pedagogy developed and tested over the 3 years of the project at the three sites, indicating that they can be adapted to any classroom environment.

This paper has presented a new pedagogy and a framework for the use of game-making in school classrooms. The pedagogy enabled learners to progress through participating in activities designed by teachers and delivered through the creation of computer games to create a student-led environment for the development of computational literacy and subject knowledge. Resources are available from the project website to support teachers in developing their pedagogy and confidence in using game-making to support deeper levels of learning. Teachers are encouraged to map when game-making is most appropriate in terms of the curriculum to ensure it is not overused.

The data collected indicated that the adoption of game-making can provide additional motivation and support the engagement and persistence of learners, thus facilitating an inclusive, creative and dynamic classroom environment.

Acknowledgements We acknowledge the funders of this Horizon 2020 project, Grant Agreement 645215. We also acknowledge the contributions from the full project team in completing the study and in producing this chapter: Nottingham Trent University, UK; INMARK Estudios y Estrategias, Spain; Universidad Politecnica De Madrid, Spain; Game City, United Kingdom; PYRO studios/ Grupo SED, Spain; Graz University of Technology, Austria, Honchshule der Medien, Germany; and National Video Arcade, UK. We also take this opportunity to thank all the learners and teachers that took part in the project.

Project Website Create@School software can be downloaded from: www.Catrobat.org

The resources referred to throughout this chapter can be downloaded from: edu.catrob.at.

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Chapter 21
Prompting Metacognition via Video-Based Abductive Reasoning Tasks

Tristan Currie

Abstract Metacognition or "thinking about thinking" involves processes vital to higher-order thought that modern educators need to integrate into their learning outcomes when engaged in sufficiently rigorous course design. Due to the many responsibilities and disrupted nature of adult learners' education, self-access learning is convenient in saving time and cost; and, when coupled with quality, focused video content, it can provide not just enticing, but also engaging, curricula. This chapter presents an ethnographic case study of an intermediate-level English pragmatics course using a video-based curriculum. Presented here are the findings about tasks involving abductive reasoning which have been evaluated for their success at prompting metacognition. Formal in-class learning and informal out-of-the-class mobile learning are compared. English pragmatics focuses on the often unspoken or indirectly communicated world of speakers' intentions. The chapter concludes that to truly unlock speaking as a macro skill for second language learners is not simply a matter of "more practice, more confidence" but rather building up a learner's confidence in his/her analytical judgement.

Keywords Adult learners · Video-based curriculum · Abductive reasoning · Metacognition · Pragmatics · Digital video · Open education

Introduction

Practice alone does not make perfect – sometimes the solution is to stop practising and start learning. With this idea in mind, an intermediate-level course on *Pragmatics of English for Adult Learners* was designed at a Hong Kong tertiary institution. In tertiary-level education, adult students expect a higher level of learning and a focus

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_21

on knowledge application and transferable, employability-motivated "soft skills" rather than just obtaining knowledge. To this end, the promotion of metacognition has become a focus for educators involved in tertiary education and was at the forefront of the planning and implementation of the course design. Educators have recommended a diversity of ways for the enhancement of metacognition in English language learning such as grammar (Paudel, 2019) and writing (Larkin, 2009). The use of educational technology (Lee, 2019) such as WeChat (Li & Peng, 2019) and videos (Shih & Huang, 2020; Susantini, Indana, Isnawati, & Sayitri, 2019; Wang & Chen, 2019) has also been suggested; most of them focus on learning strategy rather than generic capacities such as reasoning.

Along with the course design came the need for research into the success of the course's goals. Supporters of open education believe that "everyone in the world should have access to high-quality educational experiences and resources" ("What is Open Education", 2013), so the video learning materials used had to be publicly available to anybody with Internet access. Given that the teacher and researcher have to wear dual hats, a second key concept – abductive reasoning – was also important for the design and implementation of the course because metacognition about language requires communicative problem-solving. Here a problem is solved not by simply applying the solution; rather, it starts with having incomplete information at hand and proceeds by taking an intuitive leap via "inference to the best explanation" (Forster & Sober, 1994) to guide communicative action.

Adult Metacognition

"Cognitive skills are those that help a person perform a task" (Schraw, 1998, p. 89). Metacognition has two main areas: knowledge of cognition "including knowledge of one's strengths and weaknesses as a learner, knowledge about strategies and knowledge about when and where to use strategies" and regulation of cognition which "consists of planning, monitoring and correcting one's online performance" (ibid., p. 90). The key point to take away from Schraw, who contrasts adults with children, is that "adults tend to have more knowledge about their own cognition and to be better able to describe that knowledge than children or adolescents" (p. 89).

Schraw (1998) explained where metacognitive knowledge comes from. "These differences [between adults and children] appear to be incremental in nature, rather than stage or age related" (p. 93). There are three likely sources, viz. *direct learning experiences* (e.g. modelled instruction in declarative, procedural and conditional aspects of a specific domain, such as reading and using a checklist to reinforce learning); *peer regulation* (e.g. peer modelling such as Vygotsky's zone of proximal development); and *autonomous learning environments* (asking students to construct their own repertoire of strategies and report on them via reflection and theorising).

This chapter takes the view that the degree of association between accuracy and confidence can be taken as a measure of metacognition, based on consensus in the field of metacognitive research. This traditional measure of the association between

accuracy and confidence is used in this study because if subjects were able to realistically self-appraise their own understanding of a topic, then "they should report high confidence levels for correct decisions and low confidence levels for incorrect decisions" (Rebuschat, 2013, p. 610). Specifically, the results of a discourse analysis of learners' fluency, complexity and accuracy in completing a speech act are looked at for the accuracy component. These test results are compared with interview data on the theme of self-regulated learning to determine whether or not confidence and accuracy match and metacognition is achieved. The span of the interviews has to be considered in the context of their growing confidence and developing understanding as the course progresses.

Metacognition and Abductive Reasoning

Before discussing whether students gained metacognitive knowledge or not, the basic task structure and use of a video curriculum throughout the process requires a closer examination. The course adopted task-based language teaching and, in that regard, was fairly straightforward in its approach to teaching and learning. However, the course also involved heavy use of abductive reasoning, a classroom technique emphasising problem-solving often preferred in science lessons as it aligns well with and is demonstrative of a relationship to knowledge favoured in scientific disciplines. The benefit of requiring the use of abductive reasoning in a language classroom is that "as new information is incrementally obtained and processed, anomalies are constantly being redefined as a consequence of interactions between the phenomena – with its changing nature – and human cognition … Externally, the task environment determines the scope and extent to which one can access information" (Zhou, 2004). In other words, abductive reasoning not only helps solve academic problems. It is also useful for guiding students in handling new information to further predict and handle ongoing situations. This is not problem-solving in a generic, vague sense that results as an overall outcome of class activity, peer pressure and random trial and error or mindless drills. Abductive reasoning involves formulating a specific psychology in the mindset of the students, guiding them through improvements in their own solution-process towards an implemented solution. To engage learners in the abductive reasoning process well, the teacher must be able to draw learners' attention to three key things: changes in the situation, the discernment of less important from more important information and noticed changes in the learners' own thinking. As Zhou (2004) expressed it in his work on abductive reasoning, "identifying the abductive object entails comparing one's existing beliefs and evidences revealed in the current situation, becoming aware of the incongruence between them, and discovering the anomalies" (p. 132).

Educational research into the soft skills now needed in an increasingly technology-driven economy has posited the idea that talk of soft skills pertains to three domains of competency: the cognitive (logical), interpersonal (social) and intrapersonal (self) domains (National Research Council, 2012, p. 3). Metacognition

falls under the intrapersonal domain of competency. When we reject the assumption that what a speaker said is necessarily what a hearer understood, we begin to look at perlocutionary effects of speech. Perlocutionary effects refer to a change in focus away from speaking as the process of correctly making sounds unto a slightly different focus of speaking to convey an intended meaning to a listener, which involves "the performance of an act of using … vocables with a certain more-or-less definite sense and reference" (Austin, 1962, p. 95). Abductive reasoning is a very useful tool for unravelling the seemingly infinite interpretations of intended meaning that effective listening encompasses.

Digital Video

Following on task-based language learning's basic precepts, the use of digital video as a prompt for extended role-play raises three pedagogical questions that inform effective video pedagogy.

Does digital video create psychologically authentic situations? The psychological authenticity of communicative tasks was stressed by Gatbonton and Segalowitz (1988, p. 486) when they emphasised that "for the activities to meet this criterion, it is important there be no explicit prior rehearsal of what to say, when, and to whom. The activity must be designed so that the learners plunge directly into an event in which they must figure out for themselves what to do or say at each moment". Digital video can be used to sketch out the social constraints – norms and expected conduct, body language, type of eye contact, tone of voice, and dominant players – of a particular social situation they are unfamiliar with, without explicitly spelling out every nuance. Thus, *multimodal input* from video can act as an audio-visual cue to more sophisticated forms of role-play. In this way, the learner has the necessary scaffolding to initiate a role-play that adequately reflects a speech act somewhat authentically, without prior rehearsal.

Does digital video include exposure to selection and production of utterances? To Segalowitz and Gatbonton, "the aim should be to encourage intensive contact with manageable samples of language, relevant to a given problem or task. This results in ad hoc simplification, seen in terms of natural recurrence rather than contrived repetition" (1988, p. 500). That is, rather than getting learners to parrot grammatically correct phrases introduced by the teacher, a learner's word choice should arise naturally in response to the demands of the task. Activities should be inherently repetitive of the basic speech act aimed for. For example, if the lesson topic is about requests, then the task of making a request should (by a necessity built into the design of that task) mandatorily occur several times in the way that task is structured. The act of making a request should be repeated so that learners can experiment with more than one choice of words to communicate effectively. So, in this way, digital video can include selection and production of utterances when the task is repetitive of the speech act, not of pre-drilled phrases.

Does digital video present language both implicitly and explicitly? As was mentioned previously, a learner who has the necessary scaffolding to initiate a role-play that adequately reflects a speech act can somewhat authentically, without prior rehearsal, engage in more complex role-play. The learner is also not constrained to the mere use of metalinguistic knowledge (i.e. explicit pointers on language structure, function and usage) provided by the teacher, but can also draw on implicit knowledge that affords more automated use of natural language. Building on his/her pool of readily available phrases, he/she can interact more instinctively to the performative demands of the task, the differed social norms of a second language and the often subtly expressed expectations of that speech community. Digital video encourages the presentation of language both implicitly and explicitly by providing explicit visual information about the speaker's age, gender, etc., along with more implicit information, such as tone of voice, stress, awareness of what goes unspoken and what is indirectly communicated via the timing of pauses.

Data Collection

This section illustrates the data collection for the research. It covers the use of video in language learning during in-class formal teaching; the techniques employed and specific questions asked during the interview process (the research procedures); and the method used to obtain a self-recorded speech act (out-of-class mobile learning). The self-recorded speech act involved the learners in solving a communicative problem in a scenario similar to what had been taught formally in the class, but this time they had to solve the problem on their own.

Participants

The participants in the research were ten EFL (English as a foreign language) continuing education students, studying "Better Spoken English" in beginner-, intermediate- and advanced-level cohorts. Presented here are the findings pertaining only to the intermediate-level cohort. Nine of the students lived in Hong Kong and one lived in mainland China but worked in Hong Kong. Half of the students were aged 21–39; the other half were between 40 and 49 years of age. In terms of length of language exposure, 50% of the students reported learning English since kindergarten and 20% since primary school. The other 30% did not provide this information. In terms of the highest level of education achieved, one student had a master's degree, seven students (70%) had graduated from university, and two (20%) had finished high school.

Video Curriculum

To explain digital-video content as a driver for the classroom tasks observed (with the research purposes in mind), the video curriculum requires further elaboration. Though a textbook was used, the curriculum for this course was primarily a video curriculum. Each lesson incorporated three video viewings lasting no longer than 5 min each. The textbook contained links to videos available on YouTube that formed the core of the learning material. All the learners had Internet access and could access these online at their own convenience.

Interviews

All the interviews were semi-structured with open response questions, and all the answers were written down by the interviewer and read back to the interviewee at the end of each question. Reading the answers back to the interviewee helped to reduce difficulties caused by language barriers that the interviewees might have had with answering in their second language (e.g. mispronunciation and clarity of ideas). It also served to ensure that any summarisation or rephrasing of the interviewer's words by the interviewee was not misinterpreted. The interviews involved five questions about self-regulated learning.

Informal Out-of-Class Mobile Learning

Learners were given six communicative scenarios involving two characters in which they were required to choose one scenario and assume the role of that character. In each scenario, they had to do something with words (perform a speech act: apologise, complain, promise, etc.) in order to "solve" the communicatively challenging situation. Addressing their mobile phone cameras as if they were the other character mentioned in the scenario, they had to act out the exchange in 2 min. There were three such recordings. In the first recording, their speech was unscripted. In the second recording, they were instructed to write a brief script first before doing the recording and then, without reading from the script, record the speech act again, this time changing the social status of one of the speakers. For the final speech act, they were provided with feedback on grammatical errors and pragmatic improvements in the second recording before they rewrote their scripts and completed the same speech act – but this time as the response from the other character in their scenario (effectively responding to themselves).

Analysis

The project set out to achieve two aims. Firstly, it aimed to understand how to increase the metacognition of learners. A focus on metacognition was adopted to ensure adult learners' long-term progress by lessoning the impact of family and work commitments disrupting, discouraging and holding back adult learners' confidence and momentum in language learning. This was achieved primarily by thematic analysis of the interviews. Secondly, the aim was to better utilise digital video to improve the teaching of English using abductive reasoning as a scaffolding technique to enhance learners' ability to decode situated examples of natural language use, watched during the lesson. This was achieved by a discourse analysis of the fluency, complexity and accuracy of the subsequent out-of-class self-recorded speech acts, looking for evidence of improvement in their performance of spoken English.

Results

This section gives an account of learners' confidence arising out of the interview process; explains how fluency, complexity and accuracy were measured; and then summarises how much of each of these was evident in the adult learners' self-recorded speech acts. In this way, it became possible to compare learner confidence with actual outcomes. Finally, the occurrence of abductive reasoning tasks prompting metacognition inside and outside the classroom was evaluated and conclusions were drawn.

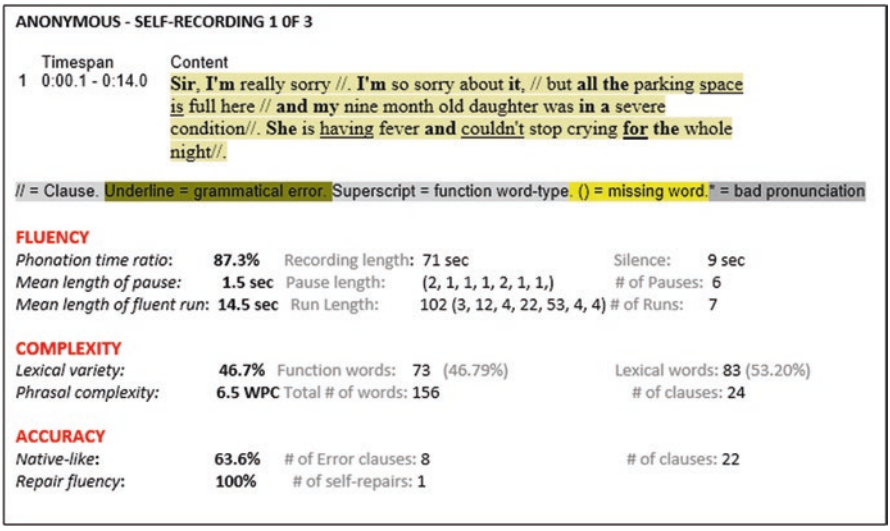
Learner Confidence

Speaking practice is not limited simply to the number of opportunities to talk in the second language but also involves the confidence and initiative to pursue new contexts in which to practise and extend one's social network. In class, formal teaching of abductive reasoning tasks gave the learners more confidence in their analytical judgement, as demonstrated in the following key quotes. As one learner explained, "message adjustment is useful to communicate with others with a different educational background". For this learner, an increase in confidence occurred due to better analysis of his and the listener's situation. Also, another learner attributed her reported new sense of confidence in this way: "I will use different speech to refuse someone's request politely and make the hearers feel more comfortable". In her case, a focus on the way words can be used not only to convey ideas but also to establish and maintain social relations gave her a new sense of "doing things with words" (in the words of Austin (1962)).

The practice of getting the students to role-play five different types of speech acts themselves, in class and at home, before collectively analysing a video example together in class (of someone else attempting the same speech act) helped learners to accurately gauge the effectiveness of particular communication strategies and choice of words. Most of the learners were already familiar with the practice of self-reflection and, as a result, their confidence was in step with their performance. However, one learner demonstrated inaccurate overconfidence. Although this learner was involved in some degree of reflection, it was through social interaction with friends where a sense of one's conduct arises from the negative responses on other people's behaviour. This type of behaviour moderation places the responsibility to moderate on other people. The lesson for all teachers to learn from this is that the process of reflection is something that can, and should, be taught explicitly to ensure proper metacognition occurs with learners that struggle.

Fluency, Complexity and Accuracy

According to Vercellotti (2012), there are three components of second language performance, viz. fluency, complexity and accuracy. In task-based language learning, "students engage in the 'authentic', pragmatic, and contextual use of language, where language production is not the aim but the vehicle for attending task goals" (Arslanyilmaz & Pedersen, 2010, p. 378). Thus, it is important that these measures are applied to naturally occurring language arising from real tasks, which in this case arose from the self-recording of a speech act, as seen in Fig. 21.1. These



ANONYMOUS - SELF-RECORDING 1 OF 3

	Timespan	Content
1	0:00.1 - 0:14.0	**Sir, I'm** really sorry //. **I'm** so sorry about **it**, // but **all the** parking space is full here // **and my** nine month old daughter was **in a** severe condition//. **She** is having fever **and** couldn't stop crying **for the** whole night//.

// = Clause. Underline = grammatical error. Superscript = function word-type. () = missing word. * = bad pronunciation

FLUENCY

Phonation time ratio:	**87.3%**	Recording length:	**71 sec**	Silence:	**9 sec**
Mean length of pause:	**1.5 sec**	Pause length:	**(2, 1, 1, 1, 2, 1, 1,)**	# of Pauses:	**6**
Mean length of fluent run:	**14.5 sec**	Run Length:	**102 (3, 12, 4, 22, 53, 4, 4)**	# of Runs:	**7**

COMPLEXITY

Lexical variety:	**46.7%**	Function words:	**73** (46.79%)	Lexical words:	**83** (53.20%)
Phrasal complexity:	**6.5 WPC**	Total # of words:	**156**	# of clauses:	**24**

ACCURACY

Native-like:	**63.6%**	# of Error clauses:	**8**	# of clauses:	**22**
Repair fluency:	**100%**	# of self-repairs:	**1**		

Fig. 21.1 Abridged speech act transcript of a single speech act

[FLUENCY]

Measure 1 – Phonation time ratio: % of time the student spoke during the recording
Measure 2 – mean length of pause [lower = fluency]
Measure 3 – mean length of fluent run: the speech between pauses [higher = fluency]

[COMPLEXITY]

Measure 1 – Lexical variety (pragmatic focus): the ratio of functional to lexical words
Measure 2 – Phrasal complexity (measured as words/clause)

[ACCURACY]

Measure 1 – Native-like: the percentage of error-free clauses
Measure 2 – Repair fluency: ratio of self-repairs to errors

Fig. 21.2 Measures of fluency, complexity and accuracy

variables are described below (Fig. 21.2) along with the ways in which they were measured. A sample analysis containing all three variables then follows.

Finding #1: The trend with the fluency, complexity and accuracy of the adult learners' talk in their self-recorded speech acts was that improved vocabulary leads to increased complexity but slightly decreased fluency at the phrase level.

In general complexity and accuracy improved at the beginning (recording 1), at the middle (recording 2) and at the end (recording 3) of the course.

Finding #2: Overall, for most learners, complexity improved but usually at the cost of fluency that remained the same (as can be seen in Table 21.1).

Formal In-Class and Informal Out-of-the-Class Learning Compared

The use of informal mobile phone recordings provided greater flexibility and made it possible to avoid textbook-centric learning that diminishes student engagement for adult learners. It was observed during this study that adult learners respond more comfortably to informal learning settings that offer the chance to use their valued life experience and do not just restrict them to activities tied to their academic abilities. The convenience of being able to review video learning content at a time and place that suited the learner using their mobile phones was another benefit. Encouraging learners to take control of, and thus responsibility for, their own learning discreetly was successful during the intermediate course.

Table 21.1 A student's improved complexity and unchanged fluency over three speech acts

	Self-recording #1	Self-recording #2	Self-recording #3	Difference (SR1-SR3)	Comment
Fluency					
Phonation time ratio	98.83	97.58	98.86	+0.03%	Higher fluency
				The same	
Mean length of pause	1	1	2	+1 s.	Lower fluency
				The same	
Mean length of fluent run	168.00	32.20	86.00	−82 s.	Higher fluency
				Decline	
Complexity					
Lexical variety	55.25	61.75	63.95	+8.7%	Higher complexity
				Improved	

Conclusion

Ensuring adult learners' long-term progress by lessoning the impact of family and work commitments is an important issue for teachers working with adult learners to contend with. Practice in abductive reasoning strengthens a learner's confidence in his or her analytical judgement and encourages a problem-solving approach to language learning that aids language learning. However, the main strength of abductive reasoning is to use it as a scaffolding technique to enhance learners' (analytical) ability to decode situated examples of natural language use, aiding the complexity, and level of vocabulary, adult learners use. When abductive reasoning is used alongside activities related to self-reflection (increased metacognition), students' spoken production exhibits improved complexity and learners' report increased confidence in their language learning.

The theoretical implication of combining abductive reasoning with a focus on metacognition is that language learning can also be conceived of from a problem-solving perspective. The pedagogical implication of doing so is that good language task design can broaden to include the setting of interesting problems as a psychological seed for both an internal and external flourishing of activity, inside and outside of the classroom.

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Chapter 22
Pedagogical Strategies with Simulation Technology to Enhance Clinical Competence in Nursing Education

Suet Lai Wong, Cythnia Sau Ting Wu, and Lorna Kwai Ping Suen

Abstract This chapter presents the results of an integrative review and synthesis of the literature to identify and evaluate pedagogical strategies with simulation technology that can enhance clinical competence of nursing students. Research studies published from 2006 to 2017 were examined which included either (1) a comparison of participants' enhancement in clinical competence with that of non-participants in simulation or (2) pedagogical strategies vital for enhancing clinical competence in nursing education. We looked systematically for studies in five databases: CINAHL, ERIC, MEDLINE, ProQuest Education, and ProQuest Nursing and Allied Health. An inductive approach was used to extract critical information for categorisation and synthesis. Eventually, 11 out of the original 261 papers met the criteria for inclusion in this review. The simulation-based learning (SBL) was designed as a group-based learning activity, where students were able to develop one of three roles – 'Performer', 'Observer', or 'Partner' – with respective responsibilities to enhance clinical competence. Specific pedagogical approaches should be deployed in the three phases of the simulation that can accommodate nursing students' learning needs. The review identified critical pedagogies of SBL delivery, with assigned roles for students, to enhance clinical competence as an agenda for future research.

Keywords Simulation · Clinical competence · Pedagogical strategies

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The original version of this chapter was revised: This chapter was inadvertently published with one of the co-author's name incorrectly spelt as "Cythnia" instead of "Cynthia" which has been corrected now. The correction to this chapter is available at https://doi.org/10.1007/978-981-15-6591-5_27

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_22

Introduction

A profusion of research evidence exists on the expanding capacity of simulation technology to increase the rate of adoption in healthcare education and diffuse the innovations in various clinical areas, as well as highlight the enhancement of attributes of clinical competence (Cook et al., 2011). Healthcare simulation technology, from static mannequins to high-fidelity simulators, has been utilised for in-service training on specific procedures since the early 1990s (Cant & Cooper, 2010). With the advances in specialised technologies, the life-like mannequins with audio-visual real-time live session recording can provide efficient and timely access to life-like situations with bio-medical feedback and responsiveness in the process of simulation.

There are different definitions of 'simulation-based learning' (SBL) among educators and researchers who are conducting a diversity of practices with related technologies (Leigh, 2008). Simulation is defined broadly here as a clinical situation within a context that enables realistic relationships in a scenario involving a patient (i.e., a standardised patient (SP) or high-fidelity simulator) to be explored, observed, and intervened in. Pedagogical strategies for simulation are simplification and support teaching and learning that can be described as 'simulation-based learning' (Leigh, 2008). The simplification focuses on graded levels of a scenario's complexity and the support assists in engaging students in the scenario to enhance their clinical competence.

Clinical competence expresses a range of general attributes in the learning outcomes of nursing students. It is the combination of knowledge, psychomotor skills, and clinical judgement that enable a nursing student to perform a specific task which reaches a defined level of proficiency in the clinical context (Hoffmann, O'Donnell, & Kim, 2007). Leigh (2008) revealed that simulation technologies are merely vehicles that deliver instructions for learning but do not enhance nursing students' competence. Therefore, it is challenging for nurse educators to design and evaluate the use of simulation-based learning (SBL) to enhance the multiple attributes of clinical competence in nursing education (Beckers, Rose, Berg, Park, & Shatzer, 2006). Despite the many learning opportunities provided by simulation technologies, the reality remains that attributes of competence are complex and challenging to implement. Pedagogical methods for enhancing clinical competence via simulations still need to be refined.

Among the recent research on simulation-based learning in nursing education, Kennedy, Jewell, and Hickey (2020) identified four major themes, including knowledge application, clinical judgement, communication, and crossing cultural barriers. Relevant research has also focused on SBL in combination with communication skills with patients (Donovan & Mullen, 2019) and transfer of learning from the classroom to clinical practice (Bruce, Levett-Jones, & Courtney-Pratt, 2019; Hustad, Johannesen, Fossum, & Hovland, 2019).

This chapter presents an integrative literature review for summarising, analysing, and synthesising existing studies (Pitt, Powis, Levett-Jones, & Hunter, 2012) to

answer the research question: 'How are pedagogical strategies vital for the simulation to enhance nursing students' clinical competence?' It also illustrates the literature search strategies with the selective criteria adopted in this review. Through summarising and analysing selected publications, the synthesis of the findings addressing the research question for SBL is discussed, with implications for further nursing education practice and research.

Method

The review was conducted to address the research question noted above. We utilised five databases: CINAHL, ERIC, MEDLINE, ProQuest Education, and ProQuest Nursing and Allied Health to search for possible publications. We selected five broad search categories, viz. 'nursing students', 'simulation', 'teaching and learning', 'clinical education', and 'competence'. They were applied in each of the databases separately and in combination with keywords (e.g. 'nursing students', 'simulation activities/technologies', 'scenario-based', 'instruction', 'skill performance', 'clinical judgement', 'decision-making', and 'clinical performance') to sort out the publications. The criteria for inclusion were listed, which were: (1) the search was limited to articles published in English between 2006 and 2017; (2) the study was either a comparison of participants' enhancement of clinical competence with that of non-participants in simulation or identified pedagogical strategies vital for enhancing clinical competence in nursing education; (3) the studies had to involve qualitative or quantitative research; and (4) the literature should have been be peer-reviewed. Editorials, conference abstracts, inaccessible unpublished dissertations, and studies not mentioning SBL were excluded. Figure 22.1 depicts the process of publication identification in a flow chart.

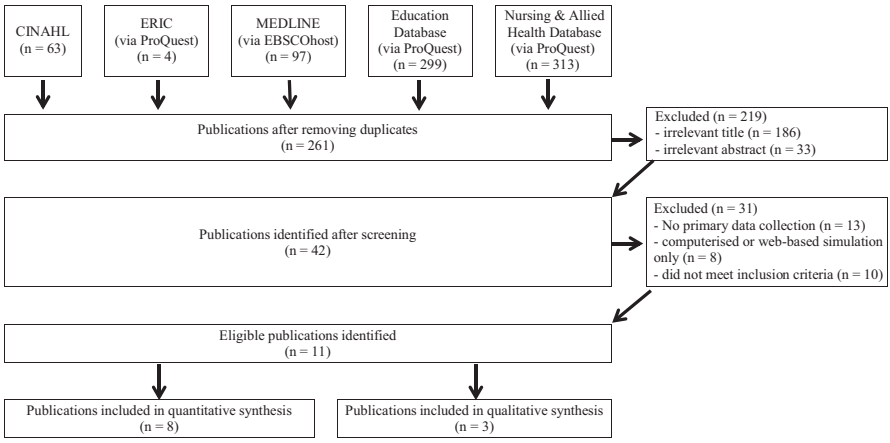

Fig. 22.1 Flow chart of publication identification

Results

A total of 261 publications were sought for initial screening. If a paper merely mentioned useful instructions or pedagogical strategies to enhance clinical competence in simulation, it was excluded from the in-depth review. Eleven out of the original 261 publications finally met the general criteria for the review. The process of summary, analysis, and synthesis began, explicitly considering how the publications presented the relationships between clinical competence and simulation-based learning to address our research question.

Of the 11 publications retained, eight used quantitative methods and three used qualitative methods. The quasi-experimental studies – except the one in Korea (Ko & Kim, 2014) – were evaluated in three reviews conducted in the United States and Europe (Alinier, Hunt, Gordon, & Harwood, 2006; Beckers et al., 2006). An experimental design was adopted in two studies (Hoffmann et al., 2007; Meyer, Connors, Hou, & Gajewski, 2011), and a survey design was used in three studies to collect perceptions of simulation-based learning, mainly among undergraduates (Kaplan & Ura, 2010; Mill et al., 2014; Swenty & Eggleston, 2011).

Colaizzi's descriptive phenomenological method (Coffman, 2012) and a typological 'coding' approach (Badir et al., 2015; Mikkelsen, Reime, & Harris, 2008) were adopted in three reviewed qualitative studies. Structured interviews were used for data collection. A summary of these quantitative and qualitative reviewed studies is provided in Tables 22.1 and 22.2, respectively.

With the deployment of pedagogical strategies in simulation technologies, SBL can be implemented with an SP and high-fidelity simulator. The contexts of SBL were mostly captured in medical and surgical nursing (Coffman, 2012; Kaplan & Ura, 2010; Mikkelsen et al., 2008; Mill et al., 2014; Swenty & Eggleston, 2011); critical care nursing (Alinier et al., 2006; Hoffmann et al., 2007); emergency care (Ko & Kim, 2014; Badir et al., 2015); paediatric nursing (Meyer et al., 2011); and psychiatric nursing (Beckers et al., 2006). The findings in published studies indicate that the pedagogy of SBL consists of three parts: (1) pedagogical goals identification; (2) scenario writing; and (3) facilitation.

Pedagogical Goals

Five of the reviewed studies confirmed that the pedagogical goals were highly expected to involve multiple concepts within a scene to fulfil learning transfer (Alinier et al., 2006; Badir et al., 2015; Beckers et al., 2006; Hoffmann et al., 2007; Kaplan & Ura, 2010; Ko & Kim, 2014). Alinier et al. (2006) illustrated that students could be exposed to a wide range of scenarios, especially those involving rare conditions, in a relatively short period for practising what had been learned during a traditional lectures. Also, Badir et al. (2015) showed that the goals of SBL promoted integrative learning by helping students to transfer specialty care, such as intensive care, in a one-time SBL session. SBL aims to allow students to observe and solve nursing problems by introspection and inference on multiple clinical problems in a

Table 22.1 A summary of the quantitative studies

Author (Year)	Objective	Design	Participant	Pedagogical strategies	Support	Measures	Results
Alinier, Hunt, Gordon, and Harwood (2006)	To assess the effect of scenario-based studies from high to immediate fidelity simulation training	A randomised control experimental study	99 senior nursing students in a higher diploma nursing programme	Role-rotation of performers, observers, and partners in pairs for pre- and post-operative health assessment in simulated intensive care nursing	*Before simulation* Advanced organiser on teamwork, communication, simulator, instructors' facilitation and the scenario *Simulation* Experiential learning in a 25-minute session *Post-simulation* Experiential learning by a 10-minute debriefing	*Skills* by objective structured clinical examination (OSCE); Self-confidence and stress in the use of the technical environment by a questionnaire developed by the authors	Clinical performance improved significantly in the experimental group. Perception of stress and confidence was similar for the two groups.
Beckers et al. (2006)	To assess the effect of scenario-based unannounced SP simulation	A randomised control experimental study	33 senior nursing students	Role-rotation of performer and observer solely for depression assessment and therapeutic communication in psychiatric nursing; SP trained by authors Scenario design based on curricular objectives of psychiatric nursing	*Before simulation* Advanced organiser on an overview of SP's problem and student's role in interviewing *Simulation* Experiential learning in a 30-minute depressed SP interview *Post-simulation* Experiential learning by a 30-minute debriefing and a piece of reflection homework on own interview performance in the video recording	*Knowledge* measured by an author-developed Communication Knowledge Test (CKT); *Skills* assessed by an author-developed Standardised Patient Interpersonal Ratings (SPIR) perceived by SPs	No significant differences were found between the two groups on measures of CKT and SPIR. Participants in the SP method indicated they had gained positive learning experiences.

(continued)

Table 22.1 (continued)

Author (Year)	Objective	Design	Participant	Pedagogical strategies	Support	Measures	Results
Hoffmann et al. (2007)	Assess the effect of scenario-based high-fidelity simulation training with a traditional clinical experience	A single group pre-test/post-test repeated-measure	29 senior nursing students	Role-rotation of performer, observer, and partner within a team (7–8) in advanced medical-surgical nursing health assessment of four scenarios. Designed scenarios were typical patient situations including acute myocardial infarction with cardiac arrest, pulmonary oedema, drug overdose and decreased level of consciousness from a motor vehicle collision.	*Before simulation* Advanced organiser on core principles of knowledge, communication, judgment, planning and resources management stressed in a debriefing form *Simulation* Experiential learning in four scenarios for 15-minute each *Post-simulation* Experiential learning by a 10-minute guided debriefing for each scenario	*Knowledge* of critical care by Basic Knowledge Assessment Tool-6 (BKAT-6) before traditional clinical placement and on the last day of simulation training.	Post-test significant improvement found in the score of BKAT-6 overall and its six sub-scales except for endocrine and gastrointestinal that were not addressed in the simulation scenarios.

Author (Year)	Objective	Design	Participant	Pedagogical strategies	Support	Measures	Results
Ko and Kim (2014)	Assess the effect of a scenario-based SP with low fidelity (part-tasks trainer) simulation training	A randomised control experimental study	65 junior nursing students	Role-rotation of performer, and partner in teams (4–5) for emergency health assessment in simulated emergency room SP trained by the author to describe the problem from a patient's perspective and to naturally respond to expected questions or behaviours	*Before simulation* Advanced organiser on scenario outline, patient history, prerequisite nursing knowledge and skills *Simulation* Experiential learning in a 20-minute scenario *Post-simulation* Experiential learning by debriefing while watching the good example of a video of 2 groups' performances (time unknown)	*Clinical judgement* by two validated tools: Critical thinking disposition questionnaire; Problem-solving process questionnaire. *Clinical competence* by a valid tool of the Clinical Competence Questionnaire	Significant increases found in the problem-solving process and clinical competence. No significant differences found in the critical thinking disposition in the experimental group compared to the control group.
Meyer et al. (2011)	Assess the effect of a program-based high fidelity simulation training as a 25% (2 out of 8 weeks) of substitution for a traditional clinical Course	A repeated measure analysis of the mixed model and covariate effects	116 junior nursing students	Role-rotation of performer and partner in teams (5) for a paediatric simulation curriculum in the paediatric clinical course. Eight scenarios designed to be scaffolded and more challenging with the final day of simulation.	*Before simulation* Advanced organiser on the scenario, infant and child health history, prerequisite knowledge and skills via an online learning environment. Positive reinforcement by the successful completion of all activities to pass the course. *Simulation* Situated and experiential learning in 8 scenarios with 20 minutes for each *Post-simulation* Situated and experiential learning by debriefing after the completion of each scenario for 20–30 minutes	*Overall clinical performance* by a validated and Likert-scale score (from scores of 5 to 30) of a weighted sum for the following items by the instructor in clinical competence: preparation; student-client communication; clinical judgment; therapeutic skills; inter-professional communication; documentation	Instructor rated the overall performance of students in the patient simulation experience higher than those who had not yet attended a simulation

(continued)

Table 22.1 (continued)

Author (Year)	Objective	Design	Participant	Pedagogical strategies	Support	Measures	Results
Kaplan and Ura (2010)	Assess participants' perceptions of the scenario-based high-fidelity simulation with multiple simulators	A survey	97 senior nursing students	Role-rotation of performer, and partner in pairs in an advanced medical-surgical nursing health assessment. Scenario design had a report being purposefully incomplete to test whether students would try to collect more information.	*Before simulation* Advanced organiser on the training format, general instructions for the simulation and the case study assignment. Drill and practice on prioritising and delegating before training on the same day *Simulation* Experiential learning in a 20-minute scenario *Post-simulation* Experiential learning by a 1-hour debriefing on objectives and critical elements of the scenario	Participants' perceptions of Post-Simulation-Based-Learning experience by the author-developed questionnaire that contained two open-ended questions and 8 Likert scales questions	Overall agreed to statements that confidence in both prioritising and working in teams was increased and understanding about how to prioritise and delegate care

Author (Year)	Objective	Design	Participant	Pedagogical strategies	Support	Measures	Results
Mill et al. (2014)	To assess participants' perceptions of the unfolding case of an SP in a high-fidelity simulated hospital environment	A survey and focus group interview	32 juniors nursing students completed the survey after the simulation sessions; five participants, two academic staff, and two SPs participated in the interview	Role-rotation of performer and partner in pairs for neurological assessment in a high-fidelity simulated ward. Two unfolding case studies designed. One unfolding case consisted of four scaffolded scenarios. The other consisted of two scaffolded scenarios.	*Before simulation* Advanced organiser on the scenario; patient history *Simulation* Situated and experiential learning in each scenario for 15 minutes. Collaborative inquiry deployed by an instructor who acted as a RN in case assistance was required. *Post-simulation* Situated and experiential learning by debriefing on the playback of sessions (times unknown)	Participants' perceptions of Post-Simulation-Based-Learning experience by three validated tools: 1. Student satisfaction and self-confidence 2. Educational practices 3. Simulation design	High positive scores for the three measures to support the successful implementation of the simulation-based learning strategies. Participants wished to participate more frequently in simulation sessions.
Swenty and Eggleston (2011)	To assess participants' perceptions on the scenario-based on high-fidelity simulation training	A survey	79 senior nursing students	Role-rotation of performer, observer, and partner in teams (four to five) for medical-surgical nursing assessment in a simulated ward. Six scenarios designed, four of which were simple and two were complex and scaffolded.	*Before simulation* Advanced organiser on the simulated ward environment. Drill and practice on a written assignment to prepare for each of the sessions. *Simulation* Situated and experiential learning in six scenarios *Post-simulation* Situated and experiential learning by debriefing with guided questions on performing an assessment and prioritising care Two hours for each scenario, including simulation and debriefing	Participants' perceptions of Post-Simulation-Based-Learning experience by three validated tools: 1. Student satisfaction and self-confidence 2. Educational practices 3. Simulation design	Fidelity valued by participants. Satisfied with the simulation experiences. Self-confidence increased with every simulation experience.

Table 22.2 A summary of the qualitative studies

Author (Year)	Objective	Design	Participant	Pedagogical strategies	Support	Results
Badir et al. (2015)	To understand nursing students' perceptions of the use of high- fidelity simulation	Focused group interviewing with the coding process by Corbin and Strauss	36 senior nursing students	Role-rotation of performer, observer, and partner in teams (seven to eight) for an assessment of cardiopulmonary resuscitation in three different scenarios in intensive care	*Before simulation* Advanced organiser on scenarios outlined with reading materials and performance checklist. Drill and practice on advanced cardiac life support algorithms for 30 minutes before sessions *Simulation* Experiential learning in a 20-minute scenario *Post-simulation* Experiential learning by a 30-minute debriefing	Participants perceived that high-fidelity simulation helped transfer knowledge to practice; heightened confidence and teamwork; and increased professional awareness.
Coffman (2012)	To compare students' perceptions on two levels of fidelity (high and low) of simulation learning	Colaizzi's descriptive phenomenological method to describe participants' written responses	31 junior nursing students	Role-rotation of performer, observer, and partner in teams (seven to eight) for child assessment with enteral tube malfunction. Scenarios designed to be scaffolded.	*Before simulation* Drill and practice on various types of enteral tube insertions, placement checks, irrigation and removal within a simple scene a week before *Simulation* Situated and experiential learning in a 20-minute complex scenario *Post-simulation* Situated and experiential learning by a 30-minute debriefing	Participants' comments indicated their comprehension of SBL's progression from low to high fidelity.

Author (Year)	Objective	Design	Participant	Pedagogical strategies	Support	Results
Mikkelsen et al. (2008)	To compare three different teaching methods: Scenario-based study groups with a teacher, without a teacher and together with simulation	Focused group interviewing with a typological 'coding' approach	21 junior nursing students	Role-rotation of performer, observer, and partner in teams (12–13) for infection control. Scenario designed to be scaffolded within one session.	*Before simulation* Didactic lecture and a test at the end of the lecture *Simulation* Collaborative inquiry deployed by an instructor who asked appropriate questions and provided feedback during a role-play simulation session *Post-simulation* Experiential learning by debriefing within each part of a scaffolded scenario	While participants realised the complexity and expectations of each scenario in the simulation training, the instructor's role was crucial in facilitation by asking appropriate questions, and giving feedback and hypothetical examples

session. The pedagogical goals are simple to state. However, the findings of Mikkelsen and her colleagues (Mikkelsen et al., 2008) indicated that inexperienced nursing students required more time and effort to translate goals into a final solution for the complexity of each scenario in one time of simulation training.

Scenario Writing

All the reviewed studies included a concise description of each SBL by creating a storyline for the scenario. Six of them stressed that experts in the discipline, either nursing faculty staff or advanced nursing practitioners, were consulted for writing up several scenarios for training. The specialists were invited to provide guidance on the content of the simulation sessions (Alinier et al., 2006; Badir et al., 2015; Beckers et al., 2006; Coffman, 2012; Hoffmann et al., 2007; Mill et al., 2014).

Three of the studies applied SBL to enhance the knowledge of intensive/emergency care and immediate nursing management for emergency situations in real life (Badir et al., 2015; Hoffmann et al., 2007; Ko & Kim, 2014). Emergency scenarios might be encountered less in a short period of clinical practicums but be frequently managed in post-graduate study, including life-threatening cardiac arrhythmias, safe airway management, defibrillation/cardioversion, and medication administration (Badir et al., 2015; Hoffmann et al., 2007; Ko & Kim, 2014). The driving force for writing rare scenarios echoed the pedagogical goal of maximising the learning to help students master the content and develop the clinical proficiency that they would require to be efficient, responsive, and accountable in their nursing careers (Ko & Kim, 2014).

Generally, what every nursing undergraduate needs to know about the nursing discipline could be taught in simulation sessions. Of all the studies reviewed, eight of them emphasised knowledge consolidation items such as (1) fundamental nursing problems, e.g. enteral tube care (Coffman, 2012); (2) infection controls in cases of MRSA and norovirus (Mikkelsen et al., 2008); (3) pre- and post-operative patient care (Alinier et al., 2006; Swenty & Eggleston, 2011); (4) paediatric nursing care (Meyer et al., 2011); (5) neurological health assessment (Mill et al., 2014); (6) therapeutic communication (Beckers et al., 2006); and (7) clinical management in prioritising and delegating planned responsibility (Kaplan & Ura, 2010). These eight reviewed studies provided a complex storyline so that participants could apply learned concepts and principles and develop clinical reasoning in SBL. The distinguishing characteristics of a storyline here were that it needed to be well organised and intuitive and be relevantly reflected by scaffolding from simple to complex (Mikkelsen et al., 2008).

Facilitation

SBL facilitated participants in practising the roles of Performer, Observer, and Partner (POP) to enhance their clinical competence in one-time SBL experiences. The participants played one of the expected roles: (1) performers who initially had to perform various clinical skills according to the flow of the scenario; (2) observers who had to observe their peers' performance and reflect on their actions in debriefing sessions; or (3) partners who had to work with performers to provide collaborative care in SBL. The instructional approaches in SBL, which were commonly found in the studies reviewed, should engage participants in three steps, viz. (1) before simulation, (2) simulation sessions, and (3) post-simulation debriefings.

Before Simulation The findings in this study revealed that the use of advanced organisers was adopted to provide participants with readable information before attending SBL to play the roles of 'POP'. The advanced organisers pointedly reminded participants who were exploring nursing concepts in the classroom about what was involved in SBL (Hoffmann et al., 2007; Kaplan & Ura, 2010; Ko & Kim, 2014; Meyer et al., 2011; Swenty & Eggleston, 2011). Performers were expected to take on the assigned roles of nurses; and partners were expected to be other healthcare professionals, such as an assisted nurse or a physician during simulation sessions (Hoffmann et al., 2007; Ko & Kim, 2014; Meyer et al., 2011; Mikkelsen et al., 2008). Hoffmann et al. (2007) provided advanced information on the profile of the case on site to engage students in the scenario. However, Alinier et al. (2006) claimed that information on a patient's background in an advanced organiser immediately hindered the testing of students' real performance in SBL. Two reviewed studies gave attention to drill and practice as behaviourist-aligned techniques in which participants were given the same materials repeatedly until mastery was achieved before attending the simulation (Badir et al., 2015; Coffman, 2012).

Simulation Session Six of the studies reviewed demonstrated that SBL was a tool of experiential learning to create clinical scenarios for each participant's practice within a set time (Alinier et al., 2006; Badir et al., 2015; Beckers et al., 2006; Hoffmann et al., 2007; Kaplan & Ura, 2010; Ko & Kim, 2014). These scenarios would be critical for inexperienced nursing students to enable them to handle difficulties in the clinical setting but are feasible for them to practise in the simulated clinical environment.

The results of the study showed that four of the reviewed studies had paired up a performer with a partner for collaborating in the SBL scenario. The rest of the participants observed their peers' actions in a distant classroom via wireless audiovisual real-time monitors or in an adjoined room via a one-way mirror (Alinier et al., 2006; Badir et al., 2015; Kaplan & Ura, 2010; Hoffmann et al., 2007). The study by Ko and Kim (2014) involved standardised patients taking part in realistic quasi-clinical scenarios, where the nursing procedures could be practised on mannequins or attached to the SP, as this was a more convincing learning environment

involving multi-mode simulation learning. Three of the reviewed studies expected observers to make notes on their peers' performances and critique their actions in a debriefing session (Alinier et al., 2006; Badir et al., 2015; Swenty & Eggleston, 2011). Alinier et al. (2006) instructed students to observe specific aspects, including peers' communication, teamwork, situation awareness, decision-making, and clinical skill.

Also, Coffman (2012) noted that instructors asked interactive questions immediately in the running of a scenario, which – compared with instructors observing in a simulation control room (Kaplan & Ura, 2010) – could help more passive students to become engaged in the SBL.

Post-simulation Debriefing All the studies reviewed adopted experiential learning to develop participants' clinical competence immediately at a debriefing (Alinier et al., 2006; Badir et al., 2015; Beckers et al., 2006; Coffman, 2012; Hoffmann et al., 2007; Kaplan & Ura, 2010; Ko & Kim, 2014; Meyer et al., 2011; Mikkelsen et al., 2008; Mill et al., 2014; Swenty & Eggleston, 2011). Nursing faculty staff led the debriefings by providing a guide on reflection in SBL. Ko and Kim (2014) conducted a debriefing in stages – including description, analysis, and application – while watching, forwards and backwards, a video of groups who had performed well. Beckers et al. (2006) used a tailor-made handbook for videotape self-analysis of therapeutic communication with depressed clients. Kaplan and Ura (2010) provided objectives and critical elements of the scenario and listed an agenda for reflection in a debriefing. Mill et al. (2014) also used video playback to identify examples of success in SBL by eventually connecting theory to practice. Also, Swenty and Eggleston (2011) aimed at sharing students' perceptions on simulation and observation of their peers' performance in a debriefing session. However, no information or follow-up was provided on how students would apply their learning in a one-time SBL to a new scenario (Alinier et al., 2006; Badir et al., 2015; Beckers et al., 2006; Hoffmann et al., 2007; Ko & Kim, 2014).

Discussion

SBL is a popularly adopted tool with simulation technology for teaching and learning in clinical nursing education. The method for delivering SBL involves three steps: the setting of pedagogical goals, writing scenarios, and deploying facilitation. Nursing students can enhance their clinical competence through three phases of SBL that expect them to take the roles of POP.

The results of the study identified several pedagogical strategies that are vital for enhancing clinical competence among nursing students. As has been mentioned, an integrated pedagogical goal of SBL – to convert integration of knowledge into skills through hands-on, one-time practice with rare conditions – is unlikely to be appropriate for inexperienced nursing students. Such students would be unable to practise safely in one-time integrated SBL within a limited time to achieve clinical

proficiency (Alinier et al., 2006; Badir et al., 2015; Beckers et al., 2006; Hoffmann et al., 2007; Ko & Kim, 2014). These students would be frustrated and anxious when instructors convert as much content as possible into a one-time SBL (Mikkelsen et al., 2008).

The essential pedagogical goal of SBL should be based on the capability of students and should have realistic expectations through sequential SBL sessions to reach optimal clinical competence (Coffman, 2012; Kaplan & Ura, 2010; Meyer et al., 2011; Mikkelsen et al., 2008; Mill et al., 2014; Swenty & Eggleston, 2011).

In this study, SBL assisted instructors to recognise the importance of scenario writing. A narrative storyline which starts at a simple level and then becomes complex is more effective than one with multiple problems to be resolved at one time. The performers and partners can react adequately in one scenario and then accumulate more experiences before attempting the next scenario phase. It is critical for nurse educators to decide on the pedagogical goals with appropriate SBL scenarios for nursing students, whether or not they are inexperienced in clinical practicums.

SBL can provide a wide range of ways – such as through experiential learning for representations, analogies, examples, explanations, and demonstrations – that can help to make the subject-matter more accessible (Meyer et al., 2011).

The SBL needed to enhance clinical competence is now discussed from the above perspective. First, an inexperienced performer might become exhausted and disappointed in SBL without a clear and specific advanced organiser and adequate drill and practice. The advanced organiser engages and immerses students in the scenario to respond appropriately to an SP or simulator. However, in the study by Hoffmann et al. (2007), the time allowance for the absorption of information was too limited as the students received a large amount of information in the advanced organiser on-site. Also, Alinier et al. (2006) did not give information about the patient's background until students participated in SBL. Because they lacked relevant information to prepare for SBL, the students were unable to focus their attention and transfer their learning to the authentic clinical context (Beckers et al., 2006). The frequency of drill and practice, therefore, varied depending on the number of decisions in the advanced organiser, but they should not be limited. Therefore, instructors should motivate and engage students in SBL by organising prior relevant information and arranging hands-on and return demonstrations with the use of an advanced organiser, drill, and practice.

Second, learning occurs because relevant guidance and instruction are provided at the point in time when students are most receptive to teaching (Mikkelsen et al., 2008). However, this review found that instructors in a control room interacted with performers and partners by using an intercom system (Kaplan & Ura, 2010). Thus, the social presence of instructor should be accessible on-site when performers and partners are facing difficult problems which are beyond their capacities to resolve.

Finally, instructor-led debriefings have been found to help performers, observers, and partners to regulate their behaviour by reflection on actions (Alinier et al., 2006; Coffman, 2012; Mikkelsen et al., 2008). Therefore, students personally determine the relevant strategies – such as clinical judgement (Hoffmann et al., 2007; Ko & Kim, 2014) – to be applied in a new situation. The arrangement of consecutive SBL

sessions helps students to transfer learning to the next level, rather than one-time integrated SBL. With the social presence of the instructor on-site and at the debriefing, professional nursing staff can coach performers, observers, and partners in SBL when necessary.

Conclusion

The delivery of SBL requires good planning of pedagogical goals, designing scenarios, and deploying facilitation. The format of scenarios (i.e. simple to complex) should be aligned with the pedagogical goals. To achieve the four attributes of clinical competence (knowledge, skills, clinical judgement, and satisfaction and confidence), no single facilitation can satisfy all the learning needs of undergraduate nursing students. SBL can be refined and advanced with scaffolding in a series of sessions, which provides nursing facilities with greater feasibility for helping students to visualise experience and comprehend and transfer what they have learned into clinical competence through the three phases of SBL. The synthesis of the frames of SBL shown here should be implemented and evaluated to enhance clinical competence in future research.

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Chapter 23
The Effect of Flipped Classroom Pedagogy on Continuing Professional Development of Academics in Higher Education

Linda Yin-king Lee

Abstract The importance of continuing professional development (CPD) for academics is increasingly acknowledged. CPD has a positive effect on their teaching practice by supporting their personal and professional growth. In order to achieve these outcomes, CPD activities must ensure effective learning among the learners. The flipped classroom, as pedagogy, has the potential to support CPD for academics. This study evaluated the effect of a flipped classroom in supporting CPD for academics in higher education. The evaluation followed Kirkpatrick's 4-level model, with the research questions being addressed by 34 academics who had attended a CPD programme which was delivered using a flipped classroom approach. Data were collected from a questionnaire and a semi-structured interview. The findings revealed that the flipped classroom effectively supported CPD. The outcome reached Level 3 of Kirkpatrick's model, indicating that the academics applied their acquired knowledge and skills in their teaching practice. This study contributes to a better understanding of the flipped classroom and helps in making CPD-related decisions for academics in higher education. Future large-scale research with a more stringent design is needed to confirm the present findings in other contexts.

Keywords Continuing professional development · Flipped classroom · Academics · Higher education

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_23

Introduction

In any higher education institution, learning is central not only for students but also for academic staff. When adults learn in a professional context through on-going education, training, and support activities, this is usually referred to as "continuing professional development" (CPD) (Bolam, 2002). Academics, as members of the education profession, have to commit themselves to self-improvement and deliver the best possible service to their students. At the same time, a higher education institution has to provide CPD opportunities for its academics.

Generally, CPD carries three functions. First, it updates the staff's professional knowledge and skills and ensures that they are continuously competent in their jobs. Second, it develops the staff in new areas of competence to enable them to take up new responsibilities and roles. Third, it develops the staff's personal and professional effectiveness and facilitates them to be competent in a wider context for the benefit of themselves and the profession (Madden & Mitchell, 1993). In order to achieve these functions, CPD activities should be able to ensure effective learning among the learners. Effective learning is increasingly being referred to as learning with more knowledge generation with others and less independent knowledge acquisition (Gadsden, 2008). From this point of view, an effective CPD activity for academics can be interpreted as one which makes them: active and collaborative in their learning; take responsibility for their learning; and learn about learning. To ensure effective learning takes place in CPD, adopting an appropriate pedagogy is essential.

Educators have been examining new pedagogies for CPD especially those powered with the latest educational technology (Serrano, Dea-Ayuela, Gonzalez-Burgos, Serrano-Gil, & Lalatsa, 2019). Flipped classroom has been recommended for the CPD of medical professionals (Carter & Stoehr, 2019; Mack, Spivym, & Filipe, 2019) as well as nursing profession (Shinners, 2019).

Conventional Classroom and Flipped Classroom as Pedagogies

The conventional classroom and flipped classroom are two pedagogies with totally different orientations to teaching. Conventional classroom teaching adopts a content-oriented approach. It considers the instructor as the central focus and the primary disseminator of learning content in the classroom. The classes are basically didactic in nature, with learners engaging in activities which are essentially on application tasks that are designed by the instructor. Flipped classroom teaching, in contrast, adopts a learner-oriented approach. The conventional educational arrangement is reversed by delivering learning content outside the classroom. The learning content is usually presented by using educational technologies and takes a variety of forms, such as video lessons and online readings. The learners study this material

beforehand and then engage in knowledge acquisition and construction activities in the classroom, supported by the instructor. The classes are personalised and less didactic – in other words, the learners are the central focus of a class (Abeysekera & Dawson, 2015). The literature indicates that a flipped classroom contributes to deeper learning among the learners (Green, 2015; Jamaludin, & Osman, 2014; Lage, Platt & Treglia, 2000). Nevertheless, a flipped classroom requires a considerable amount of self-learning. Learners who cannot keep up their learning pace in independent learning may fall far behind their peers (Strayer, 2012) and, consequently, cannot gain much benefit in the classroom.

Although existing knowledge on flipped classrooms is mainly based on the experience of school students and may not be fully relevant to adult learners, the flipped classroom has the potential to be a desirable pedagogy for supporting CPD for academics. First, a flipped classroom provides flexibility in learning by supporting learners' performance of self-learning at their own pace and place. This characteristic makes learning among academics, particularly those with full-time duties, feasible and practical. Second, a flipped classroom adopts a learner-oriented approach and supports the contributions of individual learners in knowledge construction, a feature which is particularly relevant to academics. Since most academics have already developed certain ideas about their work, along with their own beliefs, learning activity that encourages learning with and from each other in fact makes use of the learners' valuable background and makes them feel treasured. Although the initial stage of a flipped classroom puts a strong emphasis on independent learning, concern about learners falling behind the learning pace is not significant. Academics, being mature adults who have achieved a high educational level, are believed to be more capable than other adult learners in managing their own learning pace in independent learning.

With the above characteristics, it is logical to consider that a flipped classroom can be an effective pedagogy for supporting CPD for academics. McDonald and Smith (2013) indicated that many of the major benefits of flipped classroom also apply to adult learners in the context of professional development. They also suggested strategies showing how a flipped classroom can be applied in such context. Yet, evaluation work is limited. This study can shed light on, and inform decision making on, CPD practice. The findings are relevant to educational institutions which are responsible for developing CPD activities for their academics, meeting their development needs, and enabling them to take up teaching duties and responsibilities.

Methods

By adopting the flipped classroom approach, a CPD programme was developed to enhance the teaching skills of academics in a university. The CPD programme provided them with sets of self-learning resources on teaching methodology and advised them to study these materials on their own. A few weeks later, a classroom

session was arranged for them in small groups, which gave them a platform to make presentations, discuss, and share their views on the content of the self-learning resources. The classroom activities were conducted by experienced academics. Finally, the participants were advised to write reflection notes on their learning experience. The same practice was repeated for other learning topics.

Aim and Design

As noted earlier, this study aimed to evaluate the effect of a flipped classroom as pedagogy for supporting CPD for academics in higher education. It adopted a cross-sectional descriptive design, and both quantitative and qualitative approaches were used to answer the research question. These two approaches had complementary strengths and overcame the weaknesses of any single approach. Since academics are the primary beneficiaries of CPD, their evaluation of how CPD is delivered is especially significant.

Theoretical Model

Kirkpatrick's Four-Level Training Evaluation Model was adopted as the theoretical model in this research. This model was developed by Donald Kirkpatrick (1924–2014) who was influential in the field of training. Kirkpatrick's model involves a sequence of ways to evaluate training activity at four levels, viz. reaction (Level 1), learning (Level 2), behaviour (Level 3), and results (Level 4) (Kirkpatrick, 1959, 1976, 1994). It can be used to ascertain whether a favourable outcome is limited to a positive reaction towards the training or there are improvements in knowledge and skill acquisition, application, and even overall positive impacts on the trainees and the organisation (Smidt, Balandin, Sigafoos, & Reed, 2009). Kirkpatrick's model depicts a systematic and comprehensive approach to evaluating the effectiveness of training activities and has had an impact on the practice of training evaluation (Alliger, Tannenbaum, Bennett, Traver, & Shotland, 1997; Bates, 2004) and is widely used for the evaluation of training nowadays (Alliger et al., 1997; Praslova, 2010). In addition to its traditional use in business (Alliger et al., 1997), Kirkpatrick's model has been adopted in other fields, such as health care (Smidt et al., 2009) and higher education (Praslova, 2010). It is understood that there is an inadequate conceptual and scientific basis to support the relationships between the four levels of outcome within the model (Bates, 2004). However, as the major intention of this study was to identify the training outcomes to support training effectiveness, rather than to investigate the relationships between those outcomes, this inadequacy did not cause any significant problem for this study.

Data Collection and Analysis

This study used a questionnaire and a semi-structured interview to collect data. The questionnaire generated quantitative information efficiently and was able to provide an overall picture of the topic being investigated. Nevertheless, a questionnaire cannot give in-depth understanding (Bell, 2010; Polit & Beck, 2014), and so a semi-structured interview was also used to collect in-depth qualitative information. However, this method has significant resource implications (Bell, 2010; Polit & Beck, 2014). Using multiple data collection methods overcame the limitation associated with any single method and strengthened the validity of the study's findings.

A questionnaire was developed based on Kirkpatrick's model. It included 22 closed-ended questions and was divided into four sections that represented the four levels of Kirkpatrick's model. Each question was answered using a five-point scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). The questionnaire was validated by an expert panel of four senior academics in higher education. The questionnaire demonstrated favourable content validity (content validity index: 0.885) and strong internal consistency (Cronbach's alpha: 0.969). The questionnaire was distributed to all academics who had attended a CPD programme which was developed and implemented following the flipped classroom approach. The completed questionnaires were returned in anonymous return envelopes. Descriptive statistics were used to summarise subjects' responses. A mean score for each question and the average mean score of all questions within a level were calculated. The former score represented the degree of learning in a particular aspect of the CPD programme, while the latter represented the degree of learning at a particular level of Kirkpatrick's model. In both cases, a larger score indicated a higher degree of learning. Given that this study did not aim to determine group differences or detect relationships between variables, using descriptive statistics was sufficient for data analysis.

A semi-structured interview was used to solicit the subjects' views on the effect of the flipped classroom as pedagogy for supporting CPD for academics. It was arranged after the analysis of quantitative data. In order to explain the findings from the questionnaire and ensure that the different levels of the training outcomes (reaction, learning, behaviour, results) of the CPD programme could be addressed in the interview, an interview guide was developed and was then validated by experts in higher education. The interview, which lasted for 1 h and was audio-recorded, was conducted in a private room in the university. During the interview, field notes were taken. The information collected was used to substantiate subjects' responses in the questionnaire and to facilitate interpretation during data analysis. Content analysis was performed. The interview data were transcribed verbatim. The transcripts were read, and key words and phrases were highlighted and coded. Meaningful pieces of content were extracted and patterns of the content were identified. These patterns and their underlying meanings were described qualitatively. The data were analysed manually.

Sampling

The population of this study was the 40 academics who had attended the CPD programme. Total population sampling was adopted to recruit all the academics who had attended the CPD programme to answer the questionnaire – a sampling method which is particularly useful for studies with a small population (Polit & Beck, 2014). Individuals within a population have different characteristics that are relevant to the focus of a study. However, in a small population, the number of individuals who have a particular set of characteristics is very small. If a study fails to recruit these individuals, a significant portion of the input that is necessary for an overall understanding would be missed. Since the population comprised 40 academics, using total population sampling guaranteed that the entire population had been included and reduced the risk of missing potential insights from individuals who were not included (Polit & Beck, 2014). This sampling method has a greater ability to recruit a representative sample for the quantitative part of this study.

Maximum variation sampling was adopted to recruit six academics to attend a semi-structured interview. The academics with different posts and durations of teaching experience were selected to ensure a heterogeneous sample. Maximum variation sampling is a non-probability sampling method in which the researcher deliberately chooses the subjects who maximise the diversity relevant to the research question. This sampling method allows the researcher to understand how a phenomenon is interpreted by different people (Polit & Beck, 2014) and is a desirable sampling method for recruiting the sample for the qualitative part of this study.

Ethical Considerations

Ethical approval to conduct the study was obtained from the university in which it was carried out. An invitation letter describing the purpose and nature of the study was sent to the potential subjects. Their right to participation, withdrawal, privacy, and confidentiality were assured. Written consent was obtained from the subjects.

Results

This section presents the characteristics of the study sample and their responses in the questionnaire and semi-structured interview.

Table 23.1 Characteristics of the subjects who answered the questionnaire (n = 34)

Characteristic	Frequency
Post	
Teaching assistant	4
Lecturer	14
Senior lecturer	16
Duration of being in a teaching post	
<1 years	2
1 year	7
2 years	4
3 years	13
4 years	1
5 years or more	7

Table 23.2 Characteristics of the subjects who attended the interview (n = 6)

	Characteristics	
Subject Code	Post	Duration of being in an academic post
Teacher A	Senior lecturer	10 years
Teacher B	Lecturer	2 years
Teacher C	Teaching assistant	1 year
Teacher D	Senior lecturer	5 years
Teacher E	Lecturer	3 years
Teacher F	Teaching assistant	1 year

Characteristics of the Study Sample

Thirty-four out of 40 subjects answered the questionnaire. The subjects represented a junior group of academics with limited teaching experience (Table 23.1).

Six subjects attended the interview. They reflected the diverse background of the subjects who attended the CPD programme (Table 23.2).

Findings from the Questionnaire

Subjects' responses are presented as means (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). Overall, the subjects responded positively to the CPD programme. All the questions achieved a score higher than 3 (3.57–4.62), thereby indicating a certain degree of learning in each aspect of the programme.

To ascertain the degree of learning in each level of Kirkpatrick's model, a score for each level was calculated by taking the average of the scores from all the questions within that level. A larger score indicates a higher degree of learning in a

Table 23.3 Level of learning (n = 34)

Level of learning	Mean
Level 1: Reaction	
1. I consider the programme as well-designed.	3.88
2. I consider the programme as well-conducted.	3.97
3. I consider the programme as enjoyable.	4.18
4. I consider the programme as relevant to my work as an academic.	4.62
5. I consider the programme as useful for my continuing professional development as an academic.	4.35
Average for level 1:	4.20
Level 2: Learning	
6. I have learned new knowledge.	3.91
7. I have corrected my misconceptions.	3.57
8. I have learned new skills.	3.94
9. I have refined my existing skills.	4.26
10. I have gained a deeper understanding about my roles as an academic.	4.03
11. I am eager to know more about my roles as an academic.	4.24
Average for level 2:	4.08
Level 3: Behaviour	
12. I have adopted the new knowledge in my work.	4.00
13. I have adopted the new skills in my work.	4.03
14. I have revised my original work practice.	4.09
15. I have more confidence in carrying out my work.	4.12
16. I am more competent in carrying out my work.	4.03
Average for level 3:	4.05
Level 4: Results	
17. The programme brought positive results to me as an academic.	4.32
18. The programme brought positive results to my students.	3.97
19. The programme brought positive result to the university.	3.68
20. The programme facilitates me to achieve my work-related goals.	4.09
21. The programme facilitates me to improve students' learning outcomes.	4.00
22. The programme facilitates me to achieve the university's vision.	3.62
Average for level 4:	3.95

particular level. Similarly, all levels obtained a score higher than 3 (3.95–4.20), thereby indicating a significant degree of learning at each level of Kirkpatrick's model. The greatest degree of learning occurred in Level 1 (mean: 4.20), followed by Levels 2 (mean: 4.08), 3 (mean: 4.05), and 4 (mean: 3.95). These findings tentatively support the overall effect of the CPD programme. Subjects' responses are summarised in Table 23.3.

Findings from the Interview

Overall, the subjects' reactions to the CPD programme were positive. Through attending the programme, they corrected misconceptions about teaching, learned new teaching knowledge and skills, and, finally, made changes in teaching practice. However, they were uncertain about whether the programme could lead to any positive results for their students and the university. Their responses suggested that the CPD programme had achieved Level 3 of Kirkpatrick's model. The findings are elaborated and supported below by quotes from the subjects.

Reacted positively: All the subjects enjoyed attending the CPD programme and considered it useful and necessary. One subject, who was reluctant to join the programme at the beginning, said that it had been a good experience: "Unexpectedly, the session was not so formal … It was relaxing and interesting. I enjoyed this way of learning." (Teacher B).

Learned new knowledge and skills: With the input from the programme, the subjects corrected their misconceptions about teaching, gained new knowledge, and learned new teaching skills. Such learning was associated with a better understanding of the teaching skills after experiencing them and developing trust in them. Teacher B said "I used to assume that whoever has the knowledge can teach … I used to believe that a teacher develops teaching skills automatically … The programme made me realise that I was incorrect. Teaching skills can be learnt!" Also, Teacher D commented: "The CPD programme required us to conduct pre-reading before making a demonstration in the session. I gained from this learning approach. After the session, I read a lot of materials about it and learned it … I plan to suggest some relevant online videos to my students for viewing before they come to my class. I am sure that they can gain from this approach too".

Behaved differently in teaching practice: The subjects also indicated that they had made changes in their teaching practice. The changes were further reinforced by an acknowledgement of the difference in outcomes between their old and new practices. Teacher D noted: "The CPD programme reminded me of the use of some basic teaching techniques, which I have overlooked. For example, we should address the students by their names. In a recent tutorial, I addressed two students by their names. They were astonished [about] why I could name them and became extremely attentive in the class. I was surprised that even a simple action could bring a significant change!"

Felt uncertain about the results: Although the subjects agreed that the CPD programme was beneficial, all of them mentioned that they were not sure whether the CPD programme could produce any results for their students and the university. For example, Teacher D said: "The CPD programme motivated me to learn more about teaching. I gained benefit from it and changed my teaching practice accordingly. However, I am unsure whether there is any change in my students and the university."

Discussion

CPD should be able to address the specific needs of the learners. As adult learners, academics set clear goals for learning. They use their life experience to construct knowledge and are motivated by having opportunities to address their own problems. They desire unrestricted learning activities and perform best when their views are being adopted (Hunzicker, 2011). The findings illustrated that the present CPD approach is able to consider the academics' prior knowledge and experience, facilitate their construction of new knowledge from their experience, and use such new knowledge to solve their own teaching problems. The nature of the learning environment in CPD was effective for academics.

Effect of the Flipped Classroom Approach

This study adopts Kirkpatrick's model as the framework to determine the effect of the CPD programme, with four levels of outcomes being evaluated. The findings support the effectiveness of the CPD programme and indicate that Level 3 had been achieved.

Reaction (Level 1) Academics' reaction to the CPD programme was positive. They considered it challenging, necessary and beneficial. Although the evaluation of Level 1 revealed how well the training was received by the learners, it is inappropriate to associate learners' reaction to the training with their degree of learning (Smidt et al., 2009). Rogers (2007) emphasises that individuals can like the training but learn nothing from it and, conversely, they can dislike the training but learn from it. Meta-analyses of studies on the evaluation of training reveal a considerably weak relationship between reactions and learning (Alliger & Janak, 1989; Alliger et al., 1997). To comprehensively evaluate the effectiveness of the CPD programme, it is necessary to also evaluate the academics' learning, behaviour, and the results.

Learning (Level 2) The subjects agreed that the CPD programme enabled them to refresh their prior knowledge, gain new knowledge, learn new teaching skills, and develop the correct attitude towards teaching. Similarly, previous studies have reported that CPD activities can improve teachers' knowledge (Khan & Chishti, 2012; Miller & Glover, 2007; Opfer & Pedder, 2010) and attitude (Pedder, 2006) towards teaching. In particular, the CPD activities with special features, such as supporting active learning (Dalgarno & Colgan, 2007) and being considerably long-term (Boyle, Lamprianou, & Boyle, 2004), have been shown to be substantially effective and can produce considerable effects on teachers. The findings of the present CPD programme illustrated that the flipped classroom approach supported active learning among the academics, thereby achieving the desirable learning outcomes.

The evaluation of Level 2 reveals what the academics believed they had learned. This result was an immediate effect of the programme. This evaluation focuses on the extent to which the academics had improved their knowledge, enhanced their skills, and changed their attitudes as a consequence of attending the programme. With the belief that academics' knowledge, skills, and attitudes are among the most essential factors influencing student achievement (Harnett, 2012), conducting a Level 2 evaluation is justified. Nevertheless, simply conducting an evaluation at this level may not indicate adequately what the academics have actually learned. Rogers (2007) argues that most evaluation at this level is impressionistic. People may have learned something without realising it. Alternatively, they may claim to have learned something, but in reality they have not. Without a formal assessment, ascertaining what the academics have actually learned is difficult. However, conducting a formal assessment on the academics in this study was not feasible because of resource constraints. Interpreting multiple sources of data reasonably could verify academics' learning and enhance the validity of the findings.

Behaviour (Level 3) The evaluation of Level 3 reveals the changes in practice that resulted from the CPD programme. This evaluation aims to determine whether the academics retain the knowledge and skills when the CPD programme was over. The findings indicated that they used the new skills in their teaching. They could also identify the difference in outcomes between their old and new practices by observing the students' immediate responses. This promising finding shows the effectiveness of the flipped classroom as pedagogy for supporting CPD for academics.

The flipped classroom approach supports active learning and individualises the learning experience of individual learners (McDonald & Smith, 2013). In this study, the academics were enabled to bring their concern to the classroom. Through collaborative learning activities with other academics and the instructor, their specific learning needs were addressed. Moreover, flipped classes work well for busy learners (McDonald & Smith, 2013). Using this approach enabled the academics in this study to maintain continuous learning regardless of their tight work schedule and heavy workload. Thus, positive learning outcome can be achieved.

Results (Level 4) The evaluation of Level 4 reveals the result of the programme on the teachers, students, and university. An effective CPD programme, which has positive results for academics, is believed to indirectly bring positive results to the students and faculties. The evaluation at this level can definitely provide stronger evidence to support the effect of the programme than that based merely on the academics' reactions, learning, or behaviour.

Those involved in the current study agreed that the CPD programme had positive results for them, but they could hardly determine whether there would be any positive result for their students and the university. Similar comments have also been made in another study (Opfer & Pedder, 2010) and a literature review (Lawless & Pellegrino, 2007). The existing evidence reveals that the effects of the CPD activities are unlikely to happen beyond the personal level of the teachers. To a certain extent, the cross-sectional nature of previous research and this study can give them

the ability to detect changes in student and school performance that often do not happen immediately. The present findings might also be due to inadequate intensity of the CPD programme. Even though it has adopted the flipped classroom approach, the CPD programme which contained only one session of classroom activities might be inadequate to produce an impact in a wider context.

Limitations and Recommendations

This study adopted an outcome-oriented approach to evaluate training effectiveness. Despite being a simple and efficient approach for informing current practice, it is not a strong approach for examining the impact of the influencing factors on the results. Moreover, this cross-sectional study investigated the academics shortly after the CPD programme. It provided valuable information on the short-term impacts of the programme. However, despite findings revealing changes in academics' teaching practice, it is uncertain whether these changes can be sustained. Despite using multiple methods to collect data, the questionnaire and interview can only collect subjective data from subjects – there is limited objective data to complement the subjective findings.

To ascertain the effectiveness of the flipped classroom approach for supporting CPD for academics, more stringent research design is indicated. For example, it is suggested that comparison be carried out for the effect of the CPD programme which incorporates different number of sessions of classroom activities and of different duration. Findings can contribute to a better understanding of the flipped classroom approach. Changes in education outcomes are often dependent on factors which are teacher-related (e.g. teachers' beliefs and relationships), student-related (e.g. students' orientation to learning), and school-related (e.g. culture, policy, and the availability of resources) (Opfer & Pedder, 2010). Therefore, combining the process-oriented and outcome-oriented approaches can be a better approach for evaluation. It is also suggested to conduct pre-training measurement and collect both objective and subjective data, thereby achieving a more valid evaluation. Lastly, a longitudinal design with direct investigation of the parties involved, and in other education contexts, can enrich our present understanding.

Conclusions

CPD supports teachers' personal and professional growth and enables them to be competent in a considerably wide context. The importance of CPD for academics in higher education is increasingly acknowledged. The flipped classroom approach, which is learner-oriented, is believed to be desirable for informing CPD activities. This study was conducted in an academic unit of a university which had recently adopted the flipped classroom approach to develop and implement CPD activities

for its academics. The findings supported its effectiveness and indicated that it achieved the Level 3 criteria in Kirkpatrick's model. This study sheds light on the practice of CPD and suggests a pedagogy which has the potential to meet the challenges in the field of education. However, the presence of limitations in the research approach and methodology in this study limit its making generalisable conclusion. Future large-scale research with a more stringent design should be carried out to establish whether it confirms the present findings in other contexts.

Acknowledgements The author gratefully acknowledges the participation of the academics.

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Chapter 24
Enhancing Teaching of an Educational Institution via Building up Its Research Capacity

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Abstract This chapter presents an institution-wide programme for building up its research capacity for a teaching university offering open and flexible programmes. The university is keen to excel in teaching through research which serves the strategic value of keeping its academics' scholarly active and informing their teaching. The programme began with a needs analysis to determine the specific factors that favour or discourage academics' involvement in research. The analysis involved a total of 17 academics, from diverse disciplines and having involved in different levels of research activities. In the three focus group interviews held, the participants were asked about their perceived barriers to research; their views on enhancing the research culture; and their needs of research support. Based on the findings of the needs analysis, the programme for research capacity-building was designed and implemented. It covers three major areas: (1) research promotion—develop institutional research culture and enhance knowledge of academics in research; (2) research facilitation—deliver efficient research administrative support and provide consultation services; and (3) research orientation—facilitate the University to position its research and to develop a sustainable research environment. Details of the programme include a broad range of academic events and activities such as seminars, workshops, and regular roundtable meetings; an e-newsletter on research; an online platform of research resources; and an enhanced research administration system. This chapter also discussed how the programme addresses academics' research support needs and challenges faced during its implementation.

Keywords Research capacity-building · Open and flexible education · Needs analysis

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_24

Introduction

It is commonly accepted that research benefits teaching. Griffiths (2004) suggested that teaching can be research-led, research-oriented, research-based and research-informed. For a teaching institution, this serves as a strong motive for developing its research capacity, which will in turn enhance its teaching quality (Frantz et al., 2014). However, building up a teaching institution's research capacity can be a highly demanding task. Some difficulties appear to be shared by many teaching institutions. For example, Sawyerr (2004) highlighted a number of challenges, such as heavy teaching loads, inadequate infrastructure and competitive funding, which may be applicable to institutions in virtually all parts of the world. Discussion and research in this area focused mainly on the research capacity enhancement of a specific discipline (e.g. Murray & Vanassche, 2019; Trytten, Wale, & Hayes, 2019; Twelvetree, Suckley, Booth, Thomas, & Stanford, 2019; Withington, Alcorn, Maybery, & Goodyear, 2020). Those focusing on an institution-wide level have been relatively scant.

This chapter presents the experience of a self-financed teaching university in Hong Kong offering open and flexible learning in developing its research capacity and overcoming such challenges. The university has encountered difficulties, as do other teaching institutions, when it planned to systematically build up its research capacity. For instance, its academics have been heavily engaged in teaching, and many of them are either junior academics without much research experience or experienced teachers who have not been involved in research for many years. Also, as a self-financed institution, its financial resources should be devoted primarily to teaching and research often lacks resources.

Given this context, an institution-wide programme has been implemented to prepare academics to gradually develop their research competence and to enhance research engagement as an integral part of their academic work. As the first phase of the programme, it endeavours to foster an environment conducive to research activities. There are three major areas of work in developing the research culture of the university, enhancing academic staff's research knowledge and skills; improving their capability to write research proposals and publish research papers; and identifying the orientations for long-term research development.

To ensure that the research capacity development programme can focus specifically on academics' needs in research, a needs analysis was first conducted to collect data from academics. It aimed to identify their research needs in order to design and offer proper research support for them within the limitation of tight resources and to facilitate the university's strategic positioning of its research. Based on the findings of the needs analysis, a series of initiatives for the research capacity development programme have been planned and are being implemented.

Research for a Teaching Institution: Benefits and Challenges

The potential benefits of research to teaching have been well studied. For example, Elen, Lindblom-Ylänne and Clement (2007) reported a wide range of positive effects that research can bring to teaching. Academics would be more enthusiastic and dynamic in discussing their own research in teaching. There could be added value in their teaching, such as introducing research activities into teaching to develop students' research skills, thus enabling them to think independently and express their thoughts clearly. Also, they could teach more than textbook information and deliver up-to-date knowledge to enrich students' learning. Healey, Jordan, Pell and Short (2010) found that students regarded their teaching as more credible when they were taught by well-known researchers.

In particular, for academics involved in educational research, improved understandings of effective teaching and learning can be expected. An institution can develop informed and insightful policies and practices for teaching based on relevant research findings.

Despite some studies showing that the causal relationship between research and teaching is not always clear (DFES, 2003; Zamorski, 2002), Geraldo, Trevitt, Carter and Fazey (2010) stressed the need to nurture higher education students to be critical citizens, where

> it is not only researchers who need these skills, but the skills are needed in all kinds of jobs where it is important to constantly follow new knowledge, understand phenomena with the aid of scientific thinking skills, and to be able to act as an active knowledge builder in society. (Murtonen, Olkinuora, Tynjälä, & Lehtinen, 2008, p. 609)

Engaging in research could also help in building up the academic profile of a university and promote constructive connections with society. For example, the efforts of the UK Open University to improve the quantity, quality and impact of research to benefit British society and the economy have been recognised (Open University, 2013a). Its research has provided students with opportunities to collaborate with experts to develop skills and competencies that empower lifelong learning (Open University, 2013b). Hassanin (2012) illustrated the utilisation of information and communication technology in research to connect the university with industry and the government to enhance regional development.

Research capacity-building is a long-term process which requires substantial and continuing effort to tackle various challenges. McIntyre and McIntyre (1999) summarised three factors – expertise, motivation and opportunities – for academics' research engagement to be transmitted into teaching and learning, and also outlined aspects of the major challenges to conducting research in a teaching institution.

Insufficient expertise would be a problem for academics without substantial research experience. Pollard (2007) noted that only about 40% of education staff in UK higher education were research-active, and the primary expertise of many lay in professional practice. Also, Fisher (2008) reported that nearly 50% of faculty members in Canadian colleges indicated that the lack of relevant training or experience was a barrier to research. Flower et al. (2009) pointed out the limited number of

researchers who are capable of leading the design, delivery and dissemination of quality research as a major challenge for institutional research development.

Also, limited research opportunities put a damper on academics' eagerness to conduct research. For example, Mugimu, Nakabugo and Katunguka (2013) reported factors, such as heavy teaching loads, inadequate funding and poor remuneration, that undermined academics' potential to engage actively in research, despite their high level of self-efficacy regarding research competence. Similarly, Karimian, Sabbaghian, Salehi and Sedghpour (2012) noted that financial issues, in particular the lack of funding for research activities, were widely agreed by academics as the key obstacle to involvement in research.

In addition, lack of motivation to conduct research could be caused by personal and contextual factors. Egwunyenga (2008) identified the lack of incentives to encourage academics in Nigerian universities to conduct research or source research funds, largely due to the unreliable research infrastructure, such as transport and energy. Murray (2010) commented that teaching staff who are practitioners may not have a strong reason for carrying out research.

Such literature reveals the common issues that have to be addressed in planning and implementing research capacity development for a teaching institution. The following sections now present the institutional research capacity development programme of the university and illustrate how it has taken into account the challenges and specific needs of academics.

Needs Analysis

Research capacity development in the university starts with understanding the specific factors that favour or discourage academics' involvement in research (Fowler et al., 2009; Jenkins & Healey, 2005; Rees, Baron, Boyask & Taylor, 2007). A needs analysis was first conducted to identify academics' perceived barriers to research involvement and their research support needs, in order to design and provide proper support conducive to developing their research capability. It included three sessions of focus group interviews, with a total of 17 academics participating from different disciplines and with different levels of research activity. The participants were asked about their perceived barriers to research; their views on enhancing the research culture; and their need for research support. The areas of research support were structured following the Researcher Skill Development Framework (Willison & O'Regan, 2008) which covers various facets of research.

Table 24.1 shows the major perceived barriers to research and research support needs of the interviewees. The barriers they perceived revolve around administrative issues, research collaboration, and research infrastructure/resources. For example, the participants indicated their limited familiarity with research funding opportunities and the relevant policies. They expressed the need for further support, such as the provision of research software tools with relevant training, and physical space for a repository for their research data. They also wished to have activities for

Table 24.1 Barriers to research and research support needs

Perceived barriers to research	
Administrative support	Heavy teaching load Time involved in handling administrative procedures Insufficient familiarity with research funding policies
Collaboration	Difficulties in forming research teams Difficulties in research collaboration
Infrastructure and resources	Lack of work space Lack of physical storage space Insufficient licences for research software tools
Research support needs	
Embark and clarify	Notifications of updates of the library databases Sharing research ideas in various disciplines Provision of, and training on, software tools for referencing
Find and generate	Information and training on data collection methods
Evaluate and reflect	Information and training on software tools for qualitative and quantitative data analysis
Organise and manage	Consultation for research project management Platform for research collaboration Identification of potential research partners
Analyse and synthesise	Consultation on statistical modelling Experience-sharing of conducting research in various disciplines
Communicate and apply ethically	Training on proposal writing Experience-sharing on research funding applications

brainstorming research ideas and facilitating research collaboration and a consultancy service on research methodology. The interviewees showed their preferences for activities for experience sharing about proposal writing, funding applications, and conducting research in specific fields. These views have been taken into consideration in devising a programme for research capacity development.

Institutional Research Capacity Development

As noted earlier, the university's plan to systematically develop its research capability is intended to gradually establish a culture for active engagement in research; build up academics' capacity to conduct effectively quality research and publish their findings; and identify the orientations for long-term research development. This initiative aims to foster an environment conducive to research activities, and in the long-run, substantially strengthen the research profile of academics.

To cater for the various needs of academics, the institutional research capacity development programme is composed of three major areas:

Research promotion:
Develop institutional research culture and enhance knowledge of academics in research;

Research facilitation:
Deliver efficient research administrative support and provide a consultation services;

Research orientation:
Facilitate the university to identify positioning in research and to develop a sustainable research environment.

Figure 24.1 outlines the framework of the programme. The aims, strategies and major work in each of these areas are introduced below.

Research Promotion

For research promotion, a series of seminars and workshops are being organised. The seminars and workshops serve two objectives: (1) to share and exchange research ideas, experience and results and (2) to enhance research skills in specific areas, such as research budgeting, knowledge of statistical tests and use of software tools for research. Seminars on research trends in individual disciplines or on research projects, which have been completed are also being held. In the seminars, academic staff are invited to share the findings and insights of their research work, as well as their views on the research trends in the related disciplines.

Regular roundtable meetings are also being held for academics to share and discuss research-related issues. They serve as a resourceful platform to generate research ideas; gain insights on improving research plans; discuss ways of overcoming difficulties encountered in research activities; obtain suggestions for publication strategy and identify possible partners for research collaboration.

An e-newsletter has been created as a channel to share research news, research ideas, past and upcoming events and activities, and staff's research achievements.

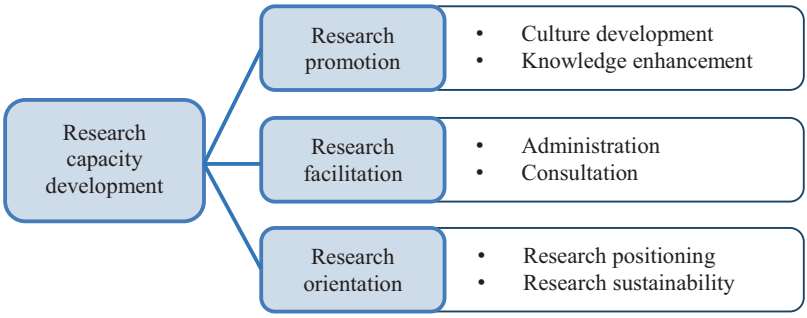

Fig. 24.1 Framework of the Research Capacity Development Programme

An online platform has also been set up to disseminate research-related information and resources, such as the details of different research funding schemes, online tutorials related to research skills and open onsite resources for research.

Aim	Strategy
Culture development	
Develop and strengthen the research culture of the university. Facilitate research collaboration between the university and other institutions.	Share research-related news and funding opportunities. Develop research networks to promote research-sharing and collaboration.
Knowledge enhancement	
Enhance academics' research knowledge and skills, and capability to write research proposals, conduct research and publish research papers. Enhance academics' knowledge and skills for using software tools for research.	Provide research-related resources. Organise professional development activities to enhance academics' research capacity. Develop training materials on research methodology and skills.

Research Facilitation

To promote research, enhanced administrative procedures have been formalised and provided for processing funding applications, coordinating project implementation, and facilitating publications. In particular, these involve (1) clearly specifying relevant procedures; (2) developing well-illustrated administrative processes by flow charts/process maps with timelines and checklist items; (3) using information technology effectively to promote the implementation of the management system and administrative procedures and (4) reviewing the system and procedures periodically to seek improvements.

Consultation services have been provided for academics to cater for their diverse individual needs at various stages of the research cycle. They cover aspects from the identification of suitable funding to proposal writing and presentation, data analysis and communication of research outputs.

Aim	Strategy
Administration	
Facilitate and coordinate applications for internal and external research funding. Oversee and coordinate the implementation of funded research projects. Facilitate staff's production of publications.	Build an efficient and effective management system for processing proposals and applications. Offer assistance in completing applications and reports.
Consultation	
Offer assistance to cater for individual needs in the research cycle.	Provide consultation services on research-related issues and the use of research tools.

Research Orientation

For research orientation, an advisory committee has been formed as an internal communication platform between the university and academics for (1) sharing information and exchanging views on research development matters and (2) collecting views from academic units for improving or fine-tuning their plans or services. This helps the university to oversee its research development and to formalise its positioning on research. A research assessment framework is being developed for evaluating the quality of academics' research, in areas such as productivity, practicability and social impact. Needs assessment is planned to be conducted periodically to review any changes in academics' research needs and adjust the provision of research support accordingly.

Aim	Strategy
Research positioning	
Position the university's research and identify strategic research areas.	Develop an effective communication channel between the university and academics for research-related issues.
Research sustainability	
Build up a sustainable research environment.	Develop a research assessment framework for ensuring the quality of research work and outputs. Conduct needs assessment periodically to capture changes in academics' research needs.

Addressing Academics' Research Support Needs

The research capacity development programme has been devised to address academics' research support needs. The three areas of work are interrelated and support research in various ways. For example, the roundtable meetings, in addition to simulating an active research culture, also serve to deliver consultancy services to resolve academics' enquiries and indirectly collect their feedback on the support services provided. The e-newsletter is an informal channel to make academics aware of the university's latest research development, future plans and relevant expectations.

While the university endeavours to build up its research capacity, it acknowledges its primary role as a self-financed teaching institution. As most of its resources should be devoted to teaching, the financial cost for research development needs to be kept minimal. Some barriers to research for academics, such as their heavy teaching loads, cannot be overcome in the short term. The programme therefore focuses on minimising academics' burden in research administrative work through providing centralised support on research administration and coordination. Academics are encouraged and helped to engage in research collaboration, so that mutual support

can be obtained in research work and research resources can be better utilised (Huang, 2014). The university also strives to capitalise on opportunities for external research funding, with academics being given substantial support in applying for external funds for their research projects.

The long-term research development of the university is also taken into consideration in the programme. Mechanisms such as the advisory committee and periodic needs assessment enable the university to keep abreast of academics' research needs and to make informed planning for further research development. As capacity-building is a process (DFID, 2010), it is anticipated that academics' needs will change when they have gradually built up their research competence, and that the corresponding research support will have to be periodically reviewed and enhanced.

Conclusion

This chapter has documented the experience of a teaching university in developing its research capacity. As the first phase of the research capacity development programme, a needs analysis was conducted for identifying academics' needs in research. With a thorough understanding of their needs, appropriate research support has been developed and provided to gradually enhance academics' research capability. The programme has been devised to cater for the specific research needs of academics from diverse backgrounds and competence levels.

This experience could be applicable to other teaching institutions, as research has been seen as an essential component in the higher education sector. Students have to acquire research skills as an integral part of their higher education, and academics have to build up their research profile for professional development. For a teaching institution, this implies an increasingly pressing need to establish an environment conducive to research and to build up its academic reputation through research excellence. This chapter has illustrated how institutional research capacity could be developed to address this pressing need.

Acknowledgement The work described in this chapter was substantially supported by a grant from the Research Grants Council of the Hong Kong Special Administrative Region, China (UGC/IDS16/14).

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Chapter 25
From Massification to Personalisation in Open Education: What Can Be Learned from School-Based Experience in Curriculum Development?

Samson Hau-lung Yuen

Abstract With the advances in technology, the challenge now facing open education no longer lies in massification or diversification of instructional methods but on the development of a more personalised curriculum. To provide a possible means for tackling this challenge, this chapter draws on the school-based curriculum development experience of a secondary school in Hong Kong that has adopted a reflective approach to its curriculum planning and implementation in order to cater for students' needs. In particular, this chapter examines how teachers who hold different mind styles according to the Gregorc Style Delineator delivered the school-based curriculum and how its implementation has implications for curriculum planning in both secondary and tertiary education.

Keywords Massification · Personalisation · Open education · School-based curriculum

Open Education: From Massification to Personalisation

Back in the late 1990s, many correspondence courses provided by open universities still adopted mail for communication, whether with tutors or course administrators, and the instructional mode was based on 'teaching through text' (Garrison & Cleveland-Innes, 2010, p. 14). A few years later in the 2000s, communication exchanges had improved significantly. Students could raise questions in the discussion board on the Internet and view comments from others, including the instructor,

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_25

even though the feedback was asynchronous. No longer was the instructional mode limited to teaching through text, but there were also teaching videos provided in VCDs and face-to-face tutorials. A decade later, communication with teachers and classmates took place in the blink of an eye. Thanks to the ubiquitous mobile technology, students could use different mobile applications to chat and videoconference with teachers and classmates; receive feedback and obtain online resources in a millisecond; and even have video-conferencing in various locations.

Following the technology advancements, there is an enormous change in the instructional modes of open education over the past 20 years. With the advances in digital technology, instructional designs in open education can now extend to interactive e-learning, multimedia e-learning, collaborative e-learning, m-learning and blended learning (Letchem & Jung, 2010). Digital technology has opened up a variety of instructional and learning methods that differ from the one-way delivery mode as in the pre-Internet era. Besides the pervasive use of digital technology, the exponential expansion of transport networks also means that commuting to campus is more efficient. This is good news for open learning students in Asia who still prefer conventional face-to-face teaching, even though there is good online support available (ibid.).

Given the advances in digital and transportation technologies, the challenge no longer lies on maximising the scope of open education or the diversification of delivery channels or instructional methods. The designs of curricula in open learning can now have greater variety, and more attention should be paid to meeting the needs of different learners. Peters (2007) warns that the industrialisation of distance education may eventually pose a threat to personalised learning as globalisation did to localisation. Thus, one problem that remains unresolved in open education is how course providers or instructors alike should make adaptations to the course content and provide more personalised teaching to meet students' needs. Here, the word 'personalised' should not be confused with 'customised' as the latter refers to the selection of predetermined computer-generated learning content based on a learner's online habits (Selwyn, 2016, p. 72). In the latter case, students' questions may be answered by pre-determined FAQ webpages. On the contrary, the word 'personalised' implies that 'learning is a social endeavour that is best supported by more knowledgeable others' (ibid., p.73). To tackle the challenge of providing more personalised learning to students in open education, there is significant work that has to be done in curriculum designs and planning, as well as research on the ways that instructors, or more knowledgeable others, deliver the courses. For example, attempts have been made to personalise learning practices through the use of digital technologies such as GPS (Tang, Hu, Xu, & Zhu, 2019) and mobile devices (Bai, 2019), as well as the adoption of learning analytics (Yuan, 2019; Zhao & Guo, 2019).

However, under neoliberalist management (Olssen & Peters, 2005), teachers in higher education are given little space in decision-making on the curriculum and instructional methods because, as part of their appraisal, their teaching is expected to be in line with the performance indicators. Murray (2016), for instance, observes that English language teachers in university language centres are undervalued by their mainstream academic seniors and how their expertise is overlooked when it

comes to curriculum decision-making and instructional methods. Given these limitations, it can be inferred that many teaching members in higher education may end up implementing a one-size-fits-all curriculum as in massified open education. As such, one prerequisite of personalisation is to provide teachers with autonomy and freedom of choice, with which they can reflect on their practice, make adjustments at their own discretion and teach according to the students' needs.

Meanwhile, open-learning institutions in higher education, especially those offering a face-to-face or blended mode of learning, could perhaps draw on the experience from their secondary counterparts which have a long tradition of dealing with the issues of personalisation against the one-for-all formal curriculum via the school-based curriculum development (SBCD) initiative. To this end, this chapter presents a case study that observed the implementation of SBCD in a Hong Kong secondary school where a reflective approach was adopted for its curriculum planning. In particular, this qualitative study aims to observe how four English teachers holding different mind styles according to the Gregorc Style Delineator responded to a school-based curriculum (SBC) that had been developed based on the reflective approach. It also offers suggestions as to how teachers' styles should be taken into consideration in curriculum planning. Finally, in contrast to previous studies on SBCD practice in Hong Kong that featured tightened bureaucratic controls, this study argues that teachers' styles and autonomy should be valued in curriculum implementation. Before the case study is presented, a brief introduction of SBCD and its historical background in Hong Kong are discussed.

Defining SBCD

SBCD is an educational initiative that allows teachers at the primary or secondary level to tailor the teaching content in the way they think appropriate to cater to learners' needs, and hence the 'major decisions about the design, content, organisation and presentation of the curriculum, about pedagogy and about assessment of learning are taken at the school level' (Skilbeck, 1998, p. 130). An SBC is, thus, opposed to a top-down one-for-all formal curriculum (Brady, 1992), which may overlook personalisation or learning diversity. As mentioned earlier, one issue facing massified open education is personalisation. One possible solution, therefore, is for instructors in higher education, especially in blended learning or face-to-face courses, to come up with an SBCD-like initiative. Although the practice of SBCD at the secondary level and the practice of curriculum development in higher education are not identical, the former's experience in dealing with the issues of personalisation via SBCD may, perhaps, provide the latter with some insights into curriculum planning and implementation.

Synoptic Review on SBCD in Hong Kong

SBCD was first introduced in Hong Kong under the School-based Curriculum Project Scheme (SBCPS) in the late 1990s, and since then it has taken root in the city as many schools 'have developed their own innovative school-based curriculum, learning and teaching strategies as well as measures to support student learning' (Curriculum Development Council, 2014, p. 7). However, the early introduction of SBCPS was criticised as a highly centralised innovation and a one-off production of standardised classroom materials (Lo, 1999; Lam & Yeung, 2010), implying that the innovation was more like a reform-steering exercise in which the education authorities attempted to put forward their innovations at the school level via the scheme (Yuen, Boulton, & Byrom, 2018). In some instances (e.g. Law, 2001), teachers were even restricted to using certain teaching methods in SBCPS, thus limiting their creativity and autonomy. Although the government has stepped back to take a more facilitating role in the SBCD initiative in recent years and invited tertiary institutions to get involved to form partnership with schools to develop their SBCs, its supportive means have again been criticised as a 'quality assurance measure in disguise' (Lam & Yeung, 2010, p. 78). Under these circumstances, the SBCD initiative in Hong Kong is at times turned into bureaucratic practice that is based on external rather than internal needs and, as such, it may not be able to fully liberate teachers from the one-for-all formal curriculum (Yuen, Boulton, & Byrom, 2018). In other words, although the Curriculum Development Council (2014) claims that different schools have their own distinctive SBCs, they may end up addressing the same issues and adopting the same teaching methods advocated for the formal curriculum.

Adopting a Reflective Approach to SBCD

To examine an alternative approach to curriculum planning and implementation, a case study has been conducted in a secondary school in Hong Kong that adopted a reflective approach to SBCD. The case study involved the development of a curriculum on *Workplace Communications for Secondary 5* (Year 11). The course was an elective in the English subject that was intended for school-based assessment, which formed part of the public examination grade. The curriculum design was based on 'writing as a method of inquiry' (Richardson, 2000), which involves two dimensions: 'First, it directs us to understand ourselves reflexively as a person from a particular position at specific times. Second, it frees us from trying to write a single text in which everything is said at once to everyone' (p. 962).

The SBC was written based on the author's teaching reflection in that school and involved an analysis of the students' characteristics rather than the requirements of the formal curriculum. Meanwhile, the teachers involved in teaching this elective were also given the autonomy to deliver the curriculum according to their preferred

styles under the assumption of 'reflection-in-action' (Schön, 1983), which means that teachers might not be able to explain their teaching approach in terms of theory, but their actions in the classroom embodied their reflection on their teaching. The SBC had been reviewed and endorsed by the teachers involved to ensure its practicality for classroom use. The SBCD practice in this case study therefore differed from the previous SBCD-related studies in Hong Kong in which SBCD was more of a bureaucratic practice (Lo, 1999) or a quality assurance measure in disguise (Lam & Yeung, 2010). While the context of higher education is different, the same reflective approach could be applied to the curriculum planning of face-to-face or blended learning courses where instructors should be given room to reflect on their practice and choose instructional methods, if not the course materials, which are pertinent to the learners' needs and context.

Participants, Procedures of Data Collection and Data Analysis

Participants

The four English teachers participating in the research were teaching Secondary 5 (Year 11). As in previous years, the teachers set aside about a month's time before the final examination to teach the English elective *Workplace Communication* and conducted school-based assessment for their students. The English elective is part of the SBC written based on the method of inquiry (Richardson, 2000). Since there were only four teachers teaching this elective, they represented the total population in the case study. The sampling strategy used in this enquiry was, therefore, purposive sampling (Bryman, 2012).

In this enquiry, I adopted the Gregorc Style Delineator (GSD) (1982) as an instrument to examine the above teachers' styles. This instrument assesses one's mediation abilities – perception and ordering. The former refers to two perceptual qualities – abstractness and concreteness; and latter refers to one's ordering abilities: sequence and randomness. While every individual possesses all these abilities, each uses them with different intensity (Harris, Sadowski, & Birchma, 2009). The four teachers' mind styles are presented in the Table 25.1.

Table 25.1 Four teachers' scores in the GSD test

Teacher (pseudonyms)	Concrete sequential (CS)	Abstract sequential (AS)	Abstract random (AR)	Concrete random (CR)	Dominant style
Tina	32	23	20	24	CS
Sussie	32	24	30	14	CS, (AR)[a]
Mitchelle	26	30	23	21	AS
Joey	30	26	27	17	CS, (AR)[a]

[a]Teachers with bimodal mind styles

Observing Teachers' Actions in the Classroom

The observation method used in this enquiry was grounded on Schön's *Reflective Practitioner* (1983), the purpose of which is for teachers to discover 'more about their own teaching by seeking to understand the processes of teaching and learning in their own and others' classrooms' (Wajnryb, 1993, p. 9).

An observation instrument was developed to study how teachers holding different styles delivered the school-based materials in the classroom, based on the way they opened, developed and closed the lesson. Running logs were used to provide 'narrative descriptions of on-going events or actions in the classroom' (Chesterfield, n.d., p. 25). Each participant was observed once in a lesson that lasted about 50 min, and so there were four running logs in total. The post-observation analysis was divided into four steps. To begin with, I decoded the teaching events in the each of the running logs using my own descriptors. Then, I formed a table to compare the descriptors I assigned to the running logs (Table 25.2). Third, I checked on the frequency and distribution of the descriptors (events) across the four running logs and then identified themes that were typical and widespread to go into the discussion section (May, 2001).

Analytical Framework

The analysis of the teaching methods embedded in the above teachers' lesson activities is based on the frames of reference (Table 25.3) developed by Kbathgate, Mostert and Sandland (2013).

Summary of Findings

The research found that the teachers' styles in terms of the Gregorc Style Delineator were associated with the instructional methods used at the classroom level. Three teachers had the same dominant mind style of Concrete Sequential (CS), and their lesson activities shared many common features. However, the teacher who held the mind style of Abstract Sequential (AS) adopted a different approach in her teaching. The findings are now summarised.

All the teachers in this case study, regardless of their mind styles, opened the lessons by settling classroom housekeeping, such as collecting homework and checking students' workbooks. Other than that, the teachers with the same mind style shared common features in their lesson activities. Teachers whose mind style was CS tended to organise their lessons in a more structured manner. They preferred to start with revision and setting targets for their lessons. During the development of the lessons, they constantly required the students to apply the target language by

Table 25.2 Descriptors assigned to the lesson observation logs

	Tina (CS)	Sussie (CS, AR)	Mitchelle (AS)	Joey (CS, AR)
Opening	Classroom housekeeping (homework checking)	Classroom housekeeping (check materials)	Classroom housekeeping (homework checking)	Classroom housekeeping (homework checking)
Development of the lessons (strategies)	- Revision - Check previous learning - Target - Demonstration - Check understanding - Independent work - Whole-class engagement - Translation - Follow-up question - Independent work - Reading aloud - Assign dictation - Application - Target - Application - Application - Follow-up question - Application - Follow-up question - Rewarding - Transition - Independent work - Application - Check understanding - Follow-up question - Transition - Video - Give guidelines	- Target - Revision - Pair work - Follow-up question - Revision - Sequential questioning - Independent work - Monitoring - Reading aloud - Check understanding - Offering help (Speeding up) - Application - Monitoring - Checking answers (presentation) - Follow-up question - Independent work - Offering help - Target - Pair work - Whole-class engagement - Monitoring - Give guidelines - Discipline	- Analysing (problem-solving) - Follow-up question - Offering help (by student, not by teacher) - Demonstration - Independent work - (Lack of) monitoring - Checking answers - (Not) reading aloud - (No) transition - Co-construction - (No) guidelines - (No) presentation - Pair work - (No) guidelines - (Not) offering help - Demonstration - Giving guidelines (but not enough) - Offering help (explaining difficult words)	- Target - Revision - Whole-class engagement - Reading aloud - Follow-up question (levelling) - Check answers - Application - Presentation - Giving feedback - Offering help - Independent work - Presentation - Offering help - Offering help (by S) - Being questioned - Independent work - Offering help - Individual difference - Monitoring - Pair work - Offering help - Individual difference
Closing	- Assign homework - Assign dictation	- Rectifying Ss' attitude - Preview of next lesson	Collect course materials (no wrap up or preview)	- Preview of next lesson - Reflection

Table 25.3 Effective educational methodologies to match the different learning styles

Frame of reference	CS (Concrete Sequential)	AS (Abstract Sequential)	AR (Abstract Random)	CR (Concrete Random)
Preference	Deriving information through direct, hands-on experience; touchable, concrete materials	Experimental, trial-and-error attitude; flashes of insight	- Strong skills in working with written and verbal symbols - Grasp concepts and ideas vicariously	Receive information in an unstructured way and like group discussions and multi-sensory experiences
Methods	- Workbooks - Demonstration teaching - Programmed instruction - Well-organised field trips - Practical orientation	- Games - Simulations - Independent study projects - Problem-solving activities - Optional assignments	- Reading and listening - Rational presentations given by authorities	- Medium movies - Group discussion - Question-and-answer sessions - Television
Media, teaching methods and practices	- Workbooks - Hand-outs - Drills - Demonstrations - Results-oriented - Practical lessons - Hands-on practice - Projects - Models - Manuals - Step-by-step directions - Programmed instruction - Orderly classroom - Orderly lab - Direct application problems - Computer-aided information	- Experiments - Stimulations - Mini-lectures - Critical issues - Interactive video - Problem-solving curriculum - Independent study - Computer and other games - Trial-and-error discovery - Optional reading assignments - Invent new ways of doing things - Stress challenges and probing questions - Insist students think for themselves	- Lectures - Textbooks - Audiotapes - Documented evidence - Study carrels - Likes scope and sequence - Evaluate by formal testing - Intellectual debate - Guide individual study - Like long-range plans - Teach from a base of content expertise - Supplementary reading assignment - Develop blueprint from an idea to visualise final product	- Group discussion - Use media - Flexible with time demands - Personalised classes - Concerned with mood of class - Use thematic approach to content - Create aesthetic or interpretative products - Assign group rather than individual activities

asking them to read their answers aloud, giving short presentations and probing follow-up questions to prompt students. When concluding the lesson, the CS teachers reinforced students' learning by assigning relevant homework, evaluating the learning task and correcting students' attitudes towards learning. The findings also showed that CS teachers whose second dominant style was Abstract Random tended to offer more help and guidelines to students.

In addition, the findings of this case study mostly go with the categorisations by Kbathgate, Mostert and Sandland (2013). There are also some instances in this case study that go against the categorisations in Table 25.3. For example, Miss Tina shows a video about the work life of a flight attendant to the students as a lead-in to the classwork. While the use of media is more aligned with the mind style of CR, more research needs to be done to examine why such exemption occurs.

In contrast, the AS teacher adopted a trial-and-error discovery approach throughout the lesson by giving only minimal help to students. While she stressed challenges and probed questions at times, she did not require any answers from students on the spot and insisted that they thought on their own.

In contrast to previous research on SBCD (e.g. Lo, 1999; Law, 2001), this case study showed respect for the teachers' autonomy. The curriculum developer had the freedom to tailor the content of the SBC based on his teaching philosophy, and teachers were also given the autonomy to deliver the course materials according to their preferred methods. Whereas the true purpose of SBCD did not come across as shown in the earlier studies on SBCD (Lo, 1999; Yuen, Boulton, & Byrom, 2018), this case study demonstrated how authentic learning took place in a natural setting. Each teacher used her preferred methods to engage students in learning. Instead of a one-off production, the SBC in this case study was sustained until this article was written (2018).

Incorporating the Concepts of Styles into SBCD

The above case study showed how the teachers' autonomy had been respected and how they taught according to their preferred styles. However, one has to be cautious about the consistency of teaching style brought about by the autonomy that teachers enjoy, which is called here 'fossilisation in teaching styles'. In open and adult education, for example, questions may arise if a single instructor insists on using his or her preferred methods when delivering a college course. Would this constrain students' learning or hinder personalisation? To answer this question, the following sections offer some suggestions on curriculum planning.

'Pedagogic Sheep Dip'

Studies on teaching and learning styles show that the congruence between the two can result in a better learning experience and attitudes (Griggs & Dunn, 1984). However, since the students' learning styles were not examined in this study, it was

not known to what extent the teachers' styles were congruent with the students' learning styles. Despite this unknown factor, Felder and Henriques (1995) argue that 'the teaching style with which students feel most comfortable may not correspond to the style that enables them to learn most effectively' (p. 27). Thus, the key is to provide balanced curriculum and instructional methods.

In real practice, a curriculum developer in open education may have difficulty in getting to know all the teachers' and students' styles. Therefore, when designing a curriculum, the curriculum developer should attempt to include features of all learning styles. Coffield, Moseley, Hall and Ecclestone (2004) call the teaching strategies that aim explicitly to touch upon all styles at some point 'pedagogic sheep dip' (p. 13). In other words, curriculum developers, whether they work in a high school or open education setting, should provide more variations when designing the learning tasks. Table 25.3, which shows the frames of reference developed by Kbathgate, Mostert and Sandland (2013), may provide a good guideline for how a curriculum could be developed. Curriculum developers may draw on at least one teaching method from each frame when designing the learning tasks. Teachers should be exposed to other methods that may not be in line with their mind styles when they go through the curriculum, and therefore can provide a more balanced teaching style.

As for online open and flexible education courses, the instructor's role may not be as salient. However, as mentioned at the beginning of this chapter, the advances in digital technology have made different instructional designs possible, such as interactive e-learning, multimedia e-learning, collaborative e-learning, m-learning and blended learning (Letchem & Jung, 2010). It is expected that the variety of online instructional designs, coupled with the fast-growing artificial intelligence, may, in the foreseeable future, provide a wider choice of learning modes that best respond to individual students' needs – not only by customisation but also by personalisation.

Freedom of Choice

Providing more choices of methods, however, does not mean that teachers must follow all the choices. Lessons should be learned from the early SBCD practice in Hong Kong, where SBCD was turned into bureaucratic or new managerial practice and teachers were compelled to follow expert-designed methods to achieve desirable learning outcomes – which in some cases aimed for official display of students' work (Yuen, Boulton, & Byrom, 2018). On the one hand, Gregorc (1982) warns against any attempts to forcibly change a teacher's natural style, saying that this may do more harm than good. On the other hand, teachers' autonomy in terms of teaching methods should be respected. By autonomy, teachers may 'decide which teaching methods should be used … without having to consult the education provider (i.e. the school's external administrative authority)' (Desurmont, Forsthuber, & Oberheidt, 2008, p. 26). The keyword here is 'decide'. Teachers do not choose a method randomly, but usually weigh up different methods before coming to a

decision. Thus, autonomy does not mean that teachers do whatever they like in the classroom, but that they are self-reflective (Dewey, 1933). They should reflect on and fine-tune their teaching with respect to the problems in the classroom, which might include any inefficacy of learning, poor attitude and rowdy behaviour among students. This ability to reflect was demonstrated by the teachers in this case study who ended their lesson by assigning appropriate assignments for consolidation, evaluating the learning tasks and rectifying students' attitudes towards learning.

Likewise, in open education, tutors should be given the autonomy to decide on the instructional methods and the space to reflect on their teaching, which thereafter responds to their students' needs by providing a more personalised curriculum. Going back to the question raised at the beginning of this section, even when teachers stick to their preferred methods, it may not necessarily hinder personalisation, provided that they have the ability to reflect and continue to improve their teaching. Having said that, further research is recommended to find out the relationship between a teacher's ability to reflect and student's learning.

No Teaching Styles or Methods Are Superior

A 'good' teacher is defined by students in various ways, as Palmer (2007) argues:

> … from years of asking students to tell me about their good teachers. As I listen to those stories, it becomes impossible to claim that all good teachers use similar techniques: some lecture non-stop and others speak very little, some stay close to their material and others loose the imagination, some teach with the carrot and others with the stick. (p. 72)

While providing a wider choice of instructional methods, a curriculum should not be too prescriptive (Fullan, 2008). Teachers should add a personal touch to the curriculum and should be given room to do so. As Palmer (2008) mentions, 'The connections made by good teachers are held not in their methods but in their hearts', meaning heart in its ancient sense – 'the place where intellect and emotion, spirit and will converge in the human self'.

The key responsibility of a curriculum developer is therefore to provide a freedom of choice but not a specification of methods. Pajak, Stotko and Masci (2007) offer a practical way of helping new teachers to develop their teaching methods, and curriculum developers may use this as their framework to fine-tune their curriculum planning:

> [Curriculum developers] should make a deliberate effort to honor and legitimate perspectives and practices that differ from their own preferred styles of perceiving and judging reality. The starting point for helping [the new] teachers succeed, in other words, should be the development of the teacher's preferred style. Once that style has been successfully developed, of course, the teacher should be encouraged to expand his or her repertoire of strategies and perspectives (p. 134).

Following the above suggestions would be what McIntyre and Jones (2014) describe as the 'development of critically engaged teachers and pupils' (p. 38), which means that teachers, including instructors in higher education, should be given opportunities 'to articulate their passions, values and beliefs about what [the subject] could

and should be within safe spaces in which open discussion and negotiation of emerging beliefs can take place'.

To sum up in one sentence, curriculum writing, as well as teaching, is not a technical practice but a reflective one, and this should be applied to education in different contexts.

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Chapter 26
Shaping Innovative and Inclusive Learning Communities: Lessons from the European Experience

Alan Bruce

Abstract In recent years, the European Union (EU) has played a major role in promoting innovative learning excellence with reference to educational strategies and policies for its member states. This chapter looks in depth at EU values and objectives on social inclusion and the creation of sustainable learning communities. It references best practices and the key outcomes from a range of key European initiatives in this sphere.

Keywords Social inclusion · Learning communities · Sustainable

Introduction

Higher education in today's world represents a powerful and evolving set of relationships – a networked web of public, private and social factors that respond to an ever-increasing set of change factors. From being the most visible element in the assertion of rank, hierarchy and elitism in past centuries, higher education now represents a market of competing ideas and visions concerning the role of higher education in the communities of which it is a part. In addition to the changing conceptions of higher education held by governments globally, higher education institutions are increasingly acting like actors on a crowded stage searching for scarce resources among many other competing interests. In this context, if no other, higher education now faces the importance of the critical role of partnerships, linkages and strategic joint ventures to achieve shared goals in a transformed external environment.

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_26

A key issue in this identified discourse is economics. The interdependence of education (and associated schooling systems) and prevailing systems of economic organisation has long been acknowledged. In an age of globalisation, however, the connection is immediate, apparent and dominant. Certain forms of education have been identified as ultimately surviving or failing based on their economic rationality rather than technological development or learner relevance. This has been particularly identified in relation to distance learning.

The pioneering work of Rumble (1997) and Hulsmann (2000) showed that the future of distance education and e-learning, for example, would be decided by economic factors. Their focus was not so much on the objective question around *what* benefits and costs of learning methodologies but *whose* benefits and costs. In a recent discussion, Black, Bissessar, and Boolaky (2019) argue that online education is an opportunity equaliser which enables citisens of less developed countries to upgrade their employability in the labour market. It is thus an effective means for curbing economic inequality.

Simpson (2005), from the United Kingdom's Open University, links discussion of such new learning paradigms directly to economic concepts derived from the discourse around the process of globalisation, viz.

- return on investment
- willingness to pay factors
- resale value of qualifications
- investment risk

Prof. Goran Therborn (2000) looked at this from the sociological perspective that analyses the impact of globalisation, and globalisation concepts, on the nature, purpose and structure of education in a rapidly evolving world society. He locates the changes in higher education under five topical discourses:

- competition
- economics
- socio-critical discourse
- state power (or impotence)
- cultural and planetary ecology

Therborn graphically links globalisation to a ruthless system of *winners* and *losers* and sees this divide having an increasing importance for how we structure and appreciate the importance of learning and education. The winners are those for whom an opened world is an opportunity for action, connection to resourceful friends, improved mobility (geographic and social), access to information and enriched access. For losers, globalisation is a closure of opportunities, employment options, chances for decent wages or profits and a cultural invasion that subverts important values.

This stark presentation of the contradictory nature of globalisation outlines the challenges for education and learning if sense is to be made of the emerging planetary social order. Old certainties are being displaced by a discourse that is ambivalent, amorphous and linked as directly to the ownership of educational institutions

as to the subject matter that has traditionally been taught. This global paradigm has direct implications for our understanding of global learning and the policy choices to be made in addressing both the opportunities and problems involved.

Globalisation has in many ways become an issue about the commodification of knowledge. Knowledge in this sense becomes just another item to be sold and traded. Yet this is all located in a web of vastly increased possibilities and opportunities if only the right and effective balance can be achieved. All the evidence points to real options around quality, innovation and a total learning experience grounded on excellence, critical and autonomous thinking and the development of reflective flexibility. Universities that get this balance right face a very positive set of future options.

In contemporary higher education, we are faced with the need to establish and extend a wide variety of new links in networked learning systems. The boundaries between sectors and streams that we have seen in traditional learning structures no longer have relevance. The blurring of the lines between education, work and community is a process that in itself produces a wide range of both opportunities and challenges in such undertakings. Such new connections and links mean a new set of policy parameters in which traditional actors see both their roles changing and new sets of desired outcomes being defined.

Throughout all these processes is the common underlying factor that no educational body can any longer act on its own. Learning communities are in their very essence now international, reflecting the changing role of the university (and other educational systems) in a globalised world. In this new international architecture, three key elements or issues can be traced, which reflect the need for:

- strategic planning
- a business model of partnership
- the importance of capacity building

This chapter starts by looking at these issues through the prism of the European experience. The European Union (EU), while having no competence specifically in the realm of education (this is left to the individual member states), nonetheless does have the authority and scope to suggest best practice, advance quality recognition systems and promote innovative excellence in educational and learning endeavours. Looking at European best practice, therefore, involves also looking at the values and priorities which underline this – social inclusion, the development of free movement of ideas, advanced and integrated digital support and a legacy of critical enquiry and research.

Creating Innovative Partnerships

From the outset, universities have been characterised by partnerships between various interests and agencies. In this, there is nothing new. Universities have served rich and complex roles not simply in generating and directing research, particularly

research that feeds into social and economic policy. Universities and other research and learning agencies (public, private and philanthropic) populate a rich landscape of ideas, investigation and teaching which in turn is profoundly affected by external change, socio-economic pressures and technological transformation. The need for enhanced quality (not least because of what can only be termed "competitive processes" at work between educational institutions) has become critical. Quality and standards themselves rely on a structured linkage which situates learning and its outputs in a matrix of socially desirable outcomes and outputs.

Globalisation has given a special flavour to this strategy. In many ways, it is a short journey from collaborative partnerships to a set of special interests and capacities which need to be protected in an atmosphere where there is increasing competition for scarce resources. Universities and other higher education institutions find themselves subject to huge competitive pressures in everything from comparative league tables to outsourcing, institutional amalgamation and rationalisation. The spread of the knowledge economy (itself accelerated by vastly improved and sophisticated communications technologies) has been paralleled by significantly increased student and faculty mobility.

Underlying this huge process is an increasing level of integration between learning systems and educational institutions and the world of industry and enterprise. At a societal level, education therefore plays an important balancing role between stability and change. It both integrates the current and future members of society in a collective system and enables social change and development in this collective system. This inner contradiction generates a tension that produces different forms of educational system in each historical era and in each social context. Throughout this process, both communication and community are critically important. This has assumed major importance as we look at the role of education systems and the generation of innovation and responses to the pressing social needs of a globalised era.

Much of this was stated clearly and eloquently by John Dewey over a century ago (Dewey, 1916):

> Society not only continues to exist by transmission, by communication, but it may fairly be said to exist in transmission, in communication. There is more than a verbal tie between the words common, community, and communication. Men live in a community in virtue of the things which they have in common; and communication is the way in which they come to possess things in common. What they must have in common in order to form a community or society are aims, beliefs, aspirations, knowledge—a common understanding—like-mindedness as the sociologists say.

The partnership models developed in Europe have relied heavily on theory and policy that promote and foster creativity and innovation. These dimensions have profoundly influenced the drive to merge social and economic perspectives in shaping a learning paradigm based on community. The European vision is for communities of learning to be driven by innovation that supports and energises inclusion for all. Innovation and inclusion therefore form two sides of the one learning system.

According to Csikszentmihalyi's model of creativity (1996), the development of an individual's creativity depends on three interrelated components: teachers/trainers (as experts on the field), the school/work environment (as a domain) and a

student/worker. According to this model, teachers/trainers or co-students/co-workers decide on the students'/workers' unconventional thinking or acting based on their own previous experience, personal preferences, values, educational or cultural backgrounds.

The consolidation and setting down of this complex concept of creativity has also been enriched with subsequent theorisations by Csikszentmihalyi himself in collaboration with Howard Gardner and William Damon (2002). Going further, they analyse the ethical and social aspects implicit in all creative, innovating activity. In effect, the creative and innovatory practices described and interpreted by science and research do not occur in an abstract vacuum – as if nothing were happening in the external environment.

Educational and training efforts may be rooted in the structure and dimensions of the labour market, where asking oneself why, what for and who for is crucial. The analytical approach to professional practices is useful for observing the metamorphosis of the creative discourse of creativity. Professional action in which creative and innovative abilities question themselves about qualitative outcomes, thus addresses human needs, beyond the immediate interests of profit and gain. According to Craft (2003), during the last 30 years, creativity studies have been led by systemic theories that regard creativity as a co-functioning of several elements, including cognitive skills, personality traits, and social, cultural and historical factors. The current emphasis has shifted to focus on ordinary creativity rather than genius, characterising rather than measuring the social system rather than the individual.

Like creativity, innovation is associated with the tendency to think about new and better ways of doing things and try them out in practice. According to Jan Fagerberg (2003), interest in innovation began in the 1960s with the landmark creation of the Science Policy Research Unit (SPRU) at the University of Sussex. Innovation was not then a topic of interest to economists, because they associated economic change with issues such as capital accumulation or market operation. Today, in contrast, many writers are concerned with multidisciplinary research (in disciplines such as economics, sociology, psychology and management) that considers how innovation is stimulated by individuals, businesses, organisations and networks.

The past focus was primarily on innovation in the market economy. For example, the *Oslo Manual* stipulates that its object of study is confined to innovations in the business sector (manufacturing industry, primary sector and services), implying that less is known about innovation processes in non-market-oriented sectors. Regarding market innovation, theorists such as Schumpeter popularised the concept of creative destruction. This suggested that the economy is a dynamic system in which old ways of doing things are destroyed and constantly displaced by new ones. This dynamic view crystallises in four different forms of innovation which centre on attempts (led by entrepreneurs) to find new ways to exploit, organise, source and supply new products, methods of production, markets and businesses.

Today, innovation concepts apply to a context where use of the Internet and ICT has reshaped the market economy (globalisation) and led to unprecedented change in observed rhythms of growth and intensity. Knowledge has become the cornerstone on which to rest the development and survival of companies and global

regions. Creativity and innovation have turned into new tools to lead processes effectively towards new aims.

Fagerberg summarised the dominant discourse about the future of the European and global economies, as follows:

- Innovation introduces novelty (variety) into the economic sphere – if innovation stops, the economy does not increase.
- Innovation tends to cluster in certain industries/sectors, which consequently grow more rapidly, leading to structural changes in production and demand and, eventually, organisational and institutional change.
- Innovation is a powerful explanatory factor behind differences in performance between firms, regions and countries. Those that succeed in innovation prosper at the expense of less able competitors.

This ideological 'habitat' has been particularly true at the European level, where innovation has been one of the central planks of almost all policy statements and, in particular, the Lisbon Declaration (now superseded by the impact of the September 2008 financial crisis and subsequent economic recession). At the level of policy for the national member states of the EU, innovation has been advanced as a common mantra indicating the way forward.

The influence of these conceptions in a context of intense competitiveness in the world market has brought about a number of behavioural changes in companies. Literature on the subject indicates four main trends reflecting the effect of globalisation on innovation processes (Bruce, 2009):

- *Acceleration:* Technological change has speeded up substantially. This is mainly illustrated by the fact that the time required to launch a new high-tech product has been significantly reduced. The process from knowledge production to commercialisation is much shorter. The rapid development and wide dissemination of ICT has played a key role in bringing about this change.
- *Inter-firm collaboration and industrial networks:* New products are increasingly integrating different technologies – increasingly based on different scientific disciplines. To master such a variety of domains is impossible, even for big organisations. This is also reflected in the costs of developing new products and systems, which have grown. Most firms do not have the capability or the resources to undertake such initiatives, which is the main reason for the expansion of collaborative schemes for research and the growing importance of industrial networks.
- *Functional integration and networking inside firms:* Speedy adaptation and innovation give the functionally integrated firm an advantage. Flexibility, an interdisciplinary focus and cross-fertilisation of ideas at managerial and laboratory levels within the firm are now important keys for success.
- *Collaboration with knowledge production centres:* Increasing reliance on advances in scientific knowledge for major new technological opportunities has been an important stimulus for firms to collaborate with scientific centres, such

as public and private laboratories, universities and other basic and applied research centres.

These trends, more visible in some countries than in others, reveal a new and more collaborative interconnected and relational conception in company culture. They evoke a socio-economic model where the key to success is using much greater degrees of diversity, interdependency and complexity to manage risk and achieve goals. This way of doing things is diametrically opposed to the techniques of hierarchy, simplification, uniformity and control used during the industrial era (Miller, 2003).

Towards Inclusive Learning Communities

In a globalised environment, work is no longer a uniform progression of production and consumption but is also an unfolding of a profound restructuring of all social, cultural, personal and ethnic relationships and understandings. The fact remains, however, that modern society is displaying worrying levels of uneven development and disturbing levels of documented inequality, poverty and discrimination. Environmental degradation, homelessness, two-tier social service provision, absence of planning, asset stripping of public services and blind reliance on ever-increasing consumption patterns are but some of the indicators of the current social malaise.

In such a context, the ability to cut costs, maintain increased production rates and maintain competitiveness may tend to dominate all commercial thinking and forward planning. When the imperative is to survive from day to day, most companies can find issues around learning, planning, staff qualifications and innovation either esoteric or irrelevant. It is suggested that the role of the employer is to marshal economic and productive activity to meaningful social ends. In this sense, employment can become participation in profitable activities; profitable to all social stakeholders and not just shareholders. Work itself, in this sense, goes beyond the mere provision of jobs to the creation of value, in both the economic and social sense.

Learning, in the employment context, is most effectively understood when positively linked with:

- creativity
- problem resolution
- change management
- diversity and inclusion
- improved communications

Employers who have seen learning as more than skill-specific training have been able to benefit from the extraordinary potential of new and diverse elements in their workforces. This has meant that the voyage of discovery around learning has become centrally linked to the strategic learning needs of the employers concerned.

Learning in the organisation is tied directly to the learning needs of each and every employee. Employers and organisations who see only cost implications in the provision of work-based learning are, at the least, missing out on the extraordinary potential of thinking and acting in different ways.

Innovation – literally doing what has not been done before – calls for considerable creativity for employers to develop innovative practices. It is often a veritable leap into the unknown. Yet all the evidence is that the companies which achieve success do so because they are doing something new – or something old in a new way. Innovation is not about market gimmicks. It is about products and skills that emerge from new ways of organisation and human creativity. Innovation is based on learning from the past as much as about anticipating the needs of the future.

Enterprises are becoming more aware that they need to become both more flexible and more responsive to their external environments. The dynamic of work-based learning offers not just the opportunity to meet minimum obligations to staff. It offers an opportunity to maximise and sustain profitable enterprises that benefits the entire community. The business learning organisation is by its nature innovative. It also values best practice and the quality that focuses not merely on product characteristics but also on the process that produces both consistently excellent goods and a motivated workforce.

It is possible to observe that the meaning of work is experiencing a redefinition in contemporary society. As a result, new concerns are arising in working environments related to the connection between learning, creativity and innovation.

A number of these concerns are related to:

- promoting learning in companies and among workers;
- recognition, evaluation and accreditation of learning in environments other than formal, given that the traditional academic mode has lost its monopoly over learning;
- processes permitting development and consolidation of human capital;
- optimising the creativity arising from the effect of the wealth of social diversity, more evident now than in earlier epochs; and
- systems to guarantee equal learning opportunities in a world affected by inequality, within a context of fair social distribution of knowledge.

This suggests investigation of processes through which knowledge and learning are recognised and how organisations cater for diverse learners in diverse workplaces. It also raises questions for the development of methodologies to understand teaching and learning that promote flexible and equitable creativity and innovation while also enabling formal recognition systems for learning.

As in the world of work, social change and the evolution of learning require change in other sectors, including education. The strength of today's educational relationship is based on learning – above all on the specification of contextual conditions to guarantee meaning and relevance. Environments in the framework of lifelong learning, where students assume responsibility for creating and developing their learning, are a balance between individual and collective effort. The link between innovation and learning communities and articulation of best practice is

critical. Lifelong learning is at its most effective when applied in community contexts. It also requires an attitudinal and cultural change on the part of governments, policy-makers, education providers, learners and community actors. Community-based learning, particularly in its lifelong learning and adult education initiatives, requires more than government intervention or formal policy statements.

Local communities must be actively involved and committed. The community is based around the need for learning in a variety of ways and levels. At times of significant social change, communities need to be re-defined in such a way as to be meaningful to the individuals who live there. Community appropriation of lifelong learning and meaningful vocational education applications entail a greater responsibility for growth and advancement lying with the individual.

If, in society as a whole, working with others, dialogue and collaboration between different people is the obvious foundation of the construction of any cultural, economic and political environment, education is equally important. This is where the idea of community, shared and communicated, takes on particular importance. Community is not limited to the field of education.

European Policy and Innovative Learning

The provision of funding for other than purely economic, free trade or market rationalisation purposes has been a factor in European integration strategies since the formation of its earliest structures following the devastation and reconstruction programmes after the Second World War. In the early days of the European Coal and Steel Community, for example, provision was made for the retraining of workers made idle by the large-scale closure of coalmines. As the pace of integration in the then European Economic Community (EEC) increased, funding and resources were increasingly targeted on a wider range of social and policy fronts that were designed to support the primarily economic goals of a unified market for the member states.

The key delivery mechanism for delivering EU resources to an emerging Union has been the *European Social Fund* (ESF). Established in 1957 in the Treaty of Rome, the ESF is part of the *Structural Funds* of the EU, which make up the greater part of all EU spending and are designed to contribute to a cohesion policy which strives to remove regional imbalances in terms of wealth and development. In real terms, the Structural Funds act as a form of redistributive financial instruments or tools to promote balanced economic development across the Union.

The main parts of this development and cohesion policy are the:

- *European Regional Development Fund:* with modernisation, research, innovation, environmental protection and economic growth being the current priorities;
- *European Social Fund:* adaptability of labour and enterprises, enhanced access to work, social inclusion, equal access and partnership in combating discrimination; and

- *European Maritime and Fisheries Fund:* European Agricultural Guarantee Fund, European Agricultural Fund for Regional Development and European Fisheries Fund

All these funds relate to key overarching strategic objectives, prime among which are:

- the reduction of disparities in income, wealth and opportunities
- enhanced labour market outcomes in terms of employability and sustainable employment

The system that has evolved over almost six decades is a complex but adaptable one. For our purposes, the main focus is the ESF, although other structural funds may be relevant from time to time. The operation of EU funds and resources is subject to on-going strategic review and a complex set of operational mechanisms that are designed to address and balance the priorities and interests of the EU's member states and specific regions. This triple framework is informed by a detailed and complex negotiation and balancing process, which factors in often-competing interests as well as ever-changing economic and resource issues.

The strategic framework for Structural Funds is set at the EU level and then transformed into national priorities by individual member states (and specific regions). At the EU level, *Community Strategic Guidelines* embed the principles and priorities of the EU Cohesion Policy and indicate ways funding can be accessed. Each member state separately develops its *National Strategic Reference Framework* (NSRF), which establishes national priorities to address 'Community Strategic Goals'.

The previous programme phase (and Lisbon Agenda targets) has been supported by a strengthening and extension of the *Framework Programmes for Research and Technological Development* into a vastly extended initiative termed *Framework 7*. This research and innovation strand was significantly resourced and has provided major support for ICT-related projects. Although the focus was on advanced ICT application, its scope around scientific innovation and sustainable research-grounded applications had major benefits for social inclusion measures. Its budget (2007–2013) was €50.5 billion. In the current Framework, for eight programmes (called *Horizon 2020* to operate from 2014–2020), the allocated funding is over €80 billion.

The strategic framework proposed in *Europe 2020* directly informs new policy thinking on the EU Cohesion Policy to be operated from 2014 to 2020. The Cohesion Policy informs funding allocations under the new strategy and is designed to facilitate increased and more targeted investment in a number of specified areas (including energy efficiency, training, SME supports, renewable energy, transport, research and innovation, and inter-regional cooperation). The policy claimed some successes in the 2000–2006 period, especially in its support for newer accession states, as well as in training and job creation. It does acknowledge that significant gaps remain with imbalances persisting and even increasing. It is in this context that the strategy aims to maximise the impact of EU funding in the current period (2014–2020) by concentrating on results and on obtaining 'smart, sustainable and inclusive growth'.

In certain areas, the union has no competence. As has been indicated, the most notable area is education, the exclusive preserve of member states. Nonetheless, the EU can and does promote areas that allow for the development of models of best practice to facilitate the free movement of students and teachers. This underlines the rationale and success of key programmes, such as Erasmus, which has facilitated significant student mobility and study across the union for many years. In all European funding initiatives, the ultimate reference point is to those areas that have union competence: free movement of labour, free movement of capital, free movement of goods and services, and equal citizenship rights.

Changes and shifting priorities are strong features of all EU funding resources. Targets and priorities are adjusted on a regular and on-going basis. EU Directorates General and specialised agencies (e.g. EACEA) are strongly resourced by extensive research facilities. All programmes and individual projects are regularly and systematically reviewed, evaluated, monitored and audited. Programmes are regularly fine-tuned and related back to identified priorities and needs. For example, in August 2012, the European Parliament and Council of Ministers agreed on general provisions for a new *Asylum and Migration Fund* designed, among other things, to amalgamate the current European Integration Fund (EIF) and European Refugee Fund (ERF).

Framing an Inclusive and Innovative Europe

Social inclusion is not about halting the irreversible. It is about ensuring that alternative aspects of the human experience are fostered and vindicated. This in itself calls for communities of the marginalised to better define their needs and their potential contribution to the wider societies and communities of which they are part. Rather, they should be seen as integral components of a global effort to ensure that the world passed on to subsequent generations is not a uniform, suburbanised marketplace but a living and diverse collection of richly different communities.

Social inclusion can therefore be seen as an integral element of a reassertion of the primacy of human values in teaching, research and best practice. Overcoming exclusion and marginalisation means equipping students and educational stakeholders alike not simply with the mechanisms to understand social challenges but also, and more fundamentally, to be able to do something about them. Social exclusion implies both a *structure* and a *process* in the ordering of human relations. As a structure, social exclusion relates to unequal levels of ownership of resources, unequal levels of opportunity and unequal levels of privilege and status in accessing goods, services or information. As a process, social exclusion is concerned with categories that historically may vary but are, in whatever form, denied full participation and equality. As a process, it is also further concerned with the forces and groups that, for whatever reason, implement and maintain exclusion.

Managing diversity and equality approaches can be seen, at a minimum, as tools to enable educators to adapt to challenges posed by differentiated populations. In a

wider context, they may be seen as powerful resources to engage with external change processes and tap into levels of creativity and potential produced by radical departures from past certainties. This was the origin of distance learning as enhanced access. It may also be its future, as a rich source of outreach to those excluded.

The critical need for engagement and learning needs to be emphasised. Rights and inclusion are international issues – a fact not as widely represented in professional teaching formation as it should be. The removal of barriers to participation will be about asserting the primacy of a global vision that challenges traditional complacencies and inherited structures. This also emphasises the role ICT can play in achieving best practice and innovative quality. Barriers to equality stem from prejudice and ignorance. The removal of barriers can be addressed by legislation and monitoring practice. Deeper transformation can be achieved most rapidly by educators seizing the opportunities offered by social difference and incorporating them into innovative learning paradigms.

The changes produced in both the human and technical aspects of the globalisation process shape how global education may now include various learning communities previously excluded by reason of prejudice, discrimination or remoteness. We need to support learners across the globe to transcend barriers and address conflict and persistent discrimination by means of skilful application of potent technological tools in the metamorphosis of traditional educational systems to meet unprecedented levels of socio-economic transformation.

Grave problems persist throughout the European Union, despite financial harmonisation and freer movement of goods and labour. Unemployment remains disturbingly high; social and economic inequality has increased with wide variations in access to income; and racism and discrimination have also increased. Most importantly, the grim instability of violence has re-appeared with shocking intensity in the Balkan wars and genocide. Above all, the shock of the crisis has now seen a ruthless focus on neo-liberal responses based on austerity and deconstruction of social welfare systems established over the last 60 years.

The move away from school-based (or location-based) education and training to more complex and flexible forms of learning design and delivery is changing the nature of our understanding of learning. In moving from time-limited curricula to self-study, open-learning and online learning (often in work contexts), this change of understanding alters profoundly the long-established understanding of traditional training and educational approaches and methodologies. The stated reference of education and training to the actual existing social and economic characteristics of the labour market drives learning in the direction of applicability and relevance rather than mere accumulation of formal knowledge.

Writing in 2000, Garrison was fundamentally optimistic about the role of open learning in advancing inclusion.

> This century will see the emergence of a postmodern era of distance education characterised by increased diversity and choice. Such development is made possible by new communication technologies, as exemplified by the evolution of the open universities in their adoption of new models to complement the traditional self-paced, independent learning model of the industrial era.

Although there has been a considerable increase in participation rates and schooling during the last 10 years or so, many young people still leave school without the requisite qualifications, knowledge or skills for open, competitive employment. In addition, they often do not have that love of learning and motivation to learn that is essential for further learning and growth in the rest of their lives. The emphasis on learning for all recognises that education and training are prerequisites not simply for employment (or, even more rudimentary, a "job") but for equitable participation in society.

By 2010, Miles and Singal were arguing that open learning and advanced technologies had not succeeded in tackling underlying assumptions about dependency and inferiority for those marginalised by disability or other factors. Their chapter offered a re-conceptualisation of the relationship between education for all and inclusive education, arguing for greater collaboration and synergy between these currently parallel initiatives, where practitioners and policy-makers can develop more sustainable, context-appropriate policies and practices.

Europe has made an important contribution to shared strategies around learning and social inclusion. Social exclusion means not just a static snapshot of inequality. As stated earlier, it is a set of *processes*, within the labour market, educational structure and welfare systems, by which individuals, households, communities or even whole social groups are pushed towards or kept within the margins of society. It encompasses not only material deprivation but also, more broadly, the denial of opportunities to participate fully in social life. It is associated with stigmatisation and stereotyping.

The experience of the European Union is part of a more general move globally towards integration and coordination strategies based on large regions acting in common. These integration strategies have had different levels of engagement, impact and success. But all share a common characteristic that regional integration is driven by economic issues such as free trade or fiscal harmonisation. As in the European Union, these imperatives ultimately boil down to free movement of labour and free movement of capital. How this is done, however, rests on the ability to harmonise levels around education, competence, standards, assessment and certification. Even if ultimate authority rests in the hands of the nation state, a logical framework of internationally coordinated standards can only happen when approaches to learning, research, educational quality and accelerated skills acquisition are coordinated. From Mercosur in South America to ASEAN in Asia, these issues have assumed ever greater importance as the role of education in underpinning socio-economic integration, prosperity and enhanced inclusion is recognised. In the African Union, we see an extraordinarily productive concentration on the use of advanced technologies to promote quality distance learning (as evidenced by the African Virtual University). Recent initiatives in China, Indonesia and Korea demonstrate the exciting potential of distance learning. But, however worthy individual national efforts are, the potential role of a regionally coordinated and harmonised educational initiative, supported by innovative research resources and imaginative perspectives, holds out even more promise for areas such as East Asia in meeting the challenges of a globalised environment.

It can therefore be seen that international education is now at a crossroads in both its structure and process. The global focus is on mobility, skills and innovation and equitable participation. The EU funding and resources offer significant opportunities, and also the example that transnational action is the only viable method in a globalised world. All this ultimately rests on commitment and passion for community needs. And the European experience in turn demonstrates that innovative learning demands imagination, strategy and vision.

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Correction to: Pedagogical Strategies with Simulation Technology to Enhance Clinical Competence in Nursing Education

Suet Lai Wong, Cynthia Sau Ting Wu, and Lorna Kwai Ping Suen

Correction to:
Chapter 22 in: K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*,
Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_22

The chapter was inadvertently published with one of the co-author's name incorrectly spelt as "Cythnia" instead of "Cynthia."

The correction has now been incorporated by changing the name from "Cythnia" to "Cynthia" and has been updated as "Cynthia Sau Ting Wu."

The updated online version of the chapter can be found at
https://doi.org/10.1007/978-981-15-6591-5_22

K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5_27

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K. C. Li et al. (eds.), *Innovating Education in Technology-Supported Environments*, Education Innovation Series,
https://doi.org/10.1007/978-981-15-6591-5