Leigh N. Wood · Yvonne A. Breyer
Editors

Success in Higher Education

Transitions to, within and from University

Springer

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Leigh N. Wood
Macquarie University
Sydney, NSW
Australia

Yvonne A. Breyer
Macquarie University
Sydney, NSW
Australia

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Contents

1 Success in Higher Education 1
Leigh N. Wood and Yvonne A. Breyer

Part I Transitions to University

2 Student Engagement for Student Success: Pre-commencement Strategies via KickStart 23
Yvonne A. Breyer, Mauricio Marrone, Leigh N. Wood, Murray Taylor and Hajira Shaheen

3 Mentoring for Success: Programs to Support Transition to and from University 37
Christine Chung, Antonia Dykes and Jen McPherson

4 Evaluation Criteria for a Science Access Program: A Case Study at a South African University 59
Johann Engelbrecht, Ansie Harding and Marietjie Potgieter

Part II Transitions Within University

5 Student Approaches to Learning, Conceptions of Mathematics, and Successful Outcomes in Learning Mathematics 75
Priscilla E.L. Murphy

6 The Maths Arcade: A Tool for Supporting and Stretching Mathematics Undergraduates 95
Noel-Ann Bradshaw

7 Practice and Practise in University: What Defines Success and How Does Online Assessment Support Achieving This? 111
C.J. Sangwin

8 Success Strategies for International Students in China 131
Lin Guo

9 Peer Assisted Learning: Strategies to Increase Student Attendance and Student Success in Accounting 149
Mauricio Marrone and Lilia Draganov

10 Student Representation in Large University Courses: A Model of Student Partnership 167
Janise Farrell and Isabella Dillon Savage

11 The Role of Leadership Education: Benefits and Challenges for At-Risk Students 189
Ralph A. Gigliotti

Part III Transitions from University

12 Three Modes of Work-Integrated Learning: Stories of Success 203
Leanne Carter, Jennifer Ruskin and Ashleigh Cassilles

13 Sustainable Employability in Higher Education: Career Development Outside of the Curriculum 217
Clare Hurst, Justine Fowler and Georgia Scapens

14 Transitioning to Professional Work: A View from the Field 229
Sally Hawse

Part IV The Whole Journey

15 Success at University: The Student Perspective 257
Oliver Hannon, Lisa Roisin Smith and Giang Lã

16 Academic Literacy Support: Teaching Along the Continuum 269
Tessa Green, Joshua Dymock and Carol Floyd

17 Program Curriculum Alignment: Designing for Success 287
Susan Hoadley and Joanna Sabri

18 Academic Choices and Perceptions of Success by Students in Mumbai: An Analysis of Socio-Cultural Factors 301
Mohan B. Rao and Minu Mehta

19 Higher Education in Bangladesh: The East West University Experience 315
Mohammed Farashuddin

20 A Curriculum Design Decision as the Starting Point for a Multidisciplinary Research Group 333
Victor Martinez-Luaces

21 Doctoral Student Success: McGill University's Holistic Support Model 343
David Syncox, Lina Di Genova, Alison Crump and Laura Winer

Editors and Contributors

About the Editors

Prof. Leigh N. Wood is an associate dean of learning and teaching in the Faculty of Business and Economics at Macquarie University, Australia. As an associate dean, Leigh aims to work with the faculty to enhance the outcome of students and to make the profession of teaching more enjoyable, effective and efficient. Leigh has a strong record in research learning and teaching. She has produced over 30 journal articles, one research book, eight book chapters, ten edited monographs and two project websites. Her current research interests include transitions to the workplace; discipline-specific academic language development; and mapping course components and professional development for university lecturers (orcid.org/0000-0002-0921-6997).

Dr. Yvonne A. Breyer is the director of learning and teaching in the Faculty of Business and Economics at Macquarie University, Australia. Yvonne holds a strategic position in learning and teaching within the faculty. She mentors fellow academics in professional development and the scholarship of learning and teaching (particularly in assessment and feedback, and integrating technologies into learning and teaching). Yvonne serves on the Academic Senate and has successfully led a number of large projects including the KickStart Initiative that supports students and enhances their learning experience in the weeks before the start of the semester. Yvonne has been involved in a number of research projects and publishes in the areas of assessments and evaluations, teaching and retention, and success in higher education (orcid.org/0000-0003-3936-5050).

Contributors

Noel-Ann Bradshaw is currently the director of Employability for the Faculty or Architecture, Computing and Humanities at the University of Greenwich as well as a senior academic in the Department of Mathematical Sciences. She became involved in higher education after completing a mathematics degree as a mature student and has since gone on to instigate many student-facing projects designed to improve the student experience. She is a senior fellow of the Higher Education Association and is also vice-president of Communications of the Institute of Mathematics and its Applications.

Dr. Leanne Carter is a senior lecturer in Marketing the Faculty of Business and Economics at Macquarie University, Australia. Her research focuses on consumer behaviour, internal marketing, market orientation and employability as a result of the graduate capabilities that are developed as a result of internships and other work-integrated learning activities experienced by students. In addition, Leanne has an interest in learning orientation, business simulations, peer assessment and social marketing. Her latest textbook is *Social Marketing: Good Intentions 2nd Edition*, which examines current social, environmental, health and safety issues affecting individuals and their communities. It provides a critical look at the barriers and challenges to behaviour change. Having 15 years experience in industry before commencing her career as an academic, Leanne's links with industry will ensure strong connections between academia and practice for the future employability of our students.

Ashleigh Cassilles is a professional and community engagement officer in the Faculty of Business and Economics at Macquarie University, Australia. Since she began at Macquarie in 2013, she has worked in the internship and work-integrated learning space where she helps administer the PACE programme to students. Ashleigh uses her industry networks and knowledge of students' learning needs to ensure that appropriate partners are matched with student learning activities in this work-integrated learning space. She is passionate about bridging the gap between university theory and practice and has been involved in placing students in internship opportunities as well as facilitating guest speakers from industry to provide real case studies for on campus units across all faculty discipline areas. Ashleigh has a Bachelor of Economics from University of Sydney, where she majored in Marketing.

Christine Chung is a student experience officer in the Faculty of Business and Economics, at Macquarie University, Australia. She promotes a positive student experience coordinating both a mentoring and an internship programme in the Faculty of Business and Economics. Prior to joining Macquarie 2012, she worked for the Department of Foreign Affairs and Trade in the UK providing consular and passport assistance to Australians abroad. She has worked in both the private and

the public sectors including customer service, international exports and teaching English overseas. Christine has a Bachelor of Arts from the University of New South Wales in Sydney where she majored in Mandarin and Economics. She also has a Cambridge Certificate in English Language Teaching to Adults (CELTA).

Dr. Alison Crump is the academic projects manager in Graduate and Postdoctoral Studies at McGill University, Canada. She manages the development of outreach, training and workshops to support the implementation of graduate policies in the academic community at McGill, such as graduate supervision (training for new faculty and graduate students); tracking Ph.D. outcomes; and progress to degree. She also maintains her professional connections to her former department (Integrated Studies in Education) and teaches graduate and undergraduate courses in second language education and sociolinguistics. She completed her Ph.D. at McGill University (orcid.org/0000-0002-0222-3799).

Isabella Dillon Savage was previously employed at Macquarie University as the student engagement officer with the learning and teaching team. She designed, implemented and managed programmes to enhance engagement and improve students' learning experience. Prior to this, she was engaged as Partnerships and Ambassador Program Manager at national not-for-profit White Ribbon Australia, overseeing programmes designed to promote gender equity and prevent violence against women. For the past year, she has live and worked in Timor Leste, researching and implementing behavioural change interventions to ameliorate the high rates of domestic violence in rural and remote communities. Isabella has a Master's in Development and is currently completing a Master's in Public Health. She is passionate about gender equality, social inclusion and equitable access to education.

Dr. Lina Di Genova is the assessment professional in Student Services at McGill University, Canada. Lina has over ten years' experience in organisational performance metrics. Lina has led monitoring and evaluation of student affairs programmes on topics ranging from orientation to academic advising, student involvement, wellness and alumni outcomes. Before joining Student Services, Lina worked in University Institutional Planning on national assessment initiatives, such as the National Survey of Student Engagement benchmarking programme for the Canadian U15 Data Exchange and graduate education issues. Dr. Di Genova is also licensed, organisational psychologist. ORCID identifier: 0000-0002-0385-0583.

Lilia Draganov is a student support coordinator in the Faculty of Business and Economics at Macquarie University, Australia. She is passionate about leadership and peer learning and the effects that it has on student learning and performance. Lilia is also focusing on helping teaching staff develop and facilitate an engaging classroom environment that empowers students achieve their full potential.

Antonia Dykes is a senior research assistant in the Faculty of Business and Economics at Macquarie University, Australia. She completed a secondment as the First STEP Program Manager in the Faculty of Business and Economics at Macquarie University, Australia, during the research for this book. She has worked across the learning and teaching and curriculum and quality assurance teams at Macquarie University. She has previously worked in the USA and the Republic of Korea. She has a Bachelor of Liberal Studies (Advanced) from the University of Sydney, Australia, and is working towards a Master of Commerce (Business Management and Organisations) at Macquarie University.

Joshua Dymocks is a lecturer in Academic Language and Learning at Charles Darwin University in Sydney, Australia. Before working in higher education, he was a teacher of English as a Second Language. His main areas of interest are in developing the academic literacy of students, as well as working with teaching staff to help them embed academic literacy and the development of English language proficiency into their curriculum. He has also worked on projects aimed at improving student progression and retention rates, and improving the first-year experience through better engagement with students.

Prof. Johann Engelbrecht is a professor of mathematics Education at the University of Pretoria, South Africa. Previously, he was a professor of mathematics and deputy dean of the Faculty of Natural and Agricultural Sciences, and acted as a vice-principal of the University. He is also the current executive director of the South African Mathematics Foundation. He is an active researcher in the field of mathematics education on the tertiary level, and his international involvement in the teaching of undergraduate mathematics includes numerous research and keynote presentations, membership of international scientific committees for international conferences, research papers on mathematics education in international academic journals and joint research projects with colleagues in many countries.

Prof. Mohammed Farashuddin is a professor of economics, and founding vice-chancellor of East West University, Bangladesh, and is a part-time faculty member in the Institute of Business Administration at the University of Dhaka. Professor Farashuddin led a group of fifteen education enthusiasts to establish East West University in 1996 with the mission of providing high-quality university education at reasonable cost. He has been highly involved in Bangladeshi civil service, at a national level as the governor of Bangladesh Bank and an international level as the UNDP Resident Representative. Mohammed studied economics at the University of Dhaka and completed his Ph.D. on the Cost-Benefit Analysis for Computing Shadow Price of Labour, Capital and Foreign Exchange in at Boston University.

Dr. Janise Farrell is the Unit Representative Program Coordinator for the Faculty of Business and Economics, Macquarie University. She also teaches communication and academic skills, and has a background as a pronunciation and listening trainer, academic literacy adviser and English language teacher. Her current

research interests are the practical, business-relevant communication skills developed by students in the FBE unit representative programme, the influence of foreign accent and voice pitch on consumer purchasing intentions, the teaching of bottom-up decoding skills for listening, and the miss-segmentation of connected speech by English learners. Janise has a Ph.D. in speech perception from The MARCS Institute of Brain, Behaviour, and Development, Western Sydney University.

Carol Floyd is an academic language and learning adviser with the Learning Skills Unit at Macquarie University, Australia. She has a background in English language teaching, editing and publishing. Her research interests are academic literacies, teaching writing, international student experiences and pathways, and online literacy materials.

Justine Fowler is a career development consultant at Macquarie University in the Faculty of Business and Economics. Her background is in psychometric assessment, human resources, graduate programmes, and training and development. She focuses on providing students with employability skills through student consultations, workshops and embedding career information in the curriculum.

Ralph A. Gigliotti is an assistant director for the Center for Organizational Development and Leadership at Rutgers, The State University of New Jersey, USA, where he is also a doctoral candidate and part-time lecturer in communication. His research interests explore the intersection of organisational communication, leadership and crisis communication, particularly in the context of higher education. He is the former associate director for Leadership at Villanova University (orcid.org/0000-0001-6060-9270).

Tessa Green is the manager of the Learning Skills Unit at Macquarie University, Australia, where she leads a team responsible for introducing students to the academic culture and building their academic capabilities for success at university and their future employability. She has worked in the academic and professional communication field for more than 15 years and has published in the area of academic literacies. With a core focus of work involving the development of students' communication skills and on embedding academic literacies within the curriculum, she is currently leading a team working on innovative projects in student peer writing, and in developing resources for improving students' academic and workplace ethics.

Associate Prof. Lin Guo is an associate professor of Economics and Management School at Wuhan University, China. Her domain of research is the world economy and international finance. She is teaching international economics and international finance in both graduate and undergraduate programmes. As the director of international programmes in Economics and Management School, she is actively involved in the development and management of international education of

economics at Wuhan University. The Economics and Management School at Wuhan University is the first EQUIS-accredited business school in Central China. She received her Ph.D. from the University of Paris I Panthéon-Sorbonne.

Oliver Hannon is undertaking a Bachelor of Marketing and Media within the Faculty of Business and Economics at Macquarie University, Australia. He has worked in theatre and television as a performer and producer. He hopes to one day enter the film industry as an actor or director while continuing to develop his skill and passion for study, travel and martial arts.

Prof. Ansie Harding is a professor in the Department of Mathematics and Applied Mathematics in the Faculty of Natural and Agricultural Sciences, at the University of Pretoria, South Africa. Although her doctorate was in numerical analysis, her current research focuses on the challenges of teaching and learning mathematics at a tertiary level. Her research contributes to understanding and alleviating the current education crisis in the field of science in South Africa, especially in addressing the under preparedness of school leavers for the transition to university mathematics. She has published extensively on harnessing advanced technology for teaching undergraduate mathematics, investigating exciting new options in teaching. Her overall passion is in the creative side of mathematics, an interest that has led to numerous popular talks both locally and internationally (orcid.org/0000-0002-0059-7455).

Sally Hawse is a knowledge manager in transport. She has postgraduate qualifications in education and human resources. Her research interests include workplace culture, curricular design and learning frameworks that enable knowledge transfer and lifelong learning.

Susan Hoadley is a lecturer at the University of Technology of Sydney, Australia. Before joining UTS in 2016, Susan worked at Macquarie University where she specialised in learning and teaching and curriculum design and development. More recently, Susan's focus has been curriculum and instructional design to develop generic skills, particularly communication skills. Susan has extensive teaching experiencing in higher education including online and blended environments. Susan holds a Ph.D. in education from Macquarie University, a diploma in education from University of New South Wales and a Bachelor of Arts with first-class honours in Linguistics from Macquarie University (orcid.org/0000-0002-5278-9555).

Giang Lã is currently studying for a Masters of Professional Accounting at Macquarie University, Australia. She has been enjoying her education in Australia for more than five years. She also has a Bachelor of Applied Finance.

Mauricio Marrone is a lecturer of information systems in the Department of Accounting and Corporate Governance at Macquarie University, Australia. His current research interests include fashion waves, Big Data and text analytics within the context of information systems. Mauricio is also interested in implementing innovative ways to engage students with learning material.

Dr. Jen McPherson is the academic director of PACE (Professional and Community Engagement) in the Faculty of Business and Economics at Macquarie University. Jen's current role includes teaching and research in work-integrated learning. Other research interests include transformative learning, reflective practice, teamwork, learning analytics and academic reading. In earlier roles at Macquarie University, Jen provided academic leadership to the University's English Language Centre and worked in a team to establish and coordinate a project that integrated graduate capabilities within university programmes including the Master of Accounting. She has also taught academic writing to international students on a pathway to university entry (orcid.org/0000-0002-2697-6779).

Dr. Minu Mehta is head of the Centre of Excellence for Leadership and Entrepreneurship at IESMCRC in Mumbai, India. She is a certified leadership trainer and has twenty-three years of experience in academics and administration including course design, mentoring, industry interaction and pedagogic innovation. Her research interests include entrepreneurship, leadership and gender. She conducts workshops and interactive sessions for students and professionals on a wide range of topics including leadership, change management, experiential learning and gender sensitisation. She was recognised among the Top 10 College Mentors in Human Resource Management in India at the E4 Intercollegiate Summer Trainee Awards in 2015 (orcid.org/0000-0003-0652-2259).

Priscilla Murphy is a learning advisor at the Manukau Institute of Technology in Auckland, New Zealand. Her experience is truly international, she is originally from Singapore and has settled in New Zealand, and she is also a doctoral candidate at Macquarie University, Australia. As a mathematician, her teaching experiences transcend geographical, sociocultural and disciplinary boundaries in the Asia–Pacific continent. Her topics of interest are mathematics education, affective issues, technology in education and curriculum development. Invigorated by her upbringing as a convent girl in Singapore, she believes in enhancing equity in education and values lifelong learning.

Associate Prof. Marietjie Potgieter is the deputy dean for Teaching and Learning and an associate professor of chemistry in the Faculty of Natural and Agricultural Sciences at the University of Pretoria, South Africa. She is an active researcher in tertiary science education. Her research focuses on effective science instruction at tertiary level, particularly within the contexts of academic development and large first-year classes, and issues of student success, such as overconfidence as a non-cognitive risk factor for success and the design of learning environments, both in the class and in the laboratory, to develop metacognitive ability and promote better self-regulation. She is the national representative for South Africa on the Standing Committee on Chemistry Education (CCE) of the International Union for Pure and Applied Chemistry (IUPAC).

Prof. Mohan B. Rao is currently an associate dean (external collaborations) at the India Education Society Management College and Research Centre (IESMCRC) in Mumbai, India. Mohan has played a pivotal role in collaborative groups within IESMCRC as well as forging partnerships overseas including with the University of Applied Sciences Northwestern Switzerland and Macquarie University, Australia. He has more than 25 years of experience in senior management positions with leading corporations in India including Godrej & Boyce, Datamatics Group and Dishnet DSL. He is an alumnus of the Birla Institute of Technology and Science in Pilani, India, and a gold medallist in economics from Xavier School of Management, Jamshedpur, India (orcid.org/0000-0002-8862-8948).

Dr. Jennifer Ruskin is the deputy director of PACE (Professional and Community Engagement) in the Faculty of Business and Economics at Macquarie University, Australia. Before joining PACE in 2015, Jennifer completed her Ph.D. exploring the motivations of social entrepreneurs while teaching across a range of management, entrepreneurship and marketing subjects. Jennifer is passionate about entrepreneurship, social enterprise development, teaching and experiential learning. She is a former Peace Corps Volunteer whose past employers include Women's Economic Ventures, Save the Children and Frost & Sullivan. Jennifer received a BA from the University of Michigan and an MSc from the London School of Economics.

Joanna Sabri is the Senior Academic Program Officer in the Faculty of Business and Economics at Macquarie University, Australia. Since she began at Macquarie University, she has worked in curriculum and quality assurance, primarily the coursework degree area where she helps administer the faculty's programmes and work with staff to improve the educational outcomes for students. Joanna has a Bachelor of Business (Honours) from the University of Technology Sydney, where she majored in Management and International Business studies. She is currently studying for a Master of Accounting at Macquarie University.

Prof. Chris Sangwin is a professor of technology-enhanced science education at The University of Edinburgh. He previously worked at the Mathematics Education Centre at Loughborough University (2014–2015) and in the School of Mathematics at the University of Birmingham (2000–2014). From 2000 to 2011, he was seconded half-time to the UK Higher Education Academy "Maths Stats and OR Network" to promote learning and teaching of university mathematics. In 2006, he was awarded a National Teaching Fellowship. His learning and teaching interests include the following: (i) automatic assessment of mathematics using computer algebra, in particular, the development of the STACK system, and (ii) problem-solving using Moore method and similar student-centred approaches. Chris Sangwin is the author of a number of books, including "Computer Aided Assessment of Mathematics" and the popular science book "How Round is Your Circle", which illustrates and investigates many links between mathematics and engineering using physical models (orcid.org/0000-0002-3725-8625).

Hajira Shaheen is the online education and development coordinator in the Faculty of Business and Economics at Macquarie University, Australia. Previously, she worked as a marketer with several large corporations in India, the USA and Australia. In her current role, she combines her educational academic background with her digital expertise and experience as a freelance editor and radio host to create engaging digital tools to increase the student engagement and success. She holds a Master's in Learning Sciences and Technology and an MBA.

Lisa Roisin Smith is doing her third year of a double degree in a Bachelor of Business Administration with a Bachelor of Arts majoring in Marketing at Macquarie University, Australia. She loves playing sports in her free time and enjoys her family holidays overseas. She plans to find a part-time job in a promotional agency while completing her final two years, and hopes to go to Europe with her friends soon.

David Syncox is the graduate education officer in Teaching and Learning Services at McGill University, Canada. As a higher education professional, David has over ten years experience in managing graduate education initiatives. He manages SKILLSETS, a suite of professional development workshops for graduate students and postdoctoral fellows that complement research training and provide general, transitional and professional skill development opportunities. David also manages the development and implementation of supervision training for professors. He has an MA from McGill University (orcid.org/0000-0002-3355-585X).

Murray Taylor is a lecturer of International Business in the Department of Marketing and Management at Macquarie University, Australia. His current research focus is on service firm internationalisation and rapidly internationalising firms. Murray is especially interested in the internationalisation process of these firms, including their market choices and level of market commitment. Murray is also interested in student engagement and is always seeking new and interesting ways to improve his approach to teaching (orcid.org/0000-0002-3145-4393).

Dr. Laura Winer is the director of Teaching and Learning Services at McGill University, Canada. Her dossiers include course evaluations, graduate education initiatives, the appropriate and effective use of technology in teaching and learning, MOOCs and policy development. She has published and presented nationally and internationally on faculty development issues and integrating information and communication technologies (ICT) into teaching and learning. She completed a Ph.D. in Educational Technology (orcid.org/0000-0003-0209-5798).

Chapter 1
Success in Higher Education

Leigh N. Wood and Yvonne A. Breyer

Abstract Higher education plays a critically important role in society. It contributes to physical and mental well-being for individuals. Higher education has a powerful role to play in improving economic prosperity; it promotes better use of resources and supports sustainable development. However, around the globe, higher education faces many challenges and problems. Higher education is in a state of transition brought on by global competition, massification and advances in technology. The demand for higher education has exploded creating opportunities for wider participation but causing a crisis of resourcing at the same time. New models of learning and teaching are required to support the global demand. Many of the chapters in this book address the challenges and opportunities in higher education around the world. In this first chapter, we examine definitions of success from different perspectives. We propose a transition model of success in higher education: transition to becoming an effective student; transition to higher levels of knowledge and skills and transition to becoming a professional. We propose eight perspectives of success from an individual viewpoint, we propose eight institutional practices that will promote success and (bravely) we propose eight key trends for the future of success in higher education.

Keywords Success · Higher education · Transition · Transformation · International

Introduction

Higher education is in a state of transition. Soaring numbers of students are putting pressure on resources to provide quality education in the context of rising global demand for participation. Technology and knowledge advances are moving fast and the current labour and hardware intensive model of teaching in higher education is

L.N. Wood · Y.A. Breyer (✉)
Macquarie University, Sydney, Australia
e-mail: yvonne.breyer@mq.edu.au

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unsustainable. Outside of universities, well-established industries, such as banks, have moved their routine transactions to online and mobile service models, keeping human contact for high-end and specialised services.

A step-change is occurring in higher education as the demands for participation at lower cost outstrip governments' ability to fund the growth. Higher education in its traditional form is a resource-intensive model, and this will need to change. How will this affect student success? In this first chapter, we propose a transition model of the student journey through higher education which can be systematised and codified for streamlining the journey. We suggest that background demographic and educational factors are less important than real data on student learning that can be provided through the analysis of actual performance. We recommend institutional practices to support success, and we offer an outlook to future developments.

Education is about learning and transforming, about individuals and communities expanding and developing knowledge, skills, personal and interpersonal efficacy. Higher education is linked to better outcomes in life, career opportunities, and even health (McMahon 2009). The ubiquitous demand for better education has resulted in strong enrolment growth in many countries over the world. More people than ever enter university—a development that is often driven by government policies to expand the participation (Marginson 2016). In Australia, this has resulted in an increase from three per cent of Australians with bachelor degrees in the 1970s to 37 % participation in 2014 (Universities Australia 2014).

One of the key challenges of contemporary university education is to expand opportunities for learning to students from non-traditional backgrounds and to sustain learners' motivation and ability to engage effectively and deeply with their learning. Universities must develop conditions under which students from varying backgrounds can flourish and succeed. Providing access to education alone is not enough. Furthermore, universities are increasingly under pressure to not only deliver discipline-specific degrees that produce content experts but moreover, universities are expected to deliver work-ready graduates for a labour market that is undergoing disruption in its own right.

We examine success in higher education and the role of successful transitions by campus studies from Australia and around the globe. The contributions in this book illuminate initiatives that have been successful in assisting students from all backgrounds and in diverse settings to develop their academic potential. We tour the globe in search of strategies that work with different groups because different contexts require specific solutions. Many of the cases are designed and implemented by staff at the coalface and will be replicable by practitioners in other contexts. These rich perspectives present a triumph of practice that has led to the empowerment of individuals and groups that may otherwise not have had a chance to succeed in higher education.

In this book, we highlight the small and meaningful changes that individuals and institutions make to enhance the success of their graduates. The contributions in this book tell ordinary stories with extraordinary outcomes. For many students, just being accepted into university is the greatest achievement of their lives to date. We share the stories of administrators who have made a difference to the experience and

outcomes of students. We share stories of academics who have supported learning for disadvantaged students with excellent outcomes, who have worked to support students in mathematics, technology, engineering, and science (STEM) and students transitioning into and out of university. These stories frequently remain untold as they operate outside of the marketing materials and often in the background, in individual classrooms, but they nevertheless impact the lives of thousands of students and represent great practice that can be replicated elsewhere.

Success and the Importance of Successful Transitions

Success in higher education exists at different levels and may change in meaning to stakeholders at different stages of their journey. On a personal level, it may be acceptance to university, the completion of a degree, migrating to a new country, the dream job, happiness, a great experience, new friends, learning new knowledge and skills, being challenged and growing as a person. At an institutional level, success may be measured by the number of students who complete their qualification, the retention rate, and good results in student surveys and international rankings. For a nation, success in higher education may translate into the increase in human capital to society; and, globally, the development of skills and knowledge contributing to civilised society and bringing wealth and stability to the world (Fig. 1.1).

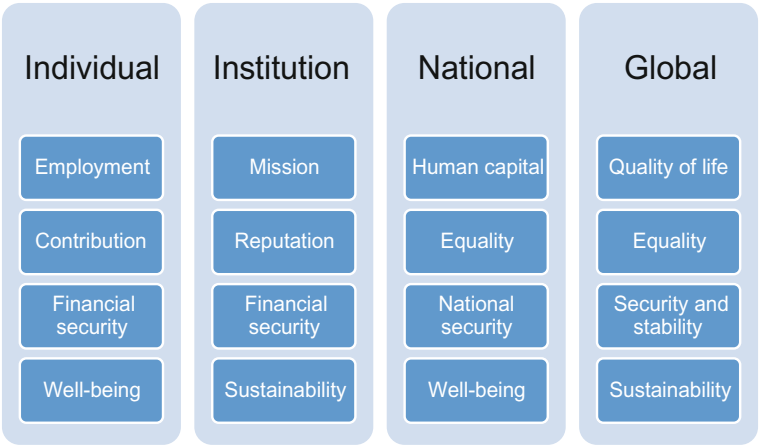

Fig. 1.1 Success factors for stakeholders

National Perspectives

Governments see the importance of higher education and fund it through national budgets, though it is heavily subsidised by personal and family contributions. For example, Australia spends 1.6 % of Gross Domestic Product (GDP) on tertiary education, USA 2.8 %, Canada 2.5 %, UK 1.8 %, NZ 1.9 %, while the OECD average is 1.5 % of GDP (OECD 2015, Table B2.3).

Governments have adopted a "human capital" approach to higher education (Yorke and Longden 2004). One of the most common definitions of human capital is "the knowledge, skills, and attributes acquired by investment in education" (McMahon 2009, p. 41). Higher education is a key contributor to the development of human capital (Sleezer et al. 2004). Campbell and Agbiokoro (2014) believe that capital is a higher level of individual competence which leads to people becoming important resources for organisations and societies which contribute to a more sustainable society.

Human capital is one of the driving forces behind economic development. Investment in education provides economic and social returns both for the individual and for society, especially with globalisation and changes in technology (van der Velden 2013). With investment in human capital, individuals can transfer core competencies or competitive advantage to their community. Different stakeholders such as government, policy makers, higher education institutions, employers, employees, and students have invested in education to improve the stock of human capital.

There is a global discussion about the ideas of the development of human capital in relation to higher education. At the annual meeting of the Group of 20 (G20) 2014, the Business 20 (B20) forum focused on four central issues, with human capital as one of these priority areas. The B20 Human Capital Taskforce Policy Summary (2014) stated that it is important to take action to support innovation, as well as to ensure people obtain the necessary skills and knowledge for the digital age. Graduates need to have the capability, flexibility, and adaptability to participate in the future workforce. It is crucial to align curricula with workforce and industry needs and utilise multiple learning pathways and models. One of the pathways to developing human capital in the knowledge-based economy is the investment in flexible systems for lifelong learning (Nesbit et al. 2013). Previous studies suggested that most lifelong learning opportunities are directed towards enhancing employment and career opportunities which benefit individuals and the economy at the same time (Quiggin 1999). This kind of learning can be regarded as "learning as becoming".

Governments use higher education in policy decisions such as widening participation in that they may facilitate entry and support for targeted groups into education (Thomas 2002). Widening participation has emphasised the importance of taking a life-cycle approach, that is, supporting students not only when they enter university, but also on their entire journey through and beyond it to support their success (Atkins and Ebdon 2014).

Change in Discourse

Over the past decade, there has been a notable change in discourse around student success. The move to discussing success and retention rather than failure and attrition has changed higher education language and practices. It is an area the editors are keen to promote. All chapter authors were encouraged to use positive language and eschew the deficit model of student learning. This discourse change in higher education reflects an opportunity to consider access to higher education not as a barrier but as a challenge to change our thinking and practices to best meet the needs of students in our global higher education landscape.

Tinto (1993) published a seminal work on factors associated with student attrition which has been used extensively. Kuh et al. (2007) have published broadly on student success. This change in discourse from attrition to success occurred after the massive increase in the numbers of students participating in higher education. Based on UNESCO data, Marginson (2016, p. 416) highlights

> Between 1970 and 2013, the world number of tertiary students multiplied by 6.12 while the global population grew by 1.93 … From the late 1990s onwards the expansion of participants accelerated … An increase of 1 % per year means 20 % in 20 years. … This suggests that the worldwide [participation] will reach 50 % inside the next generation. A staggering change.

This increase in participation is reflected globally, particularly in Asia where the demand is strong due to the growing middle class, for example in Indonesia the participation rate grew from 8.5 % in 1990 to 31.5 % in 2012 (Marginson 2016). Universities are no longer gatekeepers; they have become more open with the increase in student places available. We now move into another step-change where demographic and prior learning variables are not the main determinants of student success. In a world where higher education is open to the majority, how people perform in their learning is paramount. Technology is removing some of the prior knowledge requirements and allowing students to succeed without skills that would have been critical in the past. Statistics is an example. Students now use technology to perform computational tasks and the learning is how to use the results and their implications. Technology is also enabling access to courses to anyone who can link to the internet. Is knowledge more important than credentials? What is the value of a higher education qualification?

Becoming a Professional: Sustaining and Nurturing Transitions

We propose a model of student success based on sustaining and nurturing personal and professional transitions. Transitions to university, transitions to higher-level thinking and learning and transitions to life after higher education. We highlight the personal journey, sometimes described as the cradle-to-grave model, and the

professional journey to becoming a professional in a discipline. Transitions form a core component of university learning and teaching—transitions to university, transitions to discipline competency, and transitions from university to the workplace. Gale and Parker (2014) define transition "as the capability to navigate change" (p. 737). They suggest that the transition to university is well studied, well-structured and that there is good evidence that an institution aligned approach is optimal.

Gale and Parker (2014) theorise that there are three conceptions of transition: transition as induction (context e.g. moving from secondary school to university context); transition as development (identity e.g. changing your identity from school student to learning a profession) and transition as becoming (lived experience). They argue that the majority of interventions are in the development area, and the majority of the chapters in this book fall into their conception of transition as development.

We argue that transitions as becoming are much more about becoming a professional in your chosen discipline—having the knowledge, skills, and attributes of that profession. This may reflect our conception of higher education and our work on students' perceptions of the outcomes of higher education. We find the levels of discourse defined by Fairclough (1992) from analysis of components of text, through discursive practice to social practice to be a suitable model for transition as we move through levels of generalisation from interventions at key transitions points, through whole of institution alignment, to the alignment with the needs of professions and society. This is a journey from the individual transitions to the transition alignment of an institution and the alignment with needs of society for professionals: acquiring the resilience, the ability to adapt to changing environments and requirements of that profession into the future.

We have ordered the chapters in this book to reflect these transitions (Fig. 1.2), with several chapters more pertinent to the complete learning journey (Chaps. 15–21). Taking care at the transformative transitions in a student journey will nourish the student and their learning and sustain the institution.

Transitions form a core component of university learning and teaching. We investigate the idea of becoming—learning so that you change the way you view the world (Hager and Hodkinson 2011). For example, when one of the editors (Leigh) sees a waterfall, she sees the Navier–Stokes equation. She has become a mathematician and sees the world through that lens. Yvonne sees the structures and beauty of language. The same happens with a student. They come to university with the idea of studying business (say) and at the end of the degree they have become a business professional—they see the world differently. Transitions particularly interest us because they are times of change: of opportunities and openness to new ideas and new ways of thinking. Conversely, transitions can be times of fear, rejection, and disappointment. For example, a graduate we interviewed for a research project stated:

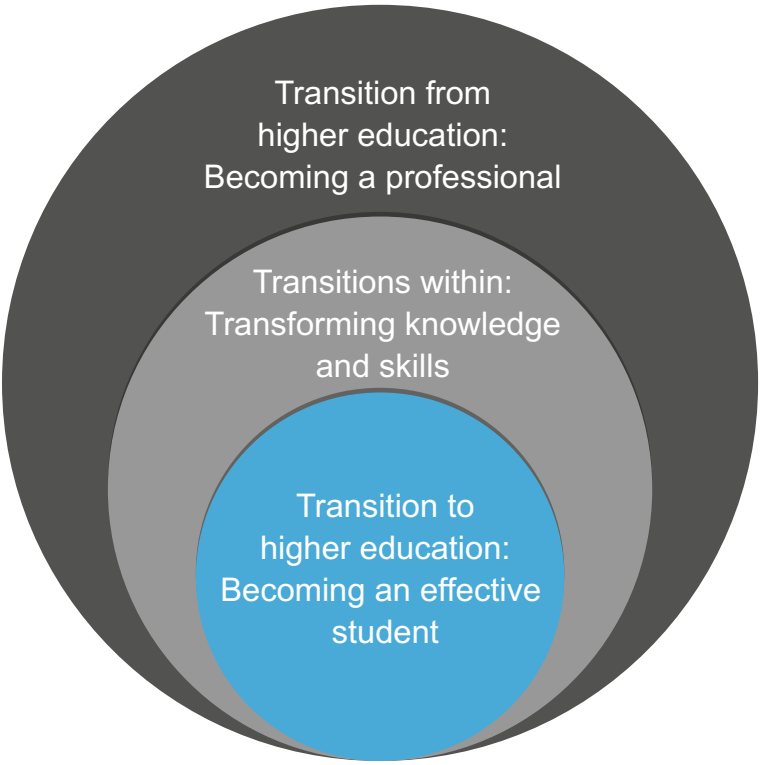

Fig. 1.2 Transition model of student success

> I ended up leaving after a year … because when I first worked in an office, I'd expected there to be much more … I wasn't prepared for the environment. (Actuarial Studies graduate)

This high-achieving graduate was lost to the industry. The transition was not managed well by the university or the employer. Therefore, an important area of research is how universities prepare students for the transition to life after their program and the investigation of the transition itself from all perspectives (see Chap. 14). This is of considerable importance on equity grounds; for example, for students who may succeed at university but find the transition to professional work problematic. Reid et al. (2011) in *From Expert Student to Novice Professional* discuss the transition to becoming a professional.

Learning is more complex and holistic than the acquisition of knowledge. Transforming and becoming form critical parts of learning. Consequently, students must be prepared to participate in learning enabled by higher education institutions. It is a contract between the student and the institution that requires a commitment from both sides to achieve success. Delivering and supporting the conditions for

students to engage as co-creators of their learning outcomes is a key role of higher education.

Extensive research and practice exist concerning the transition to university (e.g. Baik et al. 2015) and much has been done to support this part of the student journey. What is less studied is the development through a higher education qualification and the transition from higher education to further research or professional life.

The role of the academic or professional discipline in higher education is frequently underrated. University is the first time students can focus on an area of study and become a professional in that discipline. There is a strong focus on generic skills from employers and universities but what hooks students into deep learning is the discipline that they have chosen. Research on threshold concepts is highlighting the key concepts in discipline areas (Meyer and Land 2003). This work is focussing attention on disciplines and boundaries between disciplines. Research on this matter is important as it considers the transitional and transformational concepts in the journey to becoming a professional.

The other key transition—to life after higher education—is less well-researched. Following graduates after leaving the institution is a more difficult task than researching students during their studies where data and contact details are readily available. The volume of research on the final experiences of a degree is increasing. Ashwin et al. (2016) have examined dissertations as a capstone experience at the completion of a degree and capstones in business education are commonplace (Bailey et al. 2012). The types of higher education experiences that lead to better transition to professional life are not settled and are much more varied and discipline-specific that the transition to higher education.

Definitions of Success

The most fundamental definition of student success is access to higher education and completion of a qualification (Hurtado et al. 2012; Kinzie 2012; Venezia et al. 2005). The primary indicator of student success is therefore equated with graduation (Hart 2012). In addition to graduation, student success may include occupational attainment after completion (Kuh et al. 2007). Most students enter higher education to pursue career aspirations (Atkins and Ebdon 2014). Because earning a university degree is one of the most important determinants for economic security, education is an investment that yields a high return for the individual and society.

Although equating success with completion and employment is straightforward and relatively easy to measure, it offers limited insight into the complexities of student success. Kinzie (2012) argues that the focus on completion may overlook important processes and outcomes in universities, for instance, the quality of students' experiences and student behaviours; the engagement of students in educationally purposeful activities; the attainment of learning outcomes; and preparation for life. Other researchers consider that to develop a capacity for lifelong learning,

personal growth and development and many other desirable outcomes of higher education should be included in measures of student success (Moxley et al. 2013).

Therefore, it is necessary to have an expanded definition. Student success includes attainment of a qualification but adds other desirable outcomes and aspects of the educational experience itself. The singular concentration on completion rates provides limited insight into the full scope of what may be contributing to lagging completion rates and, more importantly, what action should be taken to improve student success (Kuh 2008). Professional bodies and employer groups emphasise a range of generic skills that are expected of a graduate. The Tuning process in Europe (Gonzaléz and Wagenaar 2008) has done significant work on investigating the expectations of graduates and employers.

However, the concentration on the requirements of employers and short-term employment outcomes may limit educational experiences and limit longer-term outcomes. As has been shown in the Tuning data, employers are looking backwards to what was needed previously. Given that it takes at least 3 years for a student to graduate and longer processes for universities to change their programs, it is important to examine the future needs of society and graduates. Suggestions include:

- Skills, capabilities, and attributes to be successful in a global economic and business environment (Owens and Tibby 2014)
- Innovative, creative, enterprising mindset, adaptable
- Work ethic
- Work creation (becoming employers, not employees)

Higher education institutions are embedding the development of employability capabilities and including opportunities for students to gain professional experience as part of their degree because this assists in the transition to professional employment.

Students and their families, first and foremost, want a qualification to achieve financial security—that is, a good job and a good life. Lifelong learning, personal growth, and learning for its own sake are by-products that a university will include in the curriculum in the belief that these will have a long-term benefit and the evidence that student experience inside and outside of the classroom helps with success. A transition model for student success will support curriculum designers to include opportunities for transformational learning as well as the development of employability outcomes.

Student Success from Personal and Professional Perspectives

From our contributors and the literature, we propose eight perceptions of student success in higher education from the individual perspective. These are the key drivers of students on their journeys through higher education. These factors, rather

than demographic and educational variables, are the motivators and enablers to succeed in higher education.

- The ability to choose and plan their future—to choose an area to focus on, to become, to see themselves as a professional in a discipline rather than as a student;
- Acceptance into university—a source of pride and achievement;
- Meeting the expectations of families—parental pride;
- The realisation that effort and hard work achieve outcomes—self-efficacy, persistence, confidence and resilience;
- New ideas—the importance of expanding minds and developing new and deep skills in a discipline; excitement and interest;
- Happiness and enjoyment—the importance of belonging, of feeling safe and secure;
- The prospect of future employment and a stable future;
- The opportunity to make a contribution to the community.

Institutional Practices for Success

Distilling ideas from the literature, our contributors, and our experience, we propose eight key institutional practices. These should be considered in conjunction with the perceptions listed above when embedding success strategies. All of these can be enhanced by technology and systems support. Where high-touch is required, the use of peers and students as partners is recommended.

- A clear path to success—a well-communicated student journey from the start of their program, through transitions to graduation with clear expectations.
- The astute use of technology to streamline, enhance, communicate and document the student journey.
- Purposeful interactions with faculty and peers to promote a deep sense of collaboration in learning.
- Strong connections with community and industry.
- The importance of happiness—activities in and out of the curriculum to laugh and play, to experiment and fail in a safe environment.
- Respect for students and their individual journeys.
- An institution-wide commitment to student success.
- Early intervention for support based on performance and engagement analytics, not prior variables.

Why is Success in Higher Education Important?

> The benefits of education aren't only financial. Adults with higher educational attainment are more likely to report that they are in good health, that they participate in volunteer activities, that they trust others, and that they feel they have a say in government. In other words, more highly educated adults tend to be more engaged in the world around them. (OECD 2015 p. 1)

Our social and environmental problems are not simple. We need individuals and communities of deep and effective learners to tackle the issues of society and the environment and our place within it. Curricula and the delivery of learning should reflect these issues and prepare students for a life of service to their communities and the planet.

Education is about learning, about individuals and communities expanding and developing their knowledge, skills, and personal and interpersonal efficacy. Educated societies are good for humanity and social equity. Education helps individuals to unlock their potential and increases their likelihood of higher pay. It is one of the best pathways to improving economic prosperity and contributes to physical and mental well-being (OECD 2015). Individuals are happier and more stable. Families have better economic prospects if family members are more educated.

> On average, over 80 % of tertiary-educated adults are employed, compared with over 70 % of people with upper secondary or post-secondary non-tertiary education, and less than 60 % of adults without upper secondary education. Tertiary educated adults also earn about 60 % more, on average, than adults with upper secondary as their highest level of educational attainment. (OECD 2015 p. 1)

Education also benefits the wider economy by creating jobs, creating employers, and stimulating long-term economic growth, innovation, and competitiveness in the global economy. Another implication of education is it helps the better use of resources and sustainable development. The education of women, in particular, delivers significant outcomes.

Concerns with Higher Education

OECD data shows that, in general, attainment of a higher education qualification is beneficial at all levels: individual, community, national, and global. There are diminishing returns, with doctoral qualifications often not providing the financial and personal gains of bachelor and master's degrees.

However, there are clouds on the horizon. As the current outcomes rely on past longitudinal data, it is not clear whether participating in higher education will have the same effect in the future as in the past. The explosion of student numbers in higher education since 1990 may dilute the effect of having that education. There may be an oversupply of graduates, that is, there may be insufficient graduate-level employment opportunities for the number and type of graduates—there may be a general oversupply of graduates, or a surplus in specific areas. In Australia, for

instance, there is an excess of education graduates for the number of teaching roles available. This requires a pedagogical answer from universities—we are not producing graduates for employment but to be the employers of the future. Too many graduates are not a problem if they have the skills and attributes to create prosperity for themselves and their communities.

Other problems may be poor-quality programs and outcomes, or outcomes that are not aligned with industry or society's current needs. Nonetheless, outcomes that are too specific and do not develop skills and attitudes for resilience are clearly not appropriate for higher education. National and international regulations and quality frameworks are assisting in the assurance of quality outcomes.

The funding of higher education in response to widening participation is causing budget difficulties with an increasing proportion of the cost of participation falling onto students and their families since they are seen as the chief beneficiaries of the education. This could limit the participation of disadvantaged groups and, in countries such as Bangladesh, there are simply not sufficient university places for the population.

The cost of delivery and current business models for universities will change with lower cost models, such as massive open online courses and streamlined ways to achieve outcomes. Is the current higher education model sustainable?

Research is an important but expensive component of the university mission and culture. The interaction of research with teaching broadens and deepens student learning and the student experience. Is this under threat due to funding?

Nevertheless, as we see it, higher education has grown and developed over the past 1000 years and will continue to do so because the benefits to participants are so high. The initiatives in this book are a small sample of the remarkable work that university faculty and administrative staff are doing every day to improve the outcomes for their students. All of the initiatives in this book are real—they are working, and they contribute to students succeeding on their journey to becoming a professional and making a contribution to global prosperity.

The Journey to Success: Transitions to, Within and from University

The purpose of this book is to give readers insights into the practical implementation of interventions that have been proven to work in both regional and global contexts. The editors lead a team of academic and professional staff at the Faculty of Business and Economics at Macquarie University in Australia. The Faculty is home to around 15,000 students at any time from many different backgrounds. Since 2006, the Faculty Learning and Teaching team has grown from one academic member to a team of four academic and sixteen professional staff who are responsible for student experience, curriculum design, and innovation, support for learning technologies and work experience career opportunities.

There are several markers that have influenced the nature and size of our cohort as well as the strategies and initiatives conducted by our team in line with the larger Macquarie University community. The removal of student quotas following the 2008 Review of Australian Higher Education contributed to an increase in student numbers and also to a more diverse cohort. Changes in local economies, shifts in the labour market, the strong forces of developments in technology and the increased numbers of graduates have brought into sharp focus the employability rates of university graduates.

Over the past 10 years, the activities of the Learning and Teaching team have expanded from teaching support to a coherent set of activities that are aimed at providing not only quality education but also a distinguished student experience. At the same time, the number of academic staff (faculty) has grown only slowly. This shift from the 'sage on the stage' model of teaching to a seamless real and virtual learning experience explains the increase in administrative and learning support for teaching staff and students.

We invited colleagues in higher education from around the world to share their stories of success. There are chapters on undergraduate programs, STEM, post-graduate Masters programs, one chapter on recent graduates, one by students and one chapter at the doctoral level. Here we present an overview of the rest of the book.

Part I: Transitions to University

Transitions to university form a major part of the literature that is available on student success practices. In particular, studies around creating a successful first-year experience have formed a major part of the studies already available. In this section, we have focused on three specific programs that assist the transition to university. Breyer et al. (Chap. 2) present a student induction program that delivers a transitional aid based on the curriculum that can be delivered online and at scale. Chung, Dykes and McPherson (Chap. 3) discuss two mentoring models that students can engage in with academics (transition to university) and with industry mentors (transition to professional work). Engelbrecht, Harding and Potgieter (Chap. 4) highlight the challenges to attract and retain students into science (STEM) programs in a South African university and presents the case of an access program that supports students' transition into this important area.

Part II: Transitions Within University

Transitions and success are occurring for students throughout the lifetime of their degree. In this part of the book, a range of case studies from the United States, China, New Zealand, Australia, and the United Kingdom deal with transitions

through university. STEM subjects are a particular focus here. Student success in STEM subjects has become a matter of national priority. This is reflected in the number of contributions in this book that focus on mathematics as this subject is often considered a gate-keeper subject to other STEM subjects. In Chap. 5, Murphy presents a New Zealand study that that aims to develop deep learning in mathematics and, as a result, produces better learning outcomes for learners. Students need to make a successful transition from secondary to tertiary mathematics to complete the mathematics requirements for an engineering degree. The study proposes clear implications for curriculum design, teaching activities, and assessments that can easily be adapted to other contexts and will contribute to better student outcomes. Bradshaw (Chap. 6) presents a case study of a mathematics program that was designed to engage and support students at a university in the UK with a diverse student body in terms of family income, social class, and cultural origin. The chapter contains rich information about the program itself and factors to consider in its implementation as well as valuable analysis of student outcomes and feedback. Sangwin (Chap. 7) also hails from the UK and examines the alignment (or misalignment) of current assessment practices in university mathematics and definitions of success in university STEM subjects, as articulated in published policy statements. The author highlights the common focus on procedural correctness rather than on broader, desired skills such as problem-solving. Finally, Sangwin provides valuable considerations of how technology can support a stronger focus on complex tasks through sophisticated online assessments.

Chinese students have been strongly represented in increased global mobility and have entered higher education as international students. It is more recent that Chinese higher education institutions have begun to attract inbound international students. Guo in Chap. 8 provides insight into how a lecturer in a large Chinese university has attempted to improve student outcomes through addressing their individual educational backgrounds and cultural diversity.

Back in Australia, Marrone and Draganov (Chap. 9), investigate the factors that lead students to attend a highly successful learning support program (Peer-assisted Learning, PAL) with important implications for student learning and engagement. The literature on student success shows that peer learning programs and initiatives have produced better student outcomes. They all have one thing in common, and that is, as soon as students attend, they almost always demonstrate better outcomes as a result. The challenge is to attract students to these programs (many of which are voluntary) and find out more about how students negotiate and manage their learning. Marrone and Draganov delve into this dilemma and investigates the reasons that make students engage with the PAL program. The results are a list of recommendation for administrators and academics that may be usefully employed with different cohorts to encourage participation in such programs.

Farrell and Savage (Chap. 10) describe a student representative program in a large, Australian business faculty. While prevalent in some parts of the globe, these programs are not a default option everywhere. The chapter provides valuable insight into the setting up and running of such a program. The evaluation shows that students experience an increased engagement and feeling of belonging, they

business-relevant communication skills and experience enhanced opportunities for social interaction. Lecturing staff engagement is also an outcome.

The final chapter (Gigliotti) in this section focuses on how to re-engage disconnected students at risk through a leadership education program. The study from North America demonstrates that participation in this program can provide students with critical experiences for self-awareness, discovery, and fulfilment. The chapter explores the importance of leadership education as one approach to cultivating student success in higher education, particularly in equipping at-risk students with the communication skills and co-curricular opportunities to succeed.

Part III: Transitions from University

Success in higher education does not end with the student's graduation. In fact, graduate employment rates have emerged as a significant marker in international university rankings and is a clear factor in students' perception of success. Thus, universities are developing ways to provide students with industry and external experiences throughout their degree. Chapter 12 is presenting three different approaches to integrating work experience in degrees: internships embedded in the curriculum, business-mentored competitions, and classroom-based projects. The three different types of industry engagement provide a valuable opportunity for thousands of students to gain work experience embedded in their degree every year at Macquarie University.

In Chap. 13, the authors present a range of extracurricular career-oriented student activities that are aimed at increasing students' long-term employability. These initiatives provide students with valuable networking opportunities that will add greatly to their ability to transition successfully from university to professional life.

In the final section of Part III, Chap. 14 provides an in-depth investigation into the question of what is a successful transition to professional work for engineering graduates using surveys of graduates. The chapter provides constructive recommendations for both industry and academia on how to bolster successful outcomes for engineering graduates.

Part IV: The Whole Journey

The final part of our book brings together contributions that cover transitions through a whole qualification or add a holistic view across the student journey.

Chapter 15 adds an essential perspective—one that is at times too easily neglected—the students' view on what success means to them. Three students, Oliver, Lisa, and Giang, came together to discuss and explore what success means to them personally. Also, they interviewed 57 other students. Overwhelmingly, it became clear that success at university was a deeply personal matter to the students

and that happiness, family, and friends were much more at the forefront of their minds than top marks and landing the dream job in a big company. The students' insights in this chapter provide a great opportunity for higher education institutions to reflect and review their strategies and initiatives.

There are many centres and offices in universities that work on supporting student success. At Macquarie University, the Learning Skills team discuss their approach to providing equitable and sustainable assistance to developing academic literacy in Chap. 16 (Green et al.).

One notable shift that has taken place at many institutions is the focus on programs of study rather than individual units of study. Aligning the requirements from employers, accreditation bodies, as well as the institution itself in coherent programs, is not an easy task. It is one that has potential to successfully 'entrap' learners in a web of maximum learning opportunities (Biggs 1996). Hoadley and Sabri in Chap. 17 discuss the potential of achieving this task successfully in respect to discipline-specific skills and at the same time extending this to embed highly-sought after generic skills through a program-based approach.

Participation in tertiary education is growing in many countries. India is an example of the huge growth of student enrolments in higher education institutions. The study presented by Rao and Metha in Chap. 18, hails from the IES Management College and Research Centre in Mumbai and investigates the academic choices students make when enrolling in postgraduate education. The findings reflect a positive and notable shift in Indian society towards more gender equity. However, the authors further observe the potentially negative implications of marks-based admission strategies that are currently standard. They argue for a review of these strategies to ensure that the very large numbers of entrants into higher education are selected on more than marks so that they are suited to their study program.

The rates of participation in higher education in Bangladesh have grown by a staggering amount from 31,000 to 3.1 million over just two generations. As a result of such extreme increase in demand, private higher education was introduced in the 1990s. Chapter 19 provides a fascinating close-up view of the journey of one of these private institutions narrated by Mohammed Farashuddin the founding Vice-Chancellor himself from the early beginnings through to today.

While some countries have experienced massive increases in participation in higher education, others, such as Uruguay, have had to contend with economic difficulties that have impacted higher education as much as other areas of the society. Martinez-Luaces in Chap. 20 reports on a curriculum renewal project in STEM that ended up as a successful combination of teaching and research.

It is appropriate that we round off our contributions with a holistic approach to doctoral student success contributed by Syncox, Genova, Crump, and Winer. The model developed at McGill University in Canada focuses on an outcomes-oriented definition of success for PhD students. It highlights the cultural shift from a focus on traditional definitions of success to a broader understanding of success in the sense of wellness that ultimately lead to excellence and success for both students and the institutions themselves.

What is in the Future for Success in Higher Education?

The editors see an inspiring future for student success in higher education, and here we identify key trends that we consider will affect the sector and student success in the short to medium term:

1. Administration. System innovation will transform the communication and recording of the student journey and document the knowledge and skills achieved. This may also lead to a development of the campus as real and virtual social networks.
2. Learning management systems. Personalised learning experiences are part of the affordances by new and sophisticated systems. These will enable exciting blended-learning opportunities in collaborative environments that can be tailored to individual needs and requirements.
3. Analytics. Real-time performance and engagement will be used to identify students in need of support instead of background demographic and educational variables.
4. *Flearning*. Students and staff will be able to try and fail. The current model of student success relies on avoiding failure by both students and university staff—which can stifle innovation and risk taking. Opportunities to "flearn—fail and learn"—in a safe environment will become a feature of success.
5. Threshold concepts. The key discipline concepts will be identified and taught to students.
6. Connections. Technology-enabled connectivity between people will allow for mentoring between students and external partners to enhance the transition to professional work.
7. Mobility. Global choice will increase as students and institutions facilitate opportunities to work and study internationally.
8. Cost. The cost of university education will drop, and more people will be able to access higher education, leading to an increase in global prosperity.

Names and Terminology Used

Unless clearly stated, in this book people's names used for direct quotes are pseudonyms. We have used gender- and culture-neutral names (such as "Kim"), unless the gender or background was relevant to the situation. Ethics approval was obtained for all research and evaluation.

Terminology is difficult in a book such as this one. Even within the same country terms such as "course" may mean a whole degree of 3 years or a one-semester unit of study within that degree. In the UK, "module" is used to mean a unit of study, while many in New Zealand use "course" or "paper" to mean the same thing. Given the wonderful variety of terms and contexts, we have not tried to standardise but

instead to explain the usage of the terms in the setting. If this is confusing for us—image how confusing it is for students and families. We have also not explained every detail of the education systems in the countries represented in this book and leave it to the reader to look up these details if interested—and we recommend that you do—you will certainly learn a lot about different education systems.

We deem higher education to be post-secondary university or college education. We do not examine vocational education (apprenticeships and so on) while acknowledging that this sector makes a huge contribution to post-compulsory learning.

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Part I
Transitions to University

Chapter 2
Student Engagement for Student Success: Pre-commencement Strategies via KickStart

Yvonne A. Breyer, Mauricio Marrone, Leigh N. Wood, Murray Taylor and Hajira Shaheen

Abstract Australia's large and diverse student cohort challenges our universities to provide innovative and integrated ways of supporting students at an appropriate scale. In response, we developed an initiative called KickStart to help students become more engaged with their unit (i.e. subject) content and feel better prepared and motivated at a critical stage of their studies. This paper investigates student uptake and perceptions of this online initiative, the delivery of which commenced 2 weeks before the start of the semester. A student survey (n = 1165) delivered evidence for a high student uptake. In addition, students reported that KickStart provided them with a useful start and helped them to understand learning outcomes. This initiative highlights the value of providing students with online resources and activities tailored to the unit content in the lead-up to the semester.

Keywords Motivation · Preparation · Student engagement

Introduction

The landscape of higher education has shifted dramatically over the past two decades. Student satisfaction, retention, and success have become key drivers for major strategic initiatives undertaken by Higher Education institutions (HEIs). Policy changes in Australia with the aim of widening participation in higher education have led to a large and diverse student cohort in universities (Bradley et al. 2008; Devlin and O'Shea 2011). Within this cohort a wide range of student backgrounds can be found, differing in their reasons for studying, their level of academic preparedness and ability to cope with university study. As a result, optimising the student experience at a "whole-of-cohort" level has become of

Y.A. Breyer (✉) · M. Marrone · L.N. Wood · M. Taylor · H. Shaheen
Macquarie University, Sydney, Australia
e-mail: yvonne.breyer@mq.edu.au

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particular importance to HEIs in order to provide this changing demographic of students with the best possible chance of progressing successfully through their studies. The beginning of their learning journey is as a critical phase and many activities with and for students focus on supporting their transition to and orientation at university. Social, physical, and academic resources assist students in their transition to tertiary studies (Cohen et al. 2012).

There are of course many factors that may influence a student's successful progression through their studies. Among these, student engagement—that is the student's involvement in educationally purposeful activities—has long been recognised as a critical factor for student success (Goodsell et al. 1992; Kahu 2013; Krause 2011; Krause and Coates 2008; Kuh et al. 2008; Nelson et al. 2012a; Thomas 2012; Tinto 2010). Furthermore, motivation and preparation for learning contribute positively to student success (Gilbreath et al. 2011; Krause 2011; Kuh et al. 2011; Ramsden 1997). An analysis of two decades of first-year student experience surveys has shown that while overall student satisfaction with teaching has increased significantly, 30 % of students report difficulties getting motivated and coping with studying (Baik et al. 2015). Thus, this is an area in need of intervention. There is a wide range of pre-semester programs that aim to help prepare students for their studies; these are generally delivered in the form of workshops (run over several days, sometimes weeks) relating to increasing skills in language, writing, academic literacy, or technology, to name just a few, or to prepare students to study abroad. The challenge for institutions is, as Nelson et al. (2012b) have rightly observed, to "integrate such efforts into regular teaching and learning practices" (p. 83) in a whole-of-cohort approach. In the context of having to deliver initiatives at a scale appropriate to very large student numbers, achieving this is a particular challenge.

The initiative reported in this chapter is located within the context of designing and improving orientation and transition strategies for a large student cohort. In particular, it addresses a perceived gap that exists at the level of the teaching unit and unit content, with a particular focus on student engagement, preparation, and motivation. At the institution where this research was conducted, students can normally access two unit-specific resources prior to the beginning of the semester: firstly, an entry in the University handbook which is a formal, government-compliant resource consisting of a brief summary and information regarding the relevant degree and specialisation; secondly, a more detailed unit outline which, according to institutional policy, needs to be made available to students at least 1 week prior to the beginning of the semester. Both of these documents are characterised by their formal language and brevity of information. As a result, students often do not engage with the actual content of their unit before the first day of the semester, which is a time that can be overwhelming and stressful for students. In response to this, an innovative program, KickStart, was created and piloted. The aim of the initiative was to help students be better prepared; to have a useful and positive start to their studies, to engage them with the subject matter early, and to help them build connections between their previous knowledge and the subject. The preparation of the KickStart packages involves the unit convenor, careful

consideration of the unit learning objectives and a clear engagement with the unit topic. The resources created are aimed at the cohort as a whole rather than only a specific group. They are based on the particular unit content and tightly integrated into the unit delivery as part of the online component of each unit.

KickStart packages contain videos, the course outline, readings, relevant games, and quizzes. They are developed collaboratively with the unit convenor. The unit content and learning outcomes inform the design and content. The packages target the cohort as a whole, link tightly to the unit content, and integrate fully into the unit delivery through the unit's online component. Seery and Donnelly (2012) support this approach of integration rather than additional provision of face-to-face content. This paper investigates student uptake and perceptions of KickStart in the Faculty of Business and Economics at Macquarie University, based on the results of a survey we administered to the participating students.

Methodology

Context and Design of the Study

Our study investigates student uptake of the KickStart project during the pilot phase as well as their experience of and attitudes towards this pre-semester initiative. The study took place at the business school of a mid-size university (approximately 39,000 students) in Australia. Most of the units (subjects) in this school are delivered face-to-face; however, all units have an online presence using Moodle, a Learning Management System (LMS).

For the pilot phase, KickStart packages were developed for two units offered by the Faculty which have large student enrolments: Global Business (BU200) and Financial Maths (FIN100). FIN100 is a first-year unit which had 1090 student enrolments in Semester 1, 2014. BU200 is a second year unit and had 465 student enrolments in that same semester. The KickStart packages became available for these cohorts 2 weeks prior to the beginning of the semester. Students who had enrolled in either of the units were sent an email to their student account as well as an SMS alerting them to the availability of the KickStart content.

Resources and Activities Created for KickStart Units

Materials developed for KickStart consisted of a mix of resources and activities. The course lecturer and the authors of this paper jointly developed the KickStart packages.

Unit Introduction video: Students are more confident and motivated in their academic pursuits when they perceive faculty members as approachable, respectful,

and available outside of the classroom (Komarraju et al. 2010). The introductory videos (up to 2–2½ min long) allow the convenor to introduce the subject matter and themselves. The convenors were encouraged to relate the unit content to students' previous knowledge. The videos highlight to students that they already possess skills, assumptions, and experiences that relate to their chosen unit of study. An extract from the script for the KickStart introduction to the unit on Global Business demonstrates this approach:

> We are surrounded by the influences of international businesses. From the car that you drive, the pens that you use to the university that you attend … Have you ever stopped and wondered about the international businesses that are behind the drinks that you drink, the phones that you phone … Chances are they are products produced internationally … Indeed, more firms than ever are internationalising.

Expert video: In this video an industry expert briefly discusses the significance of the unit for future employability.

> Many of the companies that our students will work for are global companies. Students immediately become more employable once they have an understanding of global business.

Student's view video: A past student of the unit speaks about their experience of the unit. This peer-to-peer video includes tips on how to get the most out of the unit.

> To succeed in this unit you really need to do your research. Going into detail, not just answering the question but also do an analysis of the issues behind the question, understanding why certain issues are occurring, the history behind certain countries – these things will really set you apart from the crowd.

Prerequisite skills: Some units require students to have specific knowledge of topics either previously covered in another unit or more generally, such as mathematics. These activities allow students to review their knowledge in advance.

Games: These games are purposely designed and relevant to the unit content. For example, the Logo Game is a simple question-and-answer game. It challenges students to draw on their knowledge as consumers to identify business logos from global companies. In the confirmation of their answer, students receive additional information on how this relates to content taught later on in the unit.

Readings: Providing the Readings list gives students the opportunity to get organised early. Where possible, a small percentage of the textbook was made available to allow students to have access to the materials during the first 2 weeks of the semester.

Data Collection

We distributed a paper-based survey during the third week of the semester. It was taken to all 20 tutorial groups of BU200 (455 students were present, that is, the sample size was 97 % of the total population) and, due to resource restrictions, to 26 of the 41 tutorial groups of FIN100 (710 students were present, that is, the

sample size was 65 % of the total population). As a result, the survey was administered to 71.2 % of the total number of students studying the two units. The response rates were very high for both: for BU200 the response rate was 83 % and for the FIN100 sample the response rate was 96 %. The key questions that this study explored were:

1. What was the student uptake of KickStart?
2. Which KickStart components did students work through; and which did they find beneficial?
3. What was the general student feedback on the KickStart initiative? Did the KickStart initiative prepare them for the unit learning?

The survey consisted of three sections and incorporated both quantitative and qualitative responses. The first section of the survey investigated the effectiveness of our communications about KickStart. The second section asked students to indicate perceived benefits they considered they had gained from the KickStart package; components they had viewed or worked through; ones they found useful; and ones they would like to see in future iterations of KickStart. The third section included an option for open comments where participants had the opportunity to provide general feedback and suggestions for the future.

Findings and Discussion

Student Uptake of KickStart

The student uptake of this initiative was measured in two ways, firstly through anonymised and aggregated log data gathered from the LMS; and secondly, through self-reports by students. Evaluation of the LMS data showed that, on average, half of all the enrolled students in each unit viewed or worked through at least part of the KickStart resources before the first week of lectures (i.e. Week 1).

The percentages in Table 2.1 show that 780 students across both units engaged with the unit content at some level *before* the first day of the semester. Almost the entire cohort of FIN100 had accessed the KickStart resources by the end of Week 1, while two-thirds of the BUS200 cohort of second year students had accessed the package by then. The students were unfamiliar with KickStart and many were students new to the University. The high and consistent uptake of the initiative across both units is a good indicator of the success of the project.

Table 2.1 Students' interactions with KickStart

	FIN100 (n = 1090) (%)	BU200 (n = 455) (%)
Before Week 1	49	52
By end of Week 1	47	11
After Week 1	4	37

Table 2.2 Students' reasons for not accessing KickStart before semester start

		FIN100 (n = 119) (%)	BU200 (n = 65) (%)
Cat 01	Did not know it was available	20	29
Cat 02	Did not know what KickStart was, didn't know it was necessary/useful	27	14
Cat 03	Couldn't or wouldn't engage before semester	30	36
Cat 04	Found it without receiving prior notification	10	19
Cat 05	Didn't access due to technical issues	4	0
Cat 06	Repeating or not 1st year, didn't think it was necessary	9	2

Survey respondents who reported that the KickStart message had not prompted them to access the unit online were able to leave a comment about that choice. The responses were divided into categories through a process of open coding in a non-hierarchical manner (Strauss and Corbin 1990). Grounded codes emerged from their answers which informed the creation of six categories.

A closer look at those reasons in Table 2.2 reveals the that on average, only one-third of all those respondents who indicated that they chose not to access KickStart before the semester did so because they would not or could not do so (Cat 03):

> Was still in holiday mode so wasn't interested in checking. I also hate maths so was even less inclined to check. However! I probably should have looking back at it. (FIN100)

> Busy with work. (FIN100)

> I was on holidays. (BU200)

> I wasn't worried about uni at the time. (BU200)

In summary, the results indicate that most of the students were interested in engaging with the unit content before the beginning of the semester. Only a small percentage indicated that they would prefer not to spend time on university-related activities during the semester break.

Opinions on Components of KickStart

The following discussion considers only those respondents who accessed KickStart resources and activities. As a result, 259 out of 377 (68.7 % of the total) received responses for BU200 were considered; and 432 out of 681 (63.4 % of the total) responses were considered for FIN100. These responses form the basis of the analysis in Table 2.3.

The results in Table 2.3 indicate that the Unit Guide was by far the most frequently viewed KickStart resource, followed by the *Unit Introduction* video.

Table 2.3 KickStart resources worked through/found useful

	FIN100 viewed/worked through (%)	FIN100 found useful (%)	BU200 viewed/worked through (%)	BU200 found useful (%)
Unit intro video	55	68	67	78
Unit guide video	N/A	N/A	63	58
Unit guide	81	78	83	91
Logo game	N/A	N/A	57	44
Student's view video	26	50	28	60
Readings	N/A	N/A	37	66
Expert view	N/A	N/A	19	54
Unit study tips	48	80	N/A	N/A
Video example (Buying a car)	27	46	N/A	N/A

However, when examining which resources students found most useful, students in the first-year unit found the Unit Study Tips most useful (although only half the students had viewed those tips). These results suggest that both the Unit Guide and Unit Study Tips are prime areas to focus on when developing materials for initiatives like KickStart.

Perceived Student Benefits of KickStart and Their Link to KickStart Components

The students were asked to indicate which benefits they considered they had gained through the KickStart package ("The KickStart package helped me to … [tick as appropriate]"). Table 2.4 shows the results for this question.

Both student cohorts indicated that the two main benefits of the KickStart package were to "better understand the unit objectives" and to "have a useful start to my studies in this unit". We then explored the linkages between benefits and KickStart components. A total of 12 binary regressions were performed to

Table 2.4 Perceived benefits of KickStart

	FIN100 (%)	BU200 (%)
Better understand the unit objectives	59	65
Feel confident about taking this unit	27	32
Relate the unit subject material to real-life situations	12	19
Confirm my decisions about taking this unit	16	30
Feel part of the unit community	10	12
Have a useful start to my studies in this unit	50	54

determine the relationship between each of the dependent variables (perceived benefits) and the independent variables (KickStart components). A binary regression was fitted to the data to test the likelihood of receiving one of the perceived benefits, depending on which KickStart components students had accessed. The regression models were statistically significant as Table 2.5 shows.

The results of the binary regression analysis presented in Table 2.5 indicate that the *Unit Introduction* video in particular was a strong predictor of helping students to better understand the learning objectives. In the first-year unit, both the unit guide and the study tips provided students with a useful start. BU200 students who had watched the *Expert's view* video were 25 times more likely to select the benefit "Relate the subject to real-life situations". Students in FIN100 were 1.6 times more likely to do so if they had watched the *Buying a Car* video. These results provide some evidence towards the need for investing time and effort into creating these type of resources.

Table 2.5 Binary regression analysis

Perceived benefit	Unit	Predictor	Chi-square	Nagelkerke R square	B	S.E.	Wald	Odds ratio
Better understand the learning outcomes	FIN100	Introductory video***	25.79***	7.8	−0.91	0.22	16.99	1.49
	BU200	Introductory video***	25.07***	12.7	1.10	0.31	12.27	19.91
Feel confident about taking this unit	FIN100	Buying a car video*	25.79**	8.4	−0.64	0.28	5.16	1.69
	BU200	Expert view's video*	18.34*	9.6	0.81	0.40	4.12	9.39
Relate the subject to real-life situations	FIN100	Buying a car video*	41.75***	17.7	−0.81	0.39	4.32	1.56
	BU200	Expert view's video*	30.69***	18.1	1.17	0.47	6.22	24.91
Confirm my decision of taking this unit	BU200	Introductory video*	28.90***	15.0	0.86	0.38	5.26	10.67
		Readings*			0.77	0.30	6.48	8.75
Feel part of the community	BU200	Student's view video*	23.14*	16.7	1.18	0.53	4.86	25.50
		Expert view's video*			1.08	0.54	3.95	18.75
Have a useful start to my study	FIN100	Unit guide***	38.07***	11.2	−1.18	0.27	18.69	1.36
		Unit study tips*			−0.55	0.21	6.94	1.78
	BU200	Unit introductory video**	30.70***	14.9	1.04	0.31	11.47	16.94

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Table 2.6 Student feedback on KickStart

		FIN100 (n = 126)	BU200 (n = 106)
Cat 01	Suggestions for improvements and further plans	57	38
Cat 02	Positive comments	66	76
Cat 03	Negative comments	3	4

Student Feedback on the KickStart Initiative

At the end of the survey, students had the opportunity to leave a comment to the following open-ended question: "Do you have other suggestions for inclusions in the KickStart program or any general comments about it?" Nearly a third of the students (29.8 %) from the first-year unit FIN100 provided comments, and an even larger proportion of BU200 students (40.9 %) gave feedback. Three categories of comments from both groups emerged from the analysis, as per Table 2.6.

Students overwhelmingly perceived the initiative as positive and negative comments were extremely rare. Those students who did respond negatively suggested that it was either "boring" or "not needed". A closer analysis of the students' comments provides insight into how students experienced this initiative. In the beginning, we outlined that engagement, preparation, and motivation are critical factors for student success. An analysis of what students had to say in this final section of the survey highlights the real potential of KickStart for enhancing the student experience in these three areas.

Engagement

The findings suggest that students perceived the initiative as "fun" and "engaging", and that KickStart helped them "to engage early in the course". It is valuable to note that the while researchers did not use the words "engage" or "engagement" in the survey, students chose this wording frequently in their feedback.

> I think it was cool. Really good to get information about the subject early on. Good for planning assessments and engaging with the unit. (BU200)

> I think it was well structured and organised, as well as being fun and engaging for undertaking a new unfamiliar unit. (BU200)

> The KickStart program was a great introduction to the unit and made me interested in the subject. (FIN100)

> A good clear opening to the subject. Always helps to see how a subject relates to life before you start it. (FIN100)

Students appreciated the initiative and the fact that the resources were not only relevant and timely but also "cool" and "fun". The videos fulfilled their intended

purpose of engaging them with the subject matter ("made me interested") and helped them to connect the subject to their previous experiences ("helps to see how a subject relates to life").

Preparation

The feedback from students demonstrates the importance they place on feeling prepared, and how the KickStart material helped them to get ready for the start of the semester.

> It was well-presented and presented information well. More information for students to get a head start on work may be beneficial. (BU200)
>
> Effective way for students to get a head start on the unit and prepare for it. (FIN100)
>
> It was helpful in being able to understand what was expected and some helpful ways to be successful in this course. (FIN100)
>
> I thought it was great. It really helped me get involved and ready for the unit and completely bypass the slow getting back into phase. Thank you. (FIN100)

The last comment deserves further exploration in future research. Can KickStart packages also help continuing students to have a better start when returning from the mid-semester break?

Motivation

One of the purposes of KickStart was to motivate students and help them to feel less overwhelmed and anxious. In order not to lead students' opinions, these words were not used throughout the survey or in the KickStart resources themselves. It is for that reason that the comments provided by students in the general feedback section are particularly encouraging.

> Thought it was great and very encouraging to start the unit. (FIN100)
>
> Thought it was very helpful and made starting the semester less overwhelming. (FIN100)
>
> The introduction through KickStart made me enthusiastic and eager to participate in the unit. (BU200)
>
> I thought it was very clever and excited me to begin the unit. It is a different technique and I thought the mixture of humour and content was great. (BU200)

Overwhelmingly, the students' responses to, and the uptake of, the KickStart initiative were positive. This study supports our assumption that students are interested in engaging with their unit of study in preparation for the semester prior to the first week. The results show that the use of introductory videos by convenors can assist students to better understand the learning outcomes of the unit, and

provide them with a useful start to their studies. The outcomes from our study indicate that such a program can help students to build connections between their prior knowledge and the course content, allowing them to contextualise the learning outcomes. Our initiative provides an example of a successful technological intervention that creates connections with students in an environment where solutions at a large scale are imperative due to the size of student cohorts. The use of an online space through well-designed videos, resources, and activities builds a first, tentative connections with students—something that, based on the findings of the survey and the comments, made a positive impact on students.

Conclusion and Future Research

This paper expands the research on the student experience and satisfaction with a focus on student engagement with unit content, preparation, and motivation prior to the teaching period. The project addresses a gap that currently exists in many transition and orientation activities—at the unit content level. The findings from the pilot study are encouraging. They demonstrate that the initiative can increase student engagement and motivation and improve students' sense of preparedness. The KickStart pilot phase has further shown that access to pre-commencement material has the potential to provide opportunities for student engagement with the subject matter and learning objectives in a timely fashion. The resources required to develop such packages are not excessive, and staff can draw on existing materials for future iterations of the same unit. The results of the study indicate that the KickStart initiative can meet student needs and concerns at the early stage of the semester. The results further show that this kind of initiative can be integrated into the day-to-day practices of teaching and be delivered at scale to large student cohorts without loss of quality. The initiative has since been rolled out across all faculties of the University. Predominantly, first-year unit convenors have engaged with this project and have included it as a regular component of their unit offering. Through collaboration with the Learning and Teaching Centre of the University, a universal design for KickStart has been developed and an improved communication strategy has been implemented in order to ensure that students are aware of the availability of KickStart before the start of the semester. Further evaluations, including in-depth focus group interviews, are under way.

In the future, we intend to develop a mid-semester package to help students maintain focus; and an end-of-semester package that concludes this part of their learning journey and helps to prepare them for the next. We believe that KickStart has further potential to assist students to reflect on their role as self-managing learners. Prerequisite quizzes ("are you ready" checks) can help students feel better prepared and are not time consuming to create. These aspects will be expanded on in the pilot of the initiative and researched accordingly.

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Chapter 3
Mentoring for Success: Programs to Support Transition to and from University

Christine Chung, Antonia Dykes and Jen McPherson

Abstract University learning goes beyond developing knowledge and skills. It is a transformative process of learning to think and act differently. Mentoring programs support students to achieve success by helping them to think and act differently as learners and as future practitioners. This chapter examines two successful mentoring programs in the Faculty of Business and Economics at Macquarie University: the First STEP mentoring program targets undergraduate students in their first year to help them in their transition to university; the Lucy Mentoring program is for female undergraduate students in their final years of study and aims to facilitate their transition from university to professional work. Through the voices of participants we demonstrate how both programs contribute to creating a connected learning community, and support student transition, transformative learning, and employability.

Keywords Mentoring · Success factors · Program implementation

Background

In this chapter we use the theme of a connected learning community. We explore how two of our programs in the Faculty of Business and Economics at Macquarie University build connections through the use of mentoring as part of the student journey, from the beginning of their undergraduate studies to becoming a professional. This aligns with the University's strategic priorities (Macquarie University 2013) as well as the Learning and Teaching Framework (Macquarie University 2015). The First STEP and Lucy Mentoring programs are among a suite of extracurricular activities offered to provide small-group experiences to our diverse cohort of undergraduate students, to allow students to build personal connections.

C. Chung · A. Dykes (✉) · J. McPherson
Macquarie University, Sydney, Australia
e-mail: antonia.dykes@mq.edu.au

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Both programs are explicitly designed to encourage success and relationship building. First STEP and Lucy Mentoring offer transformative learning experiences, by helping students to achieve their goals and develop. We have undertaken a survey of past participants which we report on later in the chapter. In order to assist others to implement similar programs, we elaborate on key factors for success as well as challenges.

Mentoring relationships in the journey through university support students in achieving their academic and professional goals by developing their sense of agency and purpose (Griffin et al. 2015). A central aim of higher education is that students graduate with a different perception about themselves and the world, and a different capacity for action (Case 2015). From this perspective, university learning is not just about developing knowledge and skills but is also a transformative process of becoming (Barnett 2004), or learning to think and act differently. Hence, how students think and act as learners and as future practitioners are dimensions of student success. As undergraduates, students are learning about themselves and their place in the world (Archer 2012, p. 11). This involves developing how they see themselves and the options available to them in any situation, as well as their capacity for action that is based on "self-awareness of goals and contexts" (O'Meara 2013, p. 3). Mentoring is one way to promote student agency (O'Meara 2013; Griffin et al. 2015) through interactions with more experienced mentors. These interactions between mentees and mentors support students in a process of becoming as they learn to develop and apply knowledge and capabilities that are central to professional work. Mentoring can be regarded as a discipline-specific transition strategy and is aligned with access to knowledge, rather than simply access to higher education, and has the potential to promote constructive modes of self-reflection. This view of mentoring is consistent with a conception of transition as becoming (Gale and Parker 2014).

Both First STEP and Lucy Mentoring feature elements common to many mentoring programs. A review of mentoring literature by Irby (2014) suggests these programs increase positive outcomes through: screening, training, support, providing accountability and an understanding of diversity, and setting time limits to mentoring relationships—both of our programs feature these elements.

Description of the Programs

Both programs are coordinated by University staff with funding provided by the University. The First STEP Program Manager supervises peer mentors and coordinates first year students and academics. The Lucy Mentoring Program Manager coordinates students and mentors. Mentors are not paid and volunteer their time. Both programs use a formal commencement event, training, and careful matching of mentors with mentees. The programs are strongly supported by the University

Executive. First STEP was recognised with the institutional Vice-Chancellor's Award for Programs that Enhance Learning for its contribution to student outcomes. The Vice-Chancellor personally supported the program by delivering a speech at the commencement event of First STEP.

First STEP Mentoring Program

First STEP is a program designed to improve the transition to university. It began in 2012 with 32 students, 10 academic staff, and 10 peer mentors (Cornelius and Wood 2012) and had grown to include 175 students, 22 peer mentors and 22 academic staff in 2015. The program design has been influenced by corporate mentoring programs, and combines one-on-one mentoring by teaching staff with group mentoring led by a peer mentor (Cornelius and Wood 2012). The use of peer as well as academic mentors is innovative and strengthens the program considerably. Previous reports on First STEP have discussed how the program was formed (Cornelius and Wood 2012) and evaluated (Cornelius et al. in press).

When they first enrol at university, students are invited to participate and can give input about their choice of mentor, as well as being given online training on how to make the most of their mentoring opportunity. Figure 3.1 outlines the timeline of the program in each semester.

Lucy Mentoring Program

Lucy Mentoring connects female undergraduate students with experienced business professionals in the workplace. It was initiated by the New South Wales Government in 2004 (Office for Women's Policy 2004) and has since been offered

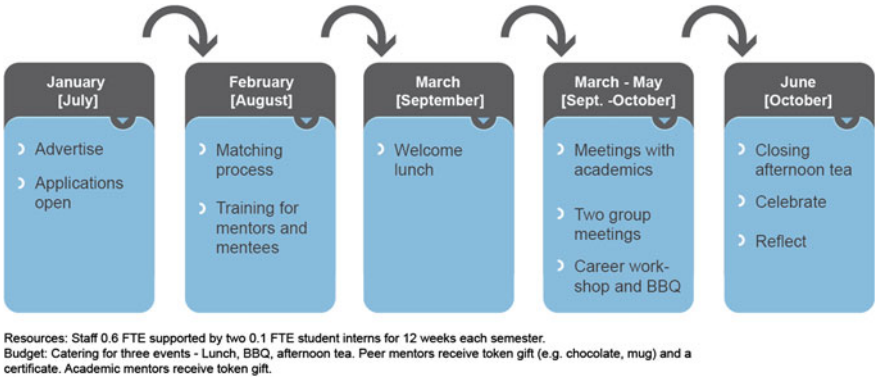

Fig. 3.1 First STEP mentoring timeline

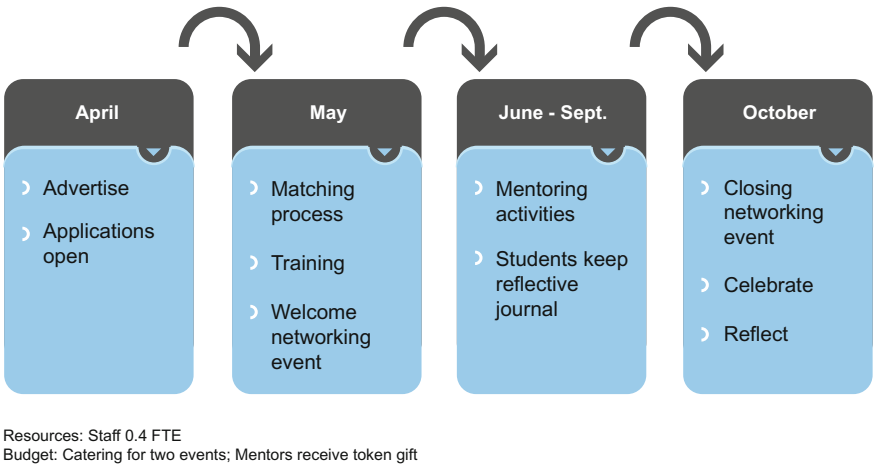

Fig. 3.2 Lucy mentoring timeline

at a number of universities. The program is voluntary and supports mentors and students (mentees) meeting and spending time together. Mentees learn to take the lead and drive the mentoring relationship towards their specific goals with the help of their mentors. Lucy Mentoring was introduced at Macquarie University in 2011 with 10 mentors and has grown to around 50 mentors in 2015. Students spend at least 20 h with the mentors, which can include shadowing or participation in workplace activities. Figure 3.2 outlines the timeline of the program across the year. First STEP and Lucy Mentoring staff work on their programs separately, however collaborate often during busy periods.

Evaluation

As part of our ongoing evaluation of the two mentoring programs, we conducted a survey of 50 former participants who had expressed willingness to keep in touch with the program after their participation. We recognise that negative accounts are less likely from those who expressed a desire to keep in contact, and that the likelihood of a response from a participant who did not enjoy the program may also be low. However, informal feedback from participants in the past has shown participants' willingness to provide constructive feedback.

Mentors and mentees were asked to reflect on their experience in response to four guiding questions (see "Appendix") and elaborate further as they wished. By using open-ended responses, we allowed the participants to decide what they most wanted to tell us about their experiences. This chapter privileges the use of direct quotes to convey the voice of the participants. Giving students and mentors a voice is a significant feature of the University Learning and Teaching Strategy, which

encourages students as "partners and co-creators" (Macquarie University 2015). While research literature more commonly examines mentoring in a tertiary institution from the student perspective (Baker et al. 2015), our research also seeks to understand the mentors' perspective.

First STEP mentees and peer mentors to date have ranged from 17 to 60 in age, with the majority aged 18–25. Academic mentors range in age between 22 and 65. In both groups there is an even mix of males and females. Approximately 70 % of the students participating are domestic and 30 % international; citizenship details are not collected for academic mentors, although they are from a variety of cultural backgrounds. Lucy mentees are all female, ranging in age from 18 to 25, both domestic and foreign citizens. Lucy mentors are both male and female, range in age from 22 to 65, and are also both domestic and foreign citizens. Responses were proportional to the mix of participants across age and gender. However, very few responses were received from international student mentees; the study was conducted during the summer break which may have limited the responses from this cohort as they were likely to be overseas.

Building Connections Through Mentoring

Both mentoring programs align with the University's strategic priority of creating a connected learning community (Macquarie University 2015); that is, a community that connects students, academic staff, and industry partners. As a result of participating in the mentoring programs, students develop greater confidence, improve their communication skills, and understand the value and importance of networking with their peers and professionals. Each program creates connections: for First STEP it is connecting students with peers and academics; for Lucy it is connecting students with professionals in industry.

First STEP: Connecting Students with Students and Academics

First year students apply to participate in the program by submitting a brief written application which includes information about their interests. Students are provided with online profiles of academic mentors and asked to nominate their top three preferences. Students are then matched with academic mentors, in groups of three to five students, as well as with a peer mentor. A diagrammatic representation is shown in Fig. 3.3.

Students choose to apply, and also have input into their choice of mentor. This design was deliberate as it mimics the development of informal mentoring (Allen et al. 2006). Informal mentoring—that develops spontaneously through the free

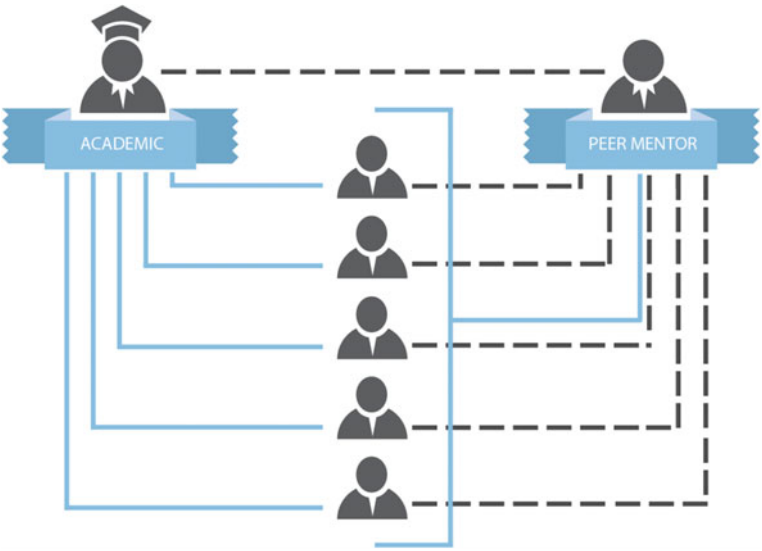

Fig. 3.3 Structure of First STEP

choice of the mentee and mentor—is viewed as the gold standard and the most effective form of mentoring (Cornelius and Wood 2012). However it can be hard for mentees, without any skills or experience, to seek out mentors. Formal mentoring programs bridge the gap between students and people with experience and provide training on mentoring.

(Note—in including reflections from participants in their own voices, we will refer to them by culturally similar pseudonyms.)

Having had this facilitated experience, students gain confidence and skills and therefore are more prepared to form connections on their own in the future. Zain, a first year student, reflected on how he was nervous initially, but after meeting his mentor they formed a connection.

> From the start, [my academic mentor] was really excited and like I was a little bit confused I thought, he is an adviser, I have to be formal and take it serious.' But when he started talking after a few minutes, I got like really relaxed in front of him. … you just talk to him frankly and you are not scared that, 'Okay I am not going to ask this question as I'll look stupid or something', so you are really frank with them, so you can get a lot of information from them.

Although more complicated than one-to-one mentoring, the administrative effort of creating the mentoring groups has substantial benefits because they offer multiple opportunities for students to form connections and seek support, as demonstrated in Fig. 3.3. Although formally the program only requires mentoring between the first year student and academic individually, and between the peer mentor and first year students as a group, informal relationships often develop, as demonstrated in the student reflections. Vivek, a peer mentor, mentioned that after seeing the benefit the

students were receiving he "took this opportunity to also seek mentorship for myself". Another peer mentor, Beverley, said of her relationships with her group:

> I didn't have any big expectations to begin with, but it actually worked out better than I thought it would be. At first I thought, 'Oh this is just kind of easy work, mentees and academic mentors, like you're being a bridge for them.' But I guess in the end I found it was actually more my personal relationship with the students as well and I'm only speaking for the ones that I actually had contact with, some of them were a bit too difficult to contact and they just never made connections with me, but yeah, a few friendships actually emerged.

Peer mentors are in their later years of study, and organise individual meetings between the first year students and the academics. This reduces the administrative burden on the academic, and provides leadership experience for peer mentors. Commonly, peer mentors reflected that this role was harder, but also more valuable than they expected. Beverly reflected:

> I thought it was going to be easy, I mean how hard can it be to link two people up? I did learn that it was actually quite a substantial amount of responsibility, that I actually had to organise and arrange for these meetings to work out … for me, this program was about connecting academics with students and I actually played a substantial role in that… not often do you get this responsibility, so it's an honour to have this responsibility and for it to work out is a big achievement.

Hamid also reflected on how being trusted to organise things in his own way deepened the leadership experience.

> One of the important factors of the First STEP mentoring program is the power and freedom handed over to the mentors to conduct and achieve the goals of the program in their own way. This ability to construct my own agenda and communicate with my mentees in the manner in which I wanted, allowed me to develop deeper and more meaningful interpersonal relationships.

Vivek similarly saw himself differently after successfully organising his group.

> I was in constant touch with new first year mentees and also the academic mentor – to lead activities among them. As a result of this experience, I developed strong relationships with all involved and was much more confident of my communicability and further saw my role as quite influential.

Although not designed to provide formal mentoring to the peer mentor, both academics and peer mentors commonly report that an informal relationship develops as they work together to assist the first year students. Vivek said:

> As a result of First STEP and my involvement, I was able to also develop a very good relationship with the academic, a great help indeed at times when personally I have been stuck in making decisions, needing advice or just having that sounding board to talk through things.

The peer mentor models professional behaviour, and reminds the student before the meeting of the time and location to ensure they are prepared, as well as gathering the group of students twice for social meetings—lunch on campus, or for an activity nearby.

The connections arising from the program are also important to the academics. One academic, Eva, reflected on the benefits of forming a connection without the barrier created by assessments:

> I have been able to assist and motivate some of my mentees while gaining so much personally. As a staff mentor you have the opportunity to develop personal relationships with students without the responsibility of assessing them. As the students are all new to university, you try as a First STEP mentor to make the transition a little less stressful for them and I found this very rewarding.

James, an academic, reflected on how he not only benefitted from the relationship with his mentees, but from the insight it gave him into the journey of the second year students he typically teaches:

> It was a reminder about how little they are aware of and how much they need to be coddled. This is not a suggestion that they are weak but rather that we forget how little we knew then. It made me sympathise with them more, and reminded me of how lost I first felt when I came to university.

Another academic, Mathew, similarly reflected on the fact it reminded him of the difference that simple things, like learning student names quickly, can make to the students.

> When I first started especially as a tutor I would get to know all their names, certainly in the first half of semester. Probably in the last three years with the pressure of teaching and research commitments and so on, I think I slacked off on that. I think, for example, getting to know the students' names and getting to know a bit about them became more random, more haphazard, I wouldn't always make that effort. They'd be time pressures that would prevent it and I think being part of this mentoring process reminded me how useful it was to establish that rapport, so I've started doing that again.

Lucy Mentoring: Connecting Students with Professional Mentors

Lucy Mentoring is an extracurricular program for female students in their second year or above of undergraduate studies. Preference is given to disadvantaged students—those with disabilities, from a non-English speaking background, or the first in their family to attend university—as these students often have fewer opportunities to connect with industry through personal networks. Students submit a written application and are interviewed. As part of the application process, the following considerations are taken into account: their grades, their access to professional networks, their overall level of maturity and professionalism, and their motivation for wanting to participate in Lucy Mentoring. At interview stage, the following points are stressed to applicants: the need for commitment in the program (if successful); a thorough understanding of their current study, part-time work, and extracurricular commitments; and the ability to exercise flexibility. A major challenge for mentees is finding the time to meet with their mentors. We look for a

genuine desire in the student to learn from someone more experienced and grow in their personal and professional development. Some interview questions have taken on the form of a role play where we ask the student to pretend to call their mentor and introduce herself over the phone.

Mentors submit an Expression of Interest to participate in the program. The Lucy Mentoring Program Manager usually meets with mentors face-to-face to explain the program in greater detail and answer any questions. Having face-to-face interaction helps with building rapport, and mentors frequently participate for several years.

Midway through the program, mentees meet as a group to share their experiences. At this point, there is usually a mixed response where some mentees are enjoying regular contact with their mentors, whereas others have tried but have not had much success in communicating with their mentors. Tips and strategies are shared as mentees discuss how they are overcoming challenges faced with their mentors. Mentees are also encouraged to build networks with each other during the program, to share ideas and meet together.

The main challenge for mentors and mentees is time. Mentees need to be flexible and appreciate that their mentors are extremely busy and so they sometimes may have to cancel a meeting at the last minute. In tackling how to get mentors to respond to mentees' emails, one mentee gave a helpful suggestion that she had a good response rate from her mentor if she emailed half an hour before the start of her mentor's workday. This is because she knew her mentor normally checked her emails on the way to work and by emailing her at this time, the mentee's email would normally be one of the first emails in her mentor's inbox.

At the conclusion of the program, mentors are given a small gift as a token of appreciation for volunteering their time and effort to support mentees. In recent years, the Program Manager has acknowledged mentors' participation on LinkedIn (an online professional network) in the form of a simple "thank you" post. This information is shared with the mentors' connections and is a good way to publicly promote the good work they are doing.

Supporting Student Transition Through Mentoring

Student transition into and out of university is about navigating change (Gale and Parker 2014). The two mentoring programs described here bookend students' journey through their degree program, helping them to navigate change: First STEP supports students' transition to university; and Lucy Mentoring supports their transition to professional practice.

Mentoring has been shown to have a positive effect on students' transition to university, retention and skill development (Galser et al. 2006). Interviews with First STEP participants at Macquarie University similarly found students felt their transition was eased through participating in the mentoring program (Cornelius et al. in press); and a recent study of the Lucy Mentoring program shows that

students benefit from participating through increased confidence, greater self-awareness, and knowledge about their future careers (Smith-Ruig 2014).

Students journey through university in different stages. When they first enter university, they may decide to join First STEP to help them transition. As they become more familiar with their surroundings and learning, when they reach their penultimate or final year they may start thinking about life beyond university. Female students in their penultimate or final years are encouraged to apply for Lucy Mentoring as they prepare to transition out of university, and to learn about professional skills needed in the workplace, or to develop interview/networking skills.

First STEP: Independent Learning Skills

A number of skills acquired in First STEP are independent learning skills required to transition into learning at university and are a small step towards those required to "transition out" such as: attending meetings on time, setting an agenda, getting to know an academic, networking with other students, and writing professional emails. Emin said:

> [My academic mentor] gave me some tips, to adjust my attitude towards study and my life. Because I got depressed a lot while I was studying, because I had so many failures and he helped me out. He said, 'Do not think about consequences too much just do whatever, the thing that I like and focus on it.' He gave me some time-management techniques and tips on writing, how should I focus on reading articles, because writing was my biggest weakness.

The program explicitly guides students in developing these skills through an online training module, weekly emails, a Facebook page, and attendance at several events. The program commences with a lunch networking event. In the first half hour, students meet peer mentors who set expectations for the program and provide students with a printed handbook that includes examples of how to write a professional email, tips for networking, and a template for goal setting. Then in the final hour academics arrive and meet their mentees, and there are short speeches as well from a member of the University Executive and a former student participant. This sets the tone that the program is something special. If students are unable to attend they have a one-on-one briefing with the First STEP Program Manager. In the first half of the semester there is also a careers workshop that encourages students to start building their résumé. Later there is a barbecue hosted by First STEP for all first year students in the Faculty. This advertises the program to other students who may participate in their second semester of university, and provides a good networking opportunity after the mid-semester break when returning students often feel nervous again after a few weeks out of university routine.

One of the most basic needs first year students have when transitioning is meeting other students. Emin reflects:

> You try to make friends at university. Sometimes it's difficult because everyone seems focused on their work and work so hard and are busy with their own life. Even now in my tutorial class I've got a lot of classmates but I hardly know any of them. With the mentoring program I see my peer mentor, I see my academic mentor, I get someone to talk to again. I get a chance to make friends, especially if I stay when we had a gathering … I still keep in touch with a lot of them, we say hi to each other because we know we're on the same boat. In your class you don't feel that.

For international students, operating in another language is perhaps the most important transition. Flora shared her concerns:

> As an international student, it was my first time being away alone from my country and I was worried about what Australia and university would be like, and whether I would be able to fit in. Being part of the STEP mentoring program played an important role in my transition into Macquarie University. I was given the chance to meet new people who were also in the same situation as me since it was everyone's first semester.

Lucy Mentoring: Supporting the Next Generation of Leaders

Lucy Mentoring is one example of how Macquarie University supports students in helping them achieve their aspirations and it provides an incubator for the next generation of leaders (Macquarie University 2013, p. 12). The program gives students a window into the corporate or professional world by linking them with mentors from the private, public and not-for-profit sectors. Daphne shared her experiences:

> As a second year university student in the Lucy Mentoring program, there were a lot of new experiences. First suits. Navigating to corporate offices. Learning about office hierarchies. What it means to work for a service provider. Realising big businesses pay bigger taxes than me.

For many students, it is their first time interacting with professionals from industry, and the experience of learning to communicate with them via email, telephone, and in person pushes students out of their comfort zones. Isla reflected on the confidence she gained from participating in Lucy:

> Through putting myself through a program in which I was the driver in developing a relationship with my mentor, initiating any contact and maintaining contact throughout the semester, my confidence has improved and increased. I am more readily seeking out opportunities to further develop my confidence and presentation skills and am excited for any chance I have to do new things. As one of the key initial goals of this program, this is a huge success for me.

A majority of students who join the program—initially unsure about what the future may hold once they graduate—find they have greater clarity about their future careers by the end of it.

The program has been successful as a result of mentors reaching out to their networks and encouraging them to participate. The Program Manager matches mentors and mentees based on information provided. There are instances where mentors and mentees are matched according to what the student is studying and the mentor's relevant industry. In other cases, mentors and mentees are matched because they share a common background; for example, they are (were) international students, or a mentor who has a passion to build confidence in young women is matched with a mentee with high grades but who lacks confidence in soft skills. Mentors sometimes request to be matched with mentees in their final year as they are best able to provide practical help in the areas of applying for jobs, interview practice, and résumé assistance.

The Program commences with a networking welcome event where all mentors and mentees meet for the first time. There is a speech from a former mentor and former mentee. For new mentors, hearing about the experiences and challenges of former mentors and mentees is inspiring. Prior to the event, all mentees are briefed on the backgrounds of their mentors and are given their contact details. They are also briefed on expectations in terms of professionalism and conduct during their participation in the program. Mentees are encouraged to drive the relationship and be proactive in their relationship with their mentors. Anna, a mentor, commented that:

> the experience of working with a mentee is only as good as the engagement of the student. During the program, my mentee always took the initiative to call me and keep in touch over email so that we could progress her goals within the timeframe of the program. She always put forward a plan of attack for our meetings. While I added my own views and agenda items, ultimately my mentee drove the process so that she got the most out of the program.

During the program, mentees may be supported in a number of other ways (such opportunities are not compulsory). For example, a former Lucy mentee now working as a professional ran a briefing workshop for Lucy mentees to help prepare them for the program. She discussed learning styles and different communication styles, and challenged mentees to be well prepared for each interaction with their mentors before, during, and in between mentoring sessions in order to make the most of their time together. One of the Lucy mentors volunteered to talk to the mentee cohort about negotiating for a salary increase as this was a topic she was passionate about. A contact of the Program Manager gave a presentation to the mentee cohort on how to create a good first impression, network effectively, and build rapport with other work professionals. Mentees were also invited to attend a workshop on body language and networking. These engaging workshops are helpful for mentees who are keen to gain practical tips on transitioning well from university to the workplace. It also gives them an opportunity to practise their networking skills as they interact with business professionals in a safe environment.

As a way to get mentors to network with each other, a breakfast networking session for mentors has been introduced, occurring midway through the program. This is an informal way for a smaller group of mentors to meet and share ideas with each other and staff members. They share the activities they are doing with their

mentees and some of the challenges they are facing. In addition to the networking session, a LinkedIn group has been set up for mentors and mentees to share information. Mentees have to be persuaded and encouraged to share their thoughts on this forum, whereas mentors are less reluctant to comment and contribute. An informal buddy system for mentees has been introduced to encourage them to network and start building connections among their peers.

At the end of the year, there is a networking event where mentors and mentees come together to celebrate. Mentees give presentations and thank mentors for volunteering their time. A small number of mentees present on behalf of the mentee cohort.

First STEP

The information needs of first year students are often quite simple—most want to get to know the campus, make friends, and understand how university is different from high school. Once they get over these hurdles, other events in the program, particularly the careers workshop, can encourage students to consider future planning.

Nevertheless, conquering these hurdles can be quite transformative. Many students are initially apprehensive about meeting academic staff, and find their lecturers unapproachable. One of the most common surprises for students is as Jessica said, "the fact that academic staff aren't so alien, that you might chat to them and they're helpful." Flora reflected on how her relationship with her mentor was much closer than expected:

> Initially, I was quite nervous about meeting my mentor, as it was such a new and intimidating experience to talk to a lecturer in her office. However, my mentor was very kind and knew how to quickly put me at ease and make me feel comfortable. At the beginning of the program, I thought that a mentor's task would be restricted to providing academic or career advice. So, I was deeply pleased to find out that our conversations would normally range from university topics to a lot of different areas of my life, such as self-confidence, stress, accommodation, and how to become a more positive and better person. I could see that my mentor was not just doing her job, but that she really wanted to be my friend and help me.

Jill was also surprised by the impact her participation had on her:

> I gained a lot more from the program than I thought I would. Most importantly, I learned the importance that good mentoring can have on someone's life. Thus, it encouraged me to become a mentor myself in the LEAP mentoring program (which is about mentoring high school students from a refugee background) and the Mentors@Macquarie Transition program; both programs are run by Macquarie University.

For a number of students who have been attracted to the program after previous failures, and have realised what it takes to succeed at university, find it is often quite transformative. Olivia said:

> I had done a semester of university before, up in Darwin at the university there. I'd felt that I wasn't involved in the university at all, other than attending my classes. There was a huge difference between what I expected from the university to what my experience was, and I didn't really know who to talk to about that at that time. So when I was doing my enrolment form [for Macquarie] and I saw [First STEP mentoring], I was like, that's probably a really good thing. [My academic mentor] was like, have I found it all right? Do I have enough time to study? Basically, he was trying to help me out with just being aware of, I've got an assessment that coming week, have I started preparing for it? He also helped me find when there were the extra maths tutorials. I definitely feel that it has made me feel more a part of the university.

Emin similarly thought:

> I had a lot of questions that I had through study experience from before I came to university. Because I'm a returning student, I had so many failures the last time when I was studying at university. I kept all the questions, I made a summary, and asked [my academic mentor], 'How should I face these problems?' He gave me a lot of tips and it was very beneficial for my start of university learning.

Students discussed the realisation that they are now fully responsible for their learning. As Jessica put it: "Other than going to your tutorials, and depending if you're the kind of person who goes to their lectures or listens to them online, you don't need to really be a part of the university at all. You get out of it what you put in, basically."

The First STEP program handbook and online module both contain information on setting goals, and creating meeting agendas. Students are encouraged to go in with an agenda even if their meetings are informal. In the final meeting of semester students are encouraged to look back and reflect on what they have learnt.

Lucy Mentoring: Reflecting on the Journey

Mentees are required to submit a reflective journal at the end of the program to share what they have learned. The reflective journals are personal reflections on what mentees have enjoyed or found challenging in the program.

The beauty of the program is that it allows students to interact with industry professionals in a safe environment. Mentees are encouraged to use their judgement and discretion, to make mistakes and ask for feedback. This can be challenging as there are no right or wrong answers. The Program Manager has fielded questions from mentees such as "What is the etiquette on who pays for coffee?", or "How many times should I keep emailing my mentor before I pick up the phone and call him or her?" Isla commented about how she grew in confidence as a result of being in the program.

> The Lucy Program pushed me out of my comfort zone by making me responsible for each interaction with my mentor. Beyond my part-time jobs, I had little experience communicating with professionals via email, telephone, or even in person. It was a valuable

> experience to learn how to engage in small talk with a professional – which had previously seemed awkward to me – how to set up meetings, and how to ask my mentor directly for help on a project or for input regarding my résumé and LinkedIn profile.

The benefits for mentees in this volunteer program are considerable. Anna shared a description of her interaction with her mentee:

> Before my very eyes, this shy student blossomed into the most confident young woman. During our short time together, she managed to secure not one, but two (!) vacationer positions at Big 4 accounting firms. She told me that she could not have obtained those offers without my help; however, I put them down to her hard work and courage to put the strategies we discussed into action.

Samantha reflected on mutual benefits and learnings from participating in Lucy Mentoring:

> Despite my mentor not working in my area of study, I was still able to gain valuable experiences about how a small business is run and was also able to share my knowledge gained at university with my mentor. In this way, my mentor and I were able to learn from each other. … This will definitely allow me to evolve my career path. I have been able to learn and do things which I would not have been able to do without the help of the Lucy Mentoring program.

Janet reflected on what she got out of being in the program.

> I was mentored by a highly driven and successful male mentor from a completely different industry, which made every session exciting and extremely insightful. My mentor is ambitious and supportive but above all, he is honest and authentic. Not only did he give me the confidence to believe in my own potential, he also taught me to accept truths about my weaknesses and rise above them. That key learning has changed the way I perceive and handle situations. I was more driven to put myself in instances I used to avoid, be it networking or speaking at events. Above all, I was constantly encouraged to test myself and discover my limitations. Even now, working in a profession that dislikes failure, that very key learning has given me the motivation to speak my thoughts more confidently.

Success Factors and Challenges

Both mentoring programs are well embedded into the University. Each rely on a number of factors for success and are faced by challenges that must be managed for the programs to remain sustainable. One of the main challenges for both programs is time. Participants are required to navigate time management well in order for the mentoring relationship to succeed. In this section we look at the challenges and success factors for each program.

First STEP

Peer Mentors

The most commonly mentioned key factor to the success of the program, by both students and academics, is the role of the peer mentor. Mateo, an academic, reflected:

> I think that having the support of a peer mentor is a must. As academics, we have limited time so having the support of peer mentors was great; for example, organising my meetings throughout the semester. In this regard, I have had two opposite experiences in the program so far. One semester my peer mentor was not proactive so I had to do pretty much all the work (re. contacting my mentees and organising). That was a tough semester. On the other hand, last semester was awesome because my peer mentor was excellent. She was very proactive and helped me a lot so everything run smoothly.

His reflection makes clear that the peer mentors can be the greatest risk to the success of the program. We endeavour to mitigate this through training at the beginning of each semester, and weekly contact with the Program Manager. The most important solution is for all parties to communicate when things are not going to plan, as the Program Manager can only intervene when it becomes clear there is a problem. Expectations are set during peer mentoring training, held prior to the start of semester, and reinforced during weekly emails between the Program Manager and peer mentors.

Time Commitment and Recognition of Volunteers

Academic mentors volunteer their time, which limits the size of the First STEP program to the number of available academics. The total commitment required over the semester is approximately 20 h, for which academics receive three service days towards their workload. However, given the number of other demands on academics, and the number of other programs and committees clamouring for participants—some of which are more public and provide more recognition—it is difficult to recruit more than the number required to replace those lost to attrition (around 20 % per semester). Time and recognition are commonly cited as limiting factors for undergraduate mentoring programs (Baker et al. 2015).

Potential solutions would require more resources. For example, part-time staff are currently not utilised. A solution to the limited supply of academics would be if funds were available to pay part-time academics for 20 h. A number of institutions have achieved success by offering internal funding to increase mentoring of undergraduate research students (Baker et al. 2015), although finding similar funding for a first year mentoring program may be more challenging. Alternatively, mentors could be drafted into the program by including it in their professional development plan; however, this may not be the best way to find mentors who are fully engaged.

Peer mentors also volunteer their time. Many students are seeking to add leadership experiences to their résumé, and the recognition provided by the program, along with a certificate and contribution to GLP (a university extracurricular program that appears on student transcripts) are attractive. The large student population also results in a sizeable pool of potential peer mentors, and recruitment of peer mentors is not a challenge.

Student Recruitment

The First STEP program started with a pilot of ten students, and grew each semester until reaching the current maximum of 100 students per semester. As the program has grown, word of mouth has spread and the program has begun to advertise itself, and perhaps even the University, as Zain said, "This process was so helpful for me that I actually convinced my younger brother to come and join Macquarie so he is also going to come next semester." Recruitment of first year students is consequently also not a challenge. Demand currently is met by supply—generally the program is oversubscribed in the first semester of the year so some students are waitlisted; they can then get a place in the second half of the year, when enrolment of new students is typically much lower.

However, the size of the program is limited and operates at full capacity with current resources. There is a danger that if it were to become more popular, and students had to be turned away, this could be a negative experience. The program was not available when some peer mentors were first year students, and some mention how they felt they missed out. Vivek says, "Many times, during the program as a peer mentor, I have told my mentees as to how lucky they are to be part of it and how I would have loved to have this opportunity [when] I was a first year student—the thoughts which many other students share." This is a challenge that needs active monitoring.

Lucy Mentoring

Time

The main challenge for Lucy mentors and mentees is finding the time to meet. During the interview stage and briefing sessions, mentees are encouraged to be flexible and highly organised in order to balance their study and part-time work schedules with meeting the demands of the program. The method of communication in the mentoring program can take different forms—depending on time and distance, mentors and mentees can choose to meet up face-to-face, or correspond via email, phone, or Skype. As some mentees live and study a considerable distance from their mentors' workplace, some flexibility is required in order to make the mentoring relationship work well. Jeslyn, a mentee, commented:

> I felt challenged when I found myself having to give up other activities to be part of the program. Travelling distances can also be quite time consuming. I had underestimated the amount of time and energy that would be dedicated to the mentoring program. The pressure forced me to be more organised with my time. I think this could be highlighted to future mentees.

From a mentor's (Anna) perspective:

> Naturally, the biggest challenge for mentors and mentees is time – it can be difficult to schedule meetings around work and study commitments. However, I would have to say that face-to-face meetings and giving the mentee an opportunity to experience the working environment are extremely important so that they can develop their professional skills. Students should remember that any mentor will be happy to set aside time for their mentee, but the responsibility for organising these meetings rests on the student.

Some mentors may use participation in the mentoring programs as part of their professional development. In promoting Lucy Mentoring, the Program Manager suggests ways for mentors to include mentees in their days to make it easier for them to complete the 20 h. For example, a mentee could shadow their mentor for half a day and observe what their mentor does in his or her role. If a mentor is having a lunch break, their mentee could join them for an informal catch up. These approaches can help to relieve some of the pressure of setting aside additional time to meet on top of mentors' schedules.

The mentoring relationship is an informal one, where the mentor and mentee build a professional and personal relationship through activities that are primarily career related. In some cases, mentors may be keen to mentor; however, in reality, the demands on their work and role may prevent them from being able to provide their mentees with a good mentoring experience. It is important that the mentor is committed to the program otherwise mentees are disappointed when mentors are too busy to meet up with them or do not return their calls. Potential mentors should consider questions such as the following before deciding to participate as mentors:

- Do they have the capacity to sustain the mentoring relationship with their mentees?
- Are they in the middle of transitioning to another role?
- Are they being promoted shortly?
- Are there other factors to consider outside of work which may impact on their commitment?
- Are they going on extended leave during the mentoring period?

If mentors are still keen to participate but are time poor, one option is to co-mentor with another colleague. This has been the exception rather than the rule in Lucy Mentoring.

Motivation and Professionalism

The success of the Lucy program depends on the maturity and professionalism of mentees who need to be able to navigate a professional relationship with their

mentors. Mentees are given support and training before the program commences on what to expect and the importance of establishing a good rapport with their mentors at the start, and they are encouraged to have clear mentoring goals.

Care is given to match mentors and mentees appropriately. It is important to understand mentors' motivations and address any issues or concerns at the start. Mentors work in different ways, with some wanting a lot of structure and direction and others requiring less. If mentors have a good experience, they are more willing to return the following year or promote the program to their contacts and networks.

In order to deliver and maintain a quality program the Program Manager should keep in touch regularly with each mentor and their mentee. This level of service can be difficult to maintain as the numbers grow; however; it is a good opportunity to offer mentees. Continuity and service are critical success factors for the Program Manager as they build and maintain relationships with the mentors.

Relationships

Lucy Mentoring works well when mentors and mentees are committed, have set down clear expectations, and discussed goals of what they would like to achieve in the program. This should be discussed at the start, ideally at their first meeting. Mentees need to understand their own time commitments and responsibilities in order for the relationship to work well.

Mentors have given feedback that it is discouraging for them when mentees frequently decline their invitations to catch up. This reflects badly on the mentees and also the University if this is the experience for mentors.

It is important to stress to mentees that mentoring relationships can vary based on the mentor/mentee relations. Regardless of their mentors' level of seniority, expertise, and background, mentees do benefit from each interaction with their mentors if they are committed to growing and developing in the program.

Setting goals and defining expectations at the first meeting are critical for mentoring success. Katrina, a mentor, shared her tips for success.

> Goal setting at the start of the mentor/mentee relationship is critical. Both parties need to clearly understand the outcomes they are seeking so the program can be tailored and time together allocated to meet the objectives. My other keys to mentoring success are trust, honesty, and good communication. These days everyone is busy, everyone seems to have a million priorities, and every person in business has someone wanting their time and attention, so it is important the mentor and mentee are clear with each other and can be a bit flexible.

Isla shared how she set expectations and communicated her mentoring goals with her mentor.

> For me personally, critical to the success of the program was establishing my expectations and relating them to my mentor. Before the Lucy Program kicked off, and even before I met my mentor, I wrote a list of key areas that I need to improve in and the different activities and methods I thought a mentor could help me to improve. Later, when I met my mentor at the Lucy Program launch, I discussed my personal goals for the program and at our next

meeting we set up a basic schedule to stick to and our communication methods for the rest of the program. This involved weekly email catch ups as well as meeting up for a coffee regularly to go over things, specifically regarding my career goals. Establishing expectations from the start helped me to maintain my mentoring goals and priorities and gave my mentor a picture of what he could do to mentor me in these areas.

Future Directions

Both mentoring programs have reached a mature phase. Numbers are unlikely to increase without an increase in resources, and both programs in the future will focus on refining the program in response to feedback, building stronger links between programs, and ensuring the programs remain current in the face of change in the university sector and in industry.

The size of the First STEP program is unlikely to grow. Future directions for mentoring in the Faculty may involve the creation of additional resources for online support and training. The Program Manager also works closely with other current mentoring programs, not only Lucy, but elsewhere in the University. Other areas of the University are now using academic mentoring programs. Future directions for mentoring at the University overall may involve alumni mentoring, or online mentoring programs, both of which have been successful at other Australian universities. First STEP currently utilises an online page and a Facebook page. During their transition to university, students are coping with new platforms, and introducing new ones would only add to their burden, consequently future technological innovations (such as a mobile phone app) are less likely unless well resourced. A recurring suggestion among peer mentors is a networking event among peer mentors, as Hamid said, "Spending more time as a team, in terms of the mentors [would] go a long way to build a sense of community within the program." This will be incorporated into the program in the future.

If numbers continue to grow in the Lucy Mentoring program, it will be important to maintain the quality of the program by ensuring there are enough staff to support participants well. The use of digital technology would be helpful in promoting the program and sharing resources and information between mentors and mentees. Subject to budget constraints, a mobile phone app could be used by mentors and mentees to share their experiences more broadly. This would help mentors who are new to mentoring learn from other mentors and mentees.

Conclusion

Mentors and mentees benefit mutually from the mentoring relationship. Mentors have said that they mentor as a way to give back, but also because they wish they had had a mentor when they were at university. They see the benefits of sharing

their mistakes with mentees so they do not have to make the same mistakes. Mentors participate in the program in order to help develop our future leaders. Katrina reflects on how mentoring supports future leaders:

> Ultimately, the role of a mentor helps make you a better leader. It gives me the opportunity to reflect on my own journey so far, revisit some of the mistakes I have made and challenges I have faced. This allows you to give stronger support, advice, and encouragement and, in doing so, make a small contribution to what tomorrow's business world and our future leaders might look like.

In the process, mentors have shared that they learn as much about themselves as they do about their mentees. As mentors reflect on their personal journeys with someone less experienced, it helps them to hone their leadership and coaching skills and gives them an opportunity to be challenged by fresh ideas and perspectives. A benefit for mentors is the opportunity to grow their own networks. Sandy shared this about her experience:

> As a first-time mentor in the Lucy program, this opportunity has renewed my passion for developing and coaching people. I have also benefitted from the various networking sessions which has assisted in growing my professional network. Since joining Lucy, I have been able to access a greater network of like-minded people that is proving to be very valuable in my current role.

Sally, a mentee, reflects on how her participation in the program affected her:

> The activities I participated in during the program enabled me to gain numerous insights that now shape the approach I am taking to my career. On a deeper level, the relationship built with my mentor has provided me with an important source of encouragement and support. As I enter my final year of university and start applying for jobs, I do so with greater confidence. I am more aware of what I'm entering into and am looking forward to both the challenges and opportunities it will bring.

Through our study of participants' reflection on these programs we are increasing the body of knowledge about mentoring programs, in the voices of the participants, so we can learn from each other and from other mentoring programs. Mentoring has had clear, positive outcomes for participants in our programs. At these stages in our students' higher education journeys, we recommend structured, supported, formal mentoring programs to inspire transformative learning and successful outcomes.

Appendix: Prompts for Participant Reflections

- Tell the story of your participation in the mentoring program—for example:
  - How did you hear about it?
  - What was your motivation for applying?
  - What was your experience as a participant in the program?
  - How did your participation affect you?

- Talk briefly about any factors that may be critical to the success of the program. These may or may not be part of the program.
- Talk briefly about any challenges you may have faced in the program.
- Talk briefly about any changes you might suggest to improve the program for future participants.

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Chapter 4
Evaluation Criteria for a Science Access Program: A Case Study at a South African University

Johann Engelbrecht, Ansie Harding and Marietjie Potgieter

Abstract Students not complying with the entrance requirements of mainstream programs in science have become a significant problem in higher education in South Africa. To provide for the needs of these students, foundation access programs have been introduced at most of the universities in the country. In this chapter, we discuss the success of the Bachelor of Science Four-Year Program (BFYP) at the University of Pretoria. It builds on two papers published on the topic. Engelbrecht et al. (Afr J Res Math Sci Technol Educ 18(3):287–298, 2015) used the BFYP as a case study to develop measuring criteria on how to evaluate academic access programs such as this one. In a different study on the same program, Potgieter et al. (SA J High Edu 22 (4):861–876, 2015) reported on students' opinions on the program, focusing on their experiences in the preparatory phase, reporting on personal perceptions of its structure, on challenges faced, and on preparedness upon transition to the mainstream program. The distinguishing feature of the study reported here is that six criteria are presented for determining the success of an access program, illustrated using data sourced from the University of Pretoria, South Africa.

Keywords Access program · Evaluation · Disadvantaged students

Background

Foundation, extended, and augmented programs, collectively referred to as access programs or academic development (AD) programs, are currently offered in a variety of formats at South African universities (Council on Higher Education 2013). According to funding regulations, all foundation courses should be credit bearing and form part of formal, extended degree programs (Case et al. 2013). The aim of these programs is to offer the opportunity to access university programs to talented, educationally disadvantaged students who fail to qualify for admission to

J. Engelbrecht · A. Harding (✉) · M. Potgieter
University of Pretoria, Pretoria, South Africa
e-mail: aharding@up.ac.za

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mainstream programs, by initially reducing the pace of presentation and intensifying the teaching approach.

Over the last three decades, expertise and background knowledge of AD provision have improved in South Africa, including expertise on the nature of under-preparedness and disadvantage, the format of effective student development initiatives, and the selection and placement of students (Boughey 2010). Central to this enterprise is the need for a well-qualified workforce to ensure economic development of the country as well as the quest for social justice and equity (Boughey 2007; Kioko 2010).

The AD model at the University of Pretoria under discussion is that of an extended program. In most extended programs at the University, the courses from the first academic year of a B.Sc. degree are spread and integrated over 2 years. The extra time is used for academic support and development of peripheral skills. Students are (mostly) accepted into AD programs on the basis of performance in selection tests. Selection to a study program can be seen as an undertaking to teach at the student's level, and selected students should have a reasonable expectation of success after admission. There are instances of institutionally designed or other selection tests (Van der Flier et al. 2003), but the majority of universities make use of the National Benchmark Tests (Grayson 2010).

Measures of Success for Academic Development Programs

Criteria that are used by universities to evaluate undergraduate programs focus on the achievement of pre-set learning objectives, student success, student personal growth, quality of teaching staff members, quality of graduate output, employment placement after completion of the program, and articulation of the program with other programs within the University and at other institutions (Inyathelo 2014; White 2011). These criteria are not necessarily applicable to AD programs—they apply to general mainstream programs.

Detailed *completion rates* (also referred to as graduation rates) are used as a measure of success for AD programs (HELTASA 2010). This rate is the proportion of a given cohort or intake of students that graduates. Over the period 1992–2005, the University of Witwatersrand in Johannesburg (WITS) reports that their B.Sc. four-year degree program produced a completion rate of just under 50 %, outperforming their mainstream B.Sc. three-year program, which had a completion rate of 42 % over the same period. At the University of Kwazulu Natal in Durban (UKZN), 63 % of AD program students had either graduated or were on course for graduation over the period 1996–2002, compared to the 65 % for mainstream program students (HELTASA 2010). For the period 2005–2008, UKZN reported lower figures of 43 and 31 % for the augmented and foundation programs respectively (CHE 2013).

Students *transferring to other faculties and subsequent graduation* is also seen as a success at WITS (HELTASA 2010). Many students do not qualify for entry

into specific faculties and programs (such as medicine), and their achievement in the AD program then gives them access to these programs. A definitive measure of success is how many students *enter and complete postgraduate studies* (HELTASA 2010). Grayson (1997) cautions that transfers should not be seen as a failure on the part of the student or the program.

The Bachelor of Science Four-Year Program

The extended program, also known as the Bachelor of Science Four-Year Program (BFYP) was introduced with the aim to increase the number of graduates in the science and science-based faculties and, in particular, graduates whose prior learning has been affected by educational and social inequalities.

The BFYP program is situated within the Faculty of Natural and Agricultural Sciences. The majority of students admitted are from previously disadvantaged ethnic groups. The program has two phases, the first phase running over three semesters. During this phase, students receive intensive psychological support, academic development, and guidance for further studies and careers.

In the first semester, all students do courses in mathematics, physics, chemistry, biology, and language and study skills. In the second semester, differentiation occurs depending on the stream that students are enrolled in. Discipline departments (rather than staff within the program itself) take responsibility for teaching activities, most of which takes place in smaller groups. This strategy gives sample opportunity for questions and discussion and allows for individual attention. However, to prepare students for the second phase of the program, students also attend lectures in large groups with a more formal teaching style. The medium of instruction in the program is English. Since the majority of students are additional-language English speakers, language and study skills courses are included in the curriculum, addressing a well-recognised barrier to learning that most of these students face (Grayson 1997).

Progress is assessed continuously, and students have to meet certain levels of academic performance throughout the year to continue in the program. The academic content is presented at a slower pace than in normal programs. This gives students more time to engage with the subject content, and they can develop a deeper understanding of the material. During the three semesters of the first phase, the rate of presentation increases gradually and by the time students have completed the first phase they should be able to work at the normal speed required in mainstream programs.

Students then continue their studies in the second phase (their fourth semester) where they join students in the normal 3-year mainstream degree program, which would be the second semester for the mainstream students. The first two semesters of the program are presented at the Mamelodi Campus of the University, a satellite campus in a township half an hour drive away from the main campus. After successfully completing the first year, students then transfer to the main campus.

Students successfully completing the first three semesters of the program obtain credit for the first semester of a 3-year mainstream degree.

The University considers the strategy of increasing the number of black students in science programs as one of its priorities. The BFYP is also supported and subsidised by the national Department of Higher Education and Training. To increase the number of black students in the program, students entering the program have access to financial assistance ranging from full scholarships to partial bursaries.

To evaluate the program, six criteria were decided upon to measure its success:

- Retention and initial success rates in the program.
- Completion rate, in terms of both total completion rate and completion rate in minimum time.
- Number of students successfully migrating to other faculties, specifically science-related faculties.[1]
- Program performance statistics compared to other universities.
- Enrolment numbers for postgraduate studies.
- Student opinions on the success of the program.

The indicators above provide indirect evidence regarding the effectiveness of selection and placement, and of the quality of academic and soft skills offerings of the program. In this study, we illustrate using these indicators to evaluate the BFYP at the University of Pretoria.

Research Design

For the first five measuring criteria quantitative data were sourced. Student data for the 2008 student intake (n = 346 students) were obtained from the Bureau for Institutional Research and Academic Planning at the University of Pretoria. Performance data for the eight semesters from 2008 to 2011 were analysed for retention, throughput, and transfer between faculties. The faculty student adviser conducted interviews with students to obtain their reasons for dropping out in the first year.

For the sixth measure for success, qualitative data were sourced. The main idea in this part of the project was to capture and describe how students experienced the BFYP program itself and their transition to the mainstream. In 2012, 102 students from the 2008 intake of students in BFYP were still enrolled in the Faculty of Natural and Agricultural Sciences, and we focus on these students in this qualitative part of the study. Of the 102 students, 18 students were enrolled in graduate programs in the faculty and the rest (84) were still completing their undergraduate

[1]Secondary schools provide poor vocational guidance; therefore, success can also be defined in terms of the quality of student choice of study programs that are suitable to their aptitude and interests. The extent of transfer between programs and faculties and dropout in later years could be seen as indirect evidence for this criterion.

studies. For the data collection, a questionnaire with open-ended response items was used. The questions were designed to capture spontaneous responses from students as they reflected on their experience in the first three semesters of BFYP—that is, the first phase of the program—and also globally over the 4 years that they had already completed at the time of this study. Students were contacted by phone to request their participation after which the questionnaires were sent to them by email. Participation in the survey was voluntary, and we received 40 completed questionnaires, representing a 39 % realisation rate.

Results and Discussion

Retention and Throughput

The student enrolment in the different streams of the BFYP and first-year attrition rates are given in Table 4.1. Since counseling and career guidance services are readily available in the first year of BFYP, students should ideally be able to make an informed decision about a future career in a scientific field by the end of this year. From Table 4.1 we see that after the first year 95 students did not return to register in January 2009, reflecting an attrition rate of 27 % in the first year of BFYP.

By the end of the fourth year, a total of 136 students had either discontinued their studies of their own accord or were excluded by the University. This implies that the highest attrition (95 of 136, or about 70 %) took place at the end of the first year of the program.

Although many tertiary institutions in South Africa experience high attrition during the first year (CHE 2013), attrition remains a reason for concern that warrants investigation. For this purpose our faculty student adviser conducted personal interviews with students (Potgieter et al. 2015) to investigate the reasons for students leaving the program in the first year. These reasons included.

- lack of finances for food;
- books and rent expenses before bursaries were paid out;
- wrong career choices;
- exhaustion because of staying far away from campus;
- lack of social and family support;
- health and psychological conditions;
- excessive participation in first-year events and sports;
- feelings of failure for not getting into mainstream programs;
- wrongfully seeing this first as a gap year to get access to the mainstream and then not committing enough time to study;
- lack of motivation; and
- lack of academic knowledge (mostly language, computer skills, mathematics, and chemistry).

Table 4.1 Student enrolment and attrition rates

		Mathematical sciences	Physical sciences	Biological and agricultural sciences	Veterinary sciences	Total
	Registered January 2008	28	185	105	28	346
	Registered January 2009	24	133	78	16	251
	Attrition (rate %)	4 (14 %)	52 (28 %)	27 (26 %)	12 (43 %)	95 (27 %)
Students enrolled per faculty in January 2009	Science faculty	24	95	37	13	169
	Selected for health sciences	–	1	13	–	14
	Selected for engineering	–	23	–	–	23
	Commerce	–	7	7	2	16
	Humanities	–	4	18	1	23
	Education	–	1	2	–	3
	Law	–	2	1	–	3
	Total in faculties other than science	0	38	41	3	82

The interviews further indicated that some students suffer from poor study skills but have a false perception of competence and then seek help too late. Table 4.1 shows that after 1 year 82 students—almost a quarter—transferred to other faculties. The highest rate for transfers came from the biological sciences (41 students). Of these students, one-third (13 students) transferred to health sciences and nearly half (18 students) to humanities. The fact that students take informed career decisions when given the opportunity to explore their interests and aptitudes shows that transfer to other faculties should be viewed positively.

From Table 4.1 we get more information on the attrition rates during the first year in different streams. There are no transfers from the mathematical sciences stream to other faculties, and we get the smallest attrition rate (14 %) in this stream, a somewhat unexpected result as mathematics is often perceived as a difficult field. It may be that some students have entered BFYP with actuarial or financial mathematics in mind, and they could not transfer to engineering unless they had chosen chemistry and physics as electives in the second semester of the first year.

In Table 4.2 we report on progression through the 4-year period 2008–2011.

Table 4.2 Progression through undergraduate studies during the period 2008–2011

Academic year	Students enrolled	Graduated
2008	346	
2009	251	
2010	226	1
2011	212	53
2012	144 undergraduate 30 postgraduate	

Table 4.3 Student success rates per BFYP stream

BFYP stream	Enrolment 2008	Still registered in 2011	Students enrolled in programs with duration four years or more	Students graduated end of 2011[a]
Mathematical sciences	28	21 (72 %)	0	1 (4 %)
Physical sciences	185	112 (62 %)	16	23 (12 %)
Biological and agricultural sciences	105	66 (63 %)	17	25 (24 %)
Veterinary sciences	28	13 (43 %)	3	4 (14 %)
Total	346	212 (61 %)	36	53 (15 %)

[a]Percentage graduates based on 2008 enrolment in the specific stream; these students enrolled in programs with a minimum duration of four years for students in the BFYP

Table 4.3 shows that 61 % (212) of the initial BFYP cohort enrolled at the start of the 2011 academic year, of which 15 % (53) graduated at the end of the year; that is, 25 % of those who were enrolled at the start of 2011. Of the degrees awarded, most were in science and agriculture (30), but a fair number also graduated in the humanities (12) and fewer in construction management (4), economics (3), radiography (2), architecture (1), and computer science (1). The percentage of students who completed a degree has a ceiling of 57 %, taking into account the 144 students of the initial cohort who are still registered for undergraduate studies and who could still graduate.

At the start of 2012, the fifth academic year for the 2008 cohort of BFYP students, the 144 students who were still in the process of completing their degrees registered for undergraduate programs; and another 30 enrolled in graduate degree programs in various faculties. The graduate group comprised 8 % of the initial intake and 56 % (30 of 53) of the 2011 graduates.

Student Opinions

Students expressed opinions on the value of the first 18 months of the program in terms of the structure and assistance offered during that time. Students felt positive about the design of that stage of the extended program. Comments included:

> The curriculum was very well structured and organised, and saw to it that we had all the knowledge we required for the mainstream program.

> The theory covered was explained in detail, and I was able to understand the concepts much better.

Students commented on the pace and workload, experiencing the program as intensive, with a full timetable making the days very long. These comments corresponded to those of the Science Foundation Program students (Grayson 1997), who acknowledged the demands of a full schedule but saw it as an opportunity to improve their time-management skills and to learn to cope under pressure. Students mentioned the challenges of time management and of finding a balance between work and personal life, for example, "having to cope with the amount of work and the fast pace of the learning program." Students appreciated the slower pace of delivery of the lectures and felt that the program gave them the opportunity to adapt to university. Furthermore, formative assessment, group activities, and a fixed timetable with scheduled tutorial classes were mentioned to be of value.

Being situated on the satellite Mamelodi Campus seemed to be problematic as it made students feel isolated from the larger B.Sc. group. Another aspect of concern was that of perceived spoon-feeding. Students felt that they were not only spoon-fed but were treated as if they were still at school. However, students expressed appreciation for the dedicated student adviser and a clinical psychologist there to support them with psycho-social matters as well as life and study skills.

Challenges of adjustment to the new social environment and adjustment to the academic environment were experienced. In addition, challenges related to personal issues, finances, or a lack of computer or language skills were mentioned.

Almost two thirds of the students (65 %) expressed their appreciation for the BFYP and some even felt that they were better prepared than the mainstream students. Students who felt underprepared suffered due to the increased workload and pace as well as the increased group sizes, and they felt overwhelmed as these new challenges emerged. These students felt that the program of the first 18 months was to blame for their ill preparation. The program was too similar to the high school approach and caused them to be over-confident upon entering the mainstream. Most students felt that they acquired study skills and learned how to work hard, giving them confidence. The overlap of work between the initial phase and the mainstream was considered beneficial.

Evaluating the Success of the Program

The data presented above enable us to evaluate the success of the BFYP according to the identified six success criteria.

Retention

The total attrition of 155 students (45 %) occurred over a 4-year period, with students leaving of their own accord or after exclusion. The attrition comprises almost half the cohort, a high percentage. The majority of these students (95) were lost in the first year, constituting 27 % of the cohort. It has to be mentioned that six of these students returned after a period of absence. Of concern is the fact that 18 % of the attrition occurred later, which could indicate that students did not make a successful transition to the mainstream or did not cope with the demands of the programs that they had chosen. Students need to develop into independent, self-regulated learners while simultaneously overcoming their under-preparedness. The program aims to assist them in this. Not all of these students are expected to be successful, and an important aspect of the program should be that there are early indicators of non-success, which all parties involved should be alerted to. The fact that most of the attrition occurred early on in the program contributes to some extent to the success of the program, in that some of these students realised early on that a degree in science is not for them.

Completion Rates

The completion rate of 15 % at the end of 2011 appears to be low, but this percentage could increase since a further 36 students are enrolled in programs with longer duration, which could boost this minimum-time completion rate to 28 %. It is anticipated that the completion rate of this cohort of students could be 57 % eventually. BFYP offered access to professional careers to close on 200 students who would not have had access otherwise. The graduation rate for 2008 mainstream students completing three-year programs in the Science Faculty in minimum time was 32 %, which puts the BFYP completion rates in a more favourable light. While these numbers cannot be compared directly, it does indicate that mainstream science programs at the University of Pretoria are also characterised by a fairly low throughput rate.

Migration

BFYP has as its purpose the recruitment of students into the scarce skills field of science and mathematics. A potential completion rate of 57 % is reported, yet the gains to science in the BFYP is less than that because roughly a quarter of students migrated to other faculties. If one views science as extending to the related fields of health sciences and engineering sciences, then the impact of migration is decreased. Almost 80 % of the students still active in the fourth year were enrolled in natural and agricultural sciences, engineering, or health sciences.

Comparison to Other Institutions

The completion rate of 15 % in minimum time is certainly low; but should the potential completion rate of 57 % be realised, it would be comparable to that of WITS and UKZN, where the rates were just under 50 and 63 % respectively (HELTASA 2010). Downs (2010) reports a completion rate of 43.5 % in minimum time in another access program, the Science Foundation Program at UKZN, with another 24.6 % still in progress to completion, giving a potential 68.1 % completion rate. These percentages are considerably higher than the potential 28 % minimum-time completion rate at the University of Pretoria and potential 57 % completion rate.

Postgraduate Entries

Increasing the number of students enrolled for postgraduate studies is important at a research-intensive university such as Pretoria. The fact that more than half the students who graduated in 2011 enrolled for postgraduate studies in 2012 (30 of 53, 57 %) is significant. Of these students, 23 were enrolled in science-related programs. Not only did they complete their undergraduate studies successfully, but they performed well enough to be admitted to postgraduate programs where they will be developed as researchers.

Student Experiences

Student experiences were mostly positive in relation to the BFYP. Students are clearly in need of counseling as they have trouble identifying academic challenges, they do not openly seek academic assistance, and they interpret problems such as not being selected for another degree program as a personal failure. Students

expressed appreciation for the counseling offered. Many students overcame these challenges and progressed to success. Gaining valuable life skills such as time management and perseverance as well as gains in confidence were mentioned by respondents across the performance bands.

Conclusion

The study reported in this paper set out to evaluate the success of BFYP, using the six criteria: retention in the program, completion rate, the number of students successfully migrating to other faculties, program performance statistics compared to other universities, enrolment numbers for postgraduate studies, and general student opinion on the program. Although there is room for improvement, the program can be considered as successful with regard to retention, completion rate, and performance in comparison to similar programs at other universities. The program is also seen to contribute to the corps of postgraduate students, an aspect that contributes to achieving the aim of a research-intensive university. Student opinions, although mostly positive, pointed to areas that need improvement.

The program serves the intended purpose, in that many students for whom a study program in science would not have been possible are succeeding in their studies in science. The program serves a secondary purpose of guiding students at an early stage, in gauging their interest and potential success for completing a science-related program at university. Based on the findings it can be concluded that the program is successful in achieving both these purposes.

Our findings of reported positive experiences of the program agree with experiences in similar programs (Carranza 2007; Eaton 2007; Efiritha et al. 2012; Grayson 1997; Quayle and Essack 2007; Wood and Lithauer 2005). Both academic and other counseling services are important aspects of any access program as evidenced by Lundell et al. (2007), Grayson (1997) and Eaton (2007), for which students expressed appreciation.

Attention should be paid to students who express dislike for the perceived spoon-feeding teaching approach. Students want to be treated like the adults they are and are sensitive to this aspect, as also witnessed by Grayson (1997). Doing the first phase of the program on a satellite campus resulted in a feeling of isolation. This is not a unique experience and has been reported by other researchers (Efiritha et al. 2012; Hlalele and Alexander 2012; Lundell et al. 2007). The problem can only be addressed at an institutional level and is likely to remain as is. No mention was made of discrimination or stigmatisation, contrary to what was typically experienced elsewhere (Lundell et al. 2007; Quayle and Essack 2007; Efiritha et al. 2012). This finding should be seen in a positive light and could point to a change in perception regarding access programs.

An overall retention rate of 55 % resulted over a four-year period. The majority of the intake succeeded in obtaining a degree, and so face favourable career opportunities. The program is by no means perfect, and there is room for improving on the success as measured by the criteria set out. The findings of the study indicate that the program offers a solid foundation to build on.

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Part II
Transitions Within University

Chapter 5
Student Approaches to Learning, Conceptions of Mathematics, and Successful Outcomes in Learning Mathematics

Priscilla E.L. Murphy

Abstract In this chapter, I concentrate on success as the completion of a degree and investigate mathematics as a key component in that success. I examine the connections between approaches to learning, conceptions of mathematics, and student performance as measured by their grades. This study highlights practical implications for mathematics in higher education, draws from the comprehensive report of the Enhancing Teaching-Learning Environments project by Hounsell and Entwistle (ETL shortened experiences of teaching and learning questionnaire [measurement instrument] 2005), and extends the international research on student conceptions of mathematics by Wood et al. (Becoming a mathematician, Springer, Dordrecht 2012). Surveys were used to investigate the learning experience of a random sample of first year mathematics students in Australia and New Zealand. This chapter highlights two key findings of relevance to teachers and curriculum developers: firstly, that successful mathematics performance was strongly associated with deep approaches to learning, organised approaches to learning, and a cohesive conception of mathematics; and secondly, that surface approaches to learning were negatively related to modelling and the abstract conceptions of mathematics.

Keywords Mathematics · Student conceptions · Approaches to learning

Context

New Zealand is a developed country in the South Pacific Ocean. It offers a vibrant mix of cultures resulting from strong Māori and Pacific Island traditions and European migration. It has eight universities, three Wānanga (a public institution

P.E.L. Murphy (✉)
Manukau Institute of Technology, Auckland, New Zealand
e-mail: priscilla.murphy@manukau.ac.nz

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that provides education in a Māori cultural context) and eighteen Institutes of Technology and Polytechnics (ITPs). In this chapter, my sample is taken from Manukau Institute of Technology (MIT). Located in Auckland, the University has 16,000 students (Manukau Institute of Technology 2014), of whom 17 % are Maori and 35 % Pacific Island. In order to fulfil the NZ Tertiary Education Commission's (TEC) strategy of improving the learning outcomes of priority learners (Māori, Pacific Island, and under 25-year-olds), tertiary institutions have to attain four measures of student success: (a) increased participation, (b) improved success and retention, (c) improved employability and progression, and (d) enhanced experience and satisfaction (New Zealand Tertiary Education Commission 2014).

A neighbouring Pacific nation is Australia. My sample also includes students from Macquarie University (MQ), based in the business and technological hub of Macquarie Park in Sydney. Similar to NZ, the Australian higher education sector is made up of universities, vocational education and training (TAFE), and private providers and is driven by teaching and learning frameworks mandated by the Tertiary Education Quality and Standards Agency (TEQSA). TEQSA's learning standards describe the scope of knowledge and skills and the level of attainment required for graduation purposes (Department of Education Employment and Workplace Relations 2011).

Introduction

In order to increase the pipeline of mathematics students in professional programs in higher education, my study investigates mathematics performance in relation to student learning processes and provides recommendations for educators.

My research questions are:

- What is the nature and extent of students' approaches to learning mathematics?
- What are the characteristics of student conceptions of mathematics?
- To what extent are learning approaches and conceptions of mathematics related?
- How are these related to student results?
- What are the implications for teaching mathematics in higher education?

These research questions are underpinned by several key constructs based on previous research in student learning: approaches to learning, conceptions of mathematics, and student performance.

Approaches to Learning

This idea was originally coined by Marton and Säljö (1976) to refer to a co-existence of intention and process of learning. A *deep approach to learning*

produces complex learning outcomes, involving the motive of intrinsic interest and using learning strategies that maximise meaning, whereas a *surface approach to learning* is driven by fear of failure and rote learning. An *achieving* or *organised approach to learning*, which overlaps with a deep approach to learning, is driven by the need for achievement and the use of space and time to achieve a task. The intentions of those who adopt achieving strategies are to strive to gain high grades. They seek to complete the tasks by making greater effort and managing their time. Approaches to learning may be influenced by learning tasks, teaching, and maturity.

Conceptions of Mathematics

This refers to one's interpretation of the discipline of mathematics. People construe specific meanings that are attached to phenomena (such as mathematics), and these meanings elicit responses. As reported in Wood et al. (2012), conceptions can be described in three levels and in Crawford et al. (1994) as two types: fragmented and cohesive conceptions. Wood et al. (2012) found that undergraduate mathematics students perceived that mathematics is about numbers and components (Level 1 components); mathematics is about modelling and abstraction (Level 2 models); and mathematics is relevant to life (Level 3 life). The Level 1 conception of mathematics as a study of numbers, components, or techniques overlaps with a "fragmented" conception of mathematics. Level 2 is akin to a cohesive conception, whereby mathematics is a complex logical system which can be used to solve complex problems. Level 3 is a higher level in which mathematics is understood as being insights for understanding the world. As Crawford et al. (1994) only investigated first year students, the Level 3 conception was not evident among their participants. Table 5.1 summarises this research.

Student Performance

Student performance can be seen as represented by quantifiable learning outcomes such as assessment marks as a standard indictor of success in learning, assuming

Table 5.1 Conceptions of mathematics

Crawford et al. (1994)	Wood et al. (2012)
Fragmented	Level 1: Mathematics is about topics, numbers, techniques (components)
Cohesive	Level 2: Mathematics is about modelling and/or abstract structures (models)
	Level 3: Mathematics is about life and career (life)

that examinations are designed to test higher level learning. For example, for participants in my study a mathematics course in a business faculty requires them to develop mathematical knowledge in algebra and calculus as well as apply the principles, concepts, and techniques learned to solve practical and abstract problems.

Even though institutions define success with broad-brush measurements such as program completion and retention rate, and assessment is often aligned with funding and auditing purposes (New Zealand Tertiary Education Commission 2014; Tertiary Education Quality and Standards Agency 2011), my study posits that students view "success" or "failure" in learning mathematics as a nominal outcome of either a Pass or Fail grade in mathematics. For example, if a faculty reports that a mathematics course had a low completion rate, this suggests that several mathematics students had failed due to either early withdrawal from the course, or a Fail grade in their examinations. My study suggests that students who fail mathematics are likely to use surface learning and fragmented conceptions of mathematics, whereas successful students tend to adopt deep learning and a cohesive conception of mathematics, assuming that teaching and assessments promoted either surface or deep learning.

This study adds to existing research in mathematics education. My results extend international research on student conceptions (Wood et al. 2012) and contribute to enhancing teaching and learning in higher education, and particularly to the goal of producing mathematics graduates with skill sets that are well suited to their future careers. In mathematics education research, conceptions of mathematics in student learning have been investigated since the 1980s, but more research is warranted on broadening the notion of learning mathematics in the context of business and engineering.

How students develop deep learning and cohesive conceptions in mathematics and the impact of these on the development of graduate capabilities are emerging as significant questions in the current higher education context. In general, deep learning, work readiness, work relevance, and analytical skills are valued by stakeholders in the international labour market (Organization for Economic Cooperation Development 2013). Accrediting bodies for engineering and business programs have regarded mathematical skills as essential to the development of graduate attributes. The Institution of Professional Engineers New Zealand (IPENZ) has developed a national plan to ensure that engineering graduates meet New Zealand's economic needs by applying knowledge of mathematics to the solution of complex engineering problems, following the guidelines of the Washington Accord (International Engineering Alliance 2009). In mathematics education, both the OECD report and IPENZ guidelines imply that mathematics educators should improve the quality of learning through deep learning and the application of mathematics to daily life, in order to adequately prepare mathematics undergraduates for the demands of complex problems faced in workplaces. This further highlights the key role that tertiary educators play in ensuring high-quality learning processes and understanding variations in student learning experiences, which are at the centre of my study.

Background

My study addresses the transition from secondary to tertiary mathematics education by investigating learning processes and recommending teaching strategies for faculty staff to promote successful outcomes. Research has shown that tertiary mathematics students face difficulties with performing basic mathematical calculations without the aid of calculators, and advanced mathematics students also lack understanding of logical proofs and appreciation of assumptions in mathematical principles in Australia (Brown 2010) and in New Zealand (Thomas et al. 2010). Australia is facing a downward trend in preparedness of first year undergraduate mathematics students, partly because secondary students have tended to choose easier options in senior mathematics and also due to a shortage of mathematics teachers. Consequently, universities tend to offer remedial courses for first year mathematics students (Brown 2010). Likewise, New Zealand tertiary mathematics students tend to adopt surface approaches to learning in secondary school due to an overemphasis on high-stake assessments (Thomas et al. 2010). It is clear that inadequate preparation in mathematics as well as poor learning approaches, particularly with first year mathematics students, create barriers to achieving success in higher education.

Many institutions have addressed the need to prepare first year commencing students diagnosed with low levels of basic mathematics (algebra and arithmetic) through bridging and foundation courses. These initiatives include developmental mathematics programs for engineering students at the University of Southern Queensland, Australia (Taylor and Morgan 1999); mathematics support at the Loughborough University in the UK (Croft et al. 2009); and after-class study groups for mathematics undergraduates (Solomon et al. 2010). In several institutions, while mathematics bridging programs are introduced to support first year commencing undergraduates, more pressure is placed on mathematics teaching staff to enhance teaching and offer mathematics support. With this in mind, my study suggests that mathematics educators do consider revisions to curriculum design in courses that support students transitioning from secondary to tertiary education in order to raise their level of mathematical achievement.

My investigation aims to validate research findings on learning processes within the context of mathematics students in business and engineering programs. Studies of student learning from the 1990s report that the majority of mathematics students tend to use surface approaches to learning and demonstrate fragmented conceptions. These students display poor-quality learning outcomes, whereas those who adopt deep learning and cohesive conceptions show high-quality learning outcomes (Crawford et al. 1994, 1998a; Liston and O'Donoghue 2009; Macbean 2004). Using phenomenological approaches, their findings are important to understanding how learning approaches and conceptions are related. However, it is noted that learning processes are not always consistent in the context of teaching and learning. Liston and O'Donoghue (2009) report that students' conceptions of mathematics may not be consistent with the approach to learning that they adopt. As an example,

a student who focuses on surface approaches may score high marks and recognise the importance of deep learning. In international mathematics research, Wood et al. (2012) found that more than half the undergraduate mathematics students surveyed (56 %) adopted fragmented conceptions with fewer students developing cohesive conceptions (44 %) and, to a lesser extent, life conceptions (6 %). In the context of engineering education, Khiat (2010) reports that engineering students in their study were less likely to form associative understandings which allowed them to relate mathematics to engineering problems. He argues that surface learners who tend to develop procedural understanding in their use of formulae and doing mathematical calculations are unable to apply mathematical concepts in solving engineering problems. Prior empirical findings in mathematics education therefore suggest that tertiary mathematics students tend to focus on surface learning and display fragmented conceptions. However, given variations in assessment and small sample sizes, it is difficult to generalise learning outcomes in relation to learning processes without considering the context of the studies. As such, my study investigates the extent of relationships between learning processes and mathematics results in the context of learning mathematics in business and engineering.

Learning processes such as approaches to learning and conceptions of learning are relatively stable traits but influenced by the learning and teaching context. If students perceive that teaching promotes deep learning strategies, they may also follow the same agenda in their learning intentions and learning processes even if they still use surface learning (Prosser and Trigwell 1999; Ramsden 2005; Richardson 2005). A study by Prosser and Trigwell (1999) reports that high-performing students are quick to adapt to their learning environment given that they generally adopt deep approaches to learning and, thus, new situations will further evoke similar deep approaches. Once they perceive that the current task or assessment requires deep learning, they tend to adopt strategies which enable them to understand the concepts. If they are aware that the task or assessment requires surface learning, they tend to adopt surface approaches such as memorising information and studying to the test. In order to attain high marks, students are willing to change their learning strategies from deep to surface at the expense of achieving high-quality learning outcomes. It has been found that the backwash effect of inappropriate quantitative assessments, focusing on lower cognitive levels of thinking, could be counter-productive for students, who prefer deep approaches to learning (Lai and Biggs 1994).

Another determinant of learning approaches is goal orientation. Senko and Miles (2008) found that 260 American university students' results were jeopardised because they tended to engage in deep learning, to adopt mastery goals and to focus too much on understanding their preferred topics. Interestingly, those who had performance-oriented goals and used surface learning strategies were more likely to achieve better results, but displayed less interest in learning the course. Hence, when students place too much emphasis on improving one's performance in examinations, they tend to perceive deep learning as a barrier to getting good grades.

With respect to age differences and workload issues, Biggs (1987) reports that young college students (less than 18 years old) tend to adopt surface approaches to learning, whereas older university students (over 22 years old) who had a heavier workload, tend to switch from deep approaches to surface approaches in their final year of undergraduate studies. In teaching mathematics, several studies (Cano and Berbén 2009; Crawford et al. 1998b; Entwistle 2005, September; Entwistle et al. 2005; Fenollar et al. 2007) have found that good teaching environments are related to deep approaches and clear teaching goals, mastery goals, and appropriate assessments; whereas fragmented conceptions are associated with surface learning due to fear of failure, heavy workload, lack of purpose and inappropriate assessments. Although teaching factors will not be investigated in my study, prior findings about mathematics teaching suggest that approaches to teaching and learning coincide with each other. Building on this body of research on student learning, the contribution of my study is to link approaches to learning, conceptions of mathematics, and performance for students commencing tertiary study.

My study is influenced by Biggs' model of constructive alignment (Biggs 1996) that underpins the Enhancing Teaching-Learning Environments (ETL) project (Hounsell et al. 2005). Hounsell and his colleagues applied principles of constructive alignment in developing undergraduate courses in Edinburgh, Durham, and Coventry universities in the UK in order to enhance the teaching and learning environment. In developing new curricula for each discipline, focusing on how learners can develop better understanding and engage in deep approaches to learning, lecturers designed learning, teaching, and assessment activities that promoted higher levels of learning behaviour. Although my study is concerned with student approaches to learning and their conceptions of mathematics, this research has helped me to recognise that learning experiences are complex and influenced by teaching and learning factors.

Methodology

My sample consisted of 291 business and engineering mathematics students from Manukau Institute of Technology and Macquarie University. At the time of the data collection, students were enrolled in first year mathematics courses, covering basic algebra and calculus concepts and problem-solving applications in engineering and business. Questionnaires were used to assess student approaches to learning and their conceptions of mathematics. This way of obtaining information was practical for a large number of students. My intention was to raise awareness of student learning and implement new teaching initiatives that would foster better learning outcomes. I used five-scale Likert-style questionnaires to investigate students' conceptions of mathematics and approaches to learning mathematics. After gaining

Table 5.2 Short form of conceptions of mathematics scale (Wood et al. 2012)

Level 1 components [*alpha* = 0.92]
Mathematics is 1. A set of models used to explain the world 6. A way to solve problems in my life 10. A way to give humans a more advanced life 11. The language of nature 14. A theoretical framework that describes reality 16. A way to generate new ideas
Level 2 models [*alpha* = 0.71]
Mathematics is 2. A way of analysing ideas and problems 4. Basic knowledge for all scientific fields 5. No use to me at all 7. A tool that can be applied in various fields
Level 3 life [*alpha* = 0.75]
Mathematics is 1. A set of models used to explain the world 6. A way to solve problems in my life 10. A way to give humans a more advanced life 11. The language of nature 14. A theoretical framework that describes reality 16. A way to generate new ideas

ethics approval, questionnaires were sent to the students at both universities. The Short Form of Conceptions of Mathematics (SCM) consists of 16 items as shown in Table 5.2.

The second questionnaire, Shortened Experiences of Teaching and Learning Questionnaire (SETLQ) was developed by Hounsell et al. (2005). The original inventory consists of the Learning and Teaching Questionnaire and Experiences of Teaching and Learning Questionnaire. As part of my pilot study, I performed a factor analysis of the ETLQ scale, which showed that the shortened version (SETLQ) was well validated and that item reduction had improved the scale reliability. In this study, I utilised a revised version (10 items), focusing on the learning approaches sub-scale (Table 5.3).

At the beginning of the data collection, students recorded their demographic details (university ID, gender and age) and self-rated their expected mathematics examination performances (ranging from 1 as "Rather badly" to 9 as "Very well"). Final examination mathematics results were used as a measure of mathematical performance. In line with the ethics protocol, all data were confidential. Using IBM SPSS software (Statistics 22), the mean score for each sub-scale was tabulated. The responses from the positive statements were coded from 1—strongly disagree to 5—strongly agree. One negative statement (that is, "Mathematics is of no use to me") was coded in reverse to match with the coding of the positive statements. Descriptive, correlation and cross-tabulation tables were extracted to investigate relations between conceptions of mathematics, study approaches, and performance.

Table 5.3 Shortened experiences of teaching and learning questionnaire (Hounsell and Entwistle 2005)

Deep approach [*alpha* = 0.77]
1. I've been over the work I've done to check my reasoning and see that it makes sense 6. It has been important for me to follow the procedure/steps, or to see the reasons behind (Original statement-It has been important for me to follow the argument, or to see the reasons behind things. things 8. I've tried to find better ways of tracking down relevant information in this subject 10. If I've not understood things well enough when studying, I've tried a different approach
Surface approach [*alpha* = 0.68]
3. Much of what I've learned seems no more than lots of unrelated bits and pieces in my mind 7. I've tended to take what we've been taught at face value without questioning it much 9. I've just been going through the motions of studying without seeing where I'm going
Organised approach [*alpha* = 0.82]
2. I have generally put a lot of effort into my studying 4. On the whole, I've been quite systematic and organised in my studying 5. I've organised my study time carefully to make the best use of it

Findings

Student Results

Omitting missing data (N = 15) from my analyses, Table 5.4 shows the distribution of examination performance for each demographic category. The majority of students who passed their examinations were typically male school-leavers (16–20 years old) and mature students (over 30 years old).

Table 5.4 Age and gender by types of performance and institution (n = 276)

Fail	Gender	Age	*N*	Pass	Gender	Age	*N*
MIT	Female 2	16–20	8	MIT	Female 19	16–20	32
Fail *N* = 15	Male 13	21–25	5	Pass *N* = 78	Male 59	21–25	22
		26–30	2			26–30	8
		Over 30	0			Over 30	14
MQ	Female 9	16–20	17	MQ	Female 70	16–20	91
Fail *N* = 23	Male 14	21–25	6	Pass *N* = 160	Male 90	21–25	49
		26–30	0			26–30	7
		Over 30	0			Over 30	10

Table 5.5 Correlation coefficients of sub-scale s (n = 291)

Sub-scale	1	2	3	4	5	6	7	8
Final course grade	1							
Expected grade	0.48**	1						
Deep approach	0.25**	0.31**	1					
Surface approach	−0.077	−0.10	0.11	1				
Organised approach	0.30**	0.42**	0.57**	0.21**	1			
Level 1 conceptions of mathematics (components)	0.013	0.12*	0.14*	−0.07	0.12*	1		
Level 2 conceptions of mathematics (models)	0.12	0.17**	0.15*	−0.25**	−0.003	0.64**	1	
Level 3 conceptions of mathematics (life)	0.15*	0.27**	0.28**	0.017	0.26**	0.51**	0.43**	1
Mean	5.14	6.23	3.88	3.22	3.61	3.88	3.94	3.42
Standard deviation	2.42	1.68	.674	0.90	0.97	0.69	0.74	0.76

*$p < 0.05$; **$p < 0.01$

Student Approaches to Learning, Conceptions of Mathematics, and Results

In order to investigate the relationship between sub-scale s and results, correlation coefficients of each category were calculated (Table 5.5). Weak and moderate correlations were generally found between the constructs.

The data show that the students had high mean scores in conceptions of mathematics Level 2 (3.94), Level 1 conception of mathematics (3.88), deep approach to learning (3.88), and organised approach to learning (3.61); and lower scores in surface approach to learning (3.22) and a Level 3 conception of mathematics (3.42). Based on Dancey and Reidy's (2004) categorisation of the strength of correlation, strong correlations range from R = 0.7 to 0.9, moderate range from 0.4 to 0.6, and weak correlations range from 0.1 to 0.3. In analysing correlation matrixes, low correlation coefficients can be significant with large sample sizes. Hence, it was more meaningful to look at the strength of correlations than to focus on their significance levels. In summary, the foregoing data display significant positive correlations between these sub-scales:

Weak correlations:

- Final grade and deep approaches (R = 0.25, $p < 0.01$)
- Final grade and organised approaches (R = 0.30, $p < 0.01$)
- Final grade and Level 3 conception (life) (R = 0.15, $p < 0.05$)
- Expected grade and Level 1 conception (components) (R = 0.12, $p < 0.05$)
- Expected grade and Level 2 conception (models) (R = 0.17, $p < 0.01$)
- Expected grade and Level 3 conception (life) (R = 0.27, $p < 0.01$)
- Expected grade and deep approaches (R = 0.31, $p < 0.01$)

- Deep approaches and Level 3 conception (life) (R = 0.28, $p < 0.01$)
- Surface approaches and organised approaches (R = 0.21, $p < 0.01$)
- Organised approaches and Level 3 conception (life) (R = 0.26, $p < 0.01$).

Moderate correlations:

- Final and expected grades (R = 0.48, $p < 0.01$)
- Expected grade and organised approaches (R = 0.42, $p < 0.01$)
- Deep approaches and organised approaches (R = 0.57, $p < 0.01$)
- Level 1 (components) and Level 2 conceptions (models) (R = 0.64, $p < 0.01$)
- Level 1 (components) and Level 3 conceptions (life) (R = 0.51, $p < 0.01$)
- Level 2 (models) and Level 3 conceptions (life) (R = 0.43, $p < 0.01$).

It can be seen from the above that students' expectations of their grades correlated positively with the three categories of conceptions of mathematics and only moderately with final grades. The higher the expected grade, the more cohesive the conception of mathematics. Moreover, there were significant correlations between expected grades and deep and organised approaches to learning. These patterns of significant correlation with organised approaches, deep approaches, and a cohesive conception were also observed in relation to the final grades.

To further establish relations between conceptions of mathematics and approaches to learning, I cross-tabulated the corresponding sub-scale s of these constructs by using 2 × 2 contingency tables (Table 5.6). When analysing the SPSS data, following Nardi (2006), two assumptions for chi-square tests were considered: that the categories for the observations should not overlap; and that each category must have an expected frequency of at least 5. If the probability (p) value of obtaining a chi-square value is less than 0.05, then the null hypothesis is rejected, suggesting that both variables are related. My initial cross-tabulation showed low expected frequencies (less than 5) in some cells, which violated the second chi-square testing assumption. Hence, I adjusted to two categories (low and high levels) by recoding the SPSS codes. For example, 1 (strongly disagree) and 2 (disagree) were classified as low levels, whereas 3 (neutral), 4 (agree), and 5 (strongly agree) were categorised as high levels for the purpose of creating the contingency tables. Each table shows approaches to learning (by row) and conceptions of mathematics (by column).

In Table 5.6, a low statistical p value (lower than 0.05) suggested that deep learning and Level 3 (life) conceptions were related ($\chi^2 = 5.657$, df = 1, $p = 0.017$). The actual count, which was similar to the expected count, confirmed that 90 % of respondents had adopted deep learning and a cohesive mathematics conception. Furthermore, organised approaches to learning and "mathematics is about life" conceptions were statistically related ($\chi^2 = 5.091$, df = 1, $p = 0.024$).

By contrast, insignificant chi-square results were noted in the relations between surface learning, deep learning, and Level 1 and 2 conceptions of mathematics.

Table 5.6 Conceptions of mathematics versus approaches to learning (N = 288)

Level 1 conception (components)		
Surface	Low	High
Low	1	57
High	10	220
Deep	Low	High
Low	0	8
High	11	269
Organised	Low	High
Low	1	35
High	10	242
Level 2 conception (models)		
Surface	Low	High
Low	2	56
High	11	219
Deep	Low	High
Low	0	8
High	13	267
Organised	Low	High
Low	1	35
High	12	240
Level 3 conception (life)		
Surface	Low	High
Low	7	51
High	17	213
Deep*	Low	High
Low	3	5
High	21	259
Organised*	Low	High
Low	7	29
High	17	235

*Chi-square statistics (significant at $p < 0.05$, df = 1)

Discussion

Mathematics Results

On one hand, my hypothesis about relations between deep approaches to learning, cohesive conceptions (Level 3 life), and high grades was demonstrated. On the other hand, my hypothesis about the relations between surface approaches to learning, fragmented conceptions, and low grades was not demonstrated and warrants further investigation. These results are important to curriculum developers who intend to teach mathematics in undergraduate courses and to motivate students to succeed in learning mathematics. Contrary to Senko and Miles (2008), my

findings suggest that in order to succeed in mathematics, students should view mathematics as a discipline that has essential application to their lives, adopt deep approaches to learning, be capable of managing their time well, and demonstrate effort in their studies. These findings are consistent with previous research (Crawford et al. 1994; Liston and O'Donoghue 2009; Macbean 2004). To a certain extent, they differ from the findings of Crawford et al. (1994) because my study found a significant relationship between deep approaches and cohesive conceptions whereas there was no significant association between surface and fragmented conceptions. Due to the quantitative nature of my results, further investigation is warranted to understand why surface learners tend not to perform well in examinations given that their sole purpose in studying mathematics is to pass, without making real connections between mathematics and their future studies.

Conceptions of Mathematics and Approaches to Learning

If educators place too much emphasis on remembering rules and formulae in assessments, this may encourage a low-level conception of mathematics and a surface approach to learning. My study shows that one group of students held lower level conceptions, seeing mathematics as about numbers and components. We found that these conceptions were significantly correlated to the conceptions that mathematics is about models and life (Levels 2 and 3). Although participants held a lower level conception, they could eventually develop a higher conception of mathematics. As suggested by Wood et al. (2012), there is scope for students to develop higher level conceptions over time because these conceptions are developmental in nature, with higher conceptions building upon lower ones. By implication, in order to achieve higher quality learning outcomes, a student who adopts a fragmented conception prior to tertiary studies should be encouraged to develop a more holistic and cohesive conception of mathematics in the first year of tertiary education. In order to improve students' higher level conceptions of mathematics, applications of constructive alignment in mathematics curricula (Hounsell et al. 2005) suggest that lecturers should teach mathematics as a connected set of topics and concepts which relate meaningfully to people's lives.

Relevance of the Findings to Educators

Mathematics Curriculum

The curriculum can be used to promote cohesive conceptions and deep learning. Constructive alignment is a useful framework for lecturers to assist their students to develop deeper learning of mathematics through applications of concepts in real-life

Table 5.7 SOLO taxonomy and learning processes

SOLO taxonomy	Approaches to learning	Conceptions of mathematics
1. Pre-structural The student has not understood the tasks 2. Unistructural The student has applied and used one or few aspects of the tasks. Understanding refers to knowing bits of information	Surface	Components
3. Multistructural Aspects of the tasks are understood and treated separately. Understanding is knowing about each component	Surface	Components
4. Relational The components are integrated into a whole. Understanding is forming relationships between components	Deep	Models
5. Extended abstract Abstraction of ideas and generalisation to a new topic. Understanding involves transfer and metacognition	Deep	Models, life

situations, as well as by focusing their awareness on the conceptual aims and learning demands of the subject (Hounsell et al. 2005). According to Biggs (1996), constructive alignment guides the alignment of curriculum goals with teaching and learning activities (TLAs) and assessment goals. One measure of the effectiveness of the constructive alignment model is the SOLO (Structure of Observed Learning Outcome) taxonomy (Biggs and Collis 1982), which specifies five levels of understanding. As an example, Biggs (1996) evaluated the use of constructive alignment in a psychology course for pre-service teachers at the University of Hong Kong and found that 37 % of pre-service teachers reached an "extended abstract" level of understanding and 40 % reached a "relational" level of understanding.

As shown in Table 5.7, the five levels of understanding in the SOLO taxonomy can be shown as parallel to different approaches to learning and conceptions of mathematics: it may be that higher levels of understanding (relational and extended abstract) are achieved by adopting deep approaches as well as Level 2 (models) and Level 3 (life) conceptions of mathematics. Conversely, it may be that lower levels of understanding (pre-structural, unistructural, multistructural) are associated with surface approaches and Level 1 (components) conceptions of mathematics.

Biggs (1996) suggests that when teachers design objectives, they can focus on developing higher levels of understanding at all stages of the learning, teaching, and assessment cycle. For instance, lecturers in his psychology course first intended that pre-service teachers develop "extended abstract" levels of understanding by evaluating their own teaching practices with reference to theories of teaching. Next, to meet class objectives, lecturers should ask themselves: "What activities are standard teaching methods most likely to elicit?" (p. 353). Teaching and learning activities could include teacher-controlled activities (such as formal tutorials involving cooperative learning); peer-controlled activities (for example, students applying teaching theories in group work); or self-controlled activities (such as taking notes from a text before a lecture to

understand psychological concepts). Then, to assess whether students have achieved specified levels of understanding, lecturers should ask: "What forms of understanding (based on the SOLO taxonomy) are called for in assessments?" Assessments which promote higher levels of understanding include diary entries, portfolio work which shows changes in practices, and concept maps of readings. To date, although few mathematics education studies have investigated the use of constructive alignment in the mathematics curriculum, it is clear that the principles of constructive alignment have the potential to promote higher levels of mathematical understanding.

As well as developing a connected curriculum which promotes understanding through constructive alignment, educators should aim to overcome barriers to deep learning. One such barrier is an over-emphasis on high-stake assessments. My study found a significant negative correlation between surface approaches to learning and modelling conceptions of mathematics. Participants were studying algebra and calculus topics in order to apply mathematical concepts and modelling to business and engineering problems. Drawing on findings from research by Crawford et al. (1998a), if lecturers focus too heavily on surface learning in high-stake assessments, students will aim to pass the course and view mathematics as a set of isolated topics. One possible reason is that students perceive assessments and TLAs as promoting surface or deep learning, so they would pursue the same agenda in their approaches to learning (Prosser and Trigwell 1999; Ramsden 2005; Richardson 2005). By implication, if students perceive that assessments are designed to test their procedural skills in mathematics despite exposure to deep learning in the classroom, they will study to the test and reproduce their notes. Similarly, if they receive inadequate teaching that promotes deep learning and are given high marks for reproducing notes in inappropriate assessments, they will use surface approaches and attain high scores. In such cases, the danger of attaining high marks is that achievement, in conventional terms, tends to mask real understanding of mathematical concepts. Therefore, in order to promote deep learning in mathematics education, lecturers should be aware of students' perceptions of TLAs and assessment goals and provide opportunities for deep learning. Hence, in the long run, lecturers might find it more productive to be aware of students' perceptions of teaching and learning contexts in order to encourage deep learning and modelling conceptions of mathematics.

Students at Risk

In order to increase student success in mathematics, my data suggest that students who have high expectations of achieving success are more likely to attain better results. My data show low achievement by younger participants: compared to mature students (over 25 years old), a higher proportion (13 %) of younger students (below 25 years old) failed mathematics. This is not consistent with a study by Biggs (1987), which found that younger students performed better than older students because older students used deep approaches to learning whereas younger students were more interested in improving their performance.

Role of Tertiary Educators

Tertiary educators play an important role in ensuring high-quality learning outcomes in mathematics education. My research found significant correlations between Level 2 and 3 conceptions, deep approaches, and an organised approach to learning. These empirical findings from undergraduate mathematics students supported a positive association between deep and organised approaches found by Marton and Säljö (1976) and variations in conceptions of mathematics in Wood et al. (2012). Deep learning is about applying one's mathematical knowledge to various fields and requires understanding of mathematical concepts. Such learning can only happen if individuals adopt organised learning approaches by managing their time well and expending productive effort. As Bruner (1966) observes, learning mathematics is about knowing mathematics as a process of gaining knowledge, not as an end-product of knowledge. This process of "knowledge-getting" suggests that knowledge is not simply accumulated but understood, applied, and constructed by the learner. We teach a subject not to produce little living libraries on that subject, but rather to get students to think mathematically for themselves (p. 72). Therefore, lecturers play an important role in ensuring that students exercise autonomy in developing mathematical understanding through deep learning.

Recommendation for Future Research

Analysis of the correlational data showed relationships between student approaches to learning, conceptions, and results. Student-learning research in education is complex because there are several intervening variables at play. One important variable, which is beyond the scope of our study, is the impact of the teaching environment on deep learning, which could be explored in future studies. As learning and teaching could be considered as two sides of the same coin, research in student learning should also take into account teaching interventions, teaching approaches, assessment and the alignment of the curriculum, and principles of constructive alignment.

Conclusion

Tertiary educators are aware of the need to increase the pipeline of successful science, technology, engineering, and mathematics graduates. One way of increasing the graduate pipeline is to ensure that tertiary institutions improve students' learning outcomes in mathematics, as this subject is a gatekeeper for engineering and business programs. My findings showed that strong mathematical

performance was positively correlated with deep approaches to learning, cohesive conceptions, and organised approaches to learning. Compared to younger learners, non-traditional mature students tended to be more successful. Moreover, students who studied a mathematics foundation subject at university were more successful than students who had studied mathematics at high school. This may explain the success of mature students, and demonstrates that students can compensate for knowledge not developed in secondary education. In order to ensure that first year tertiary mathematics students succeed in learning mathematics, educators should be aware of variations in students' learning approaches and conceptions of mathematics. More importantly, they should consider ways of teaching mathematics in order to engage students in deeper approaches to learning and to provide them with more opportunities to integrate knowledge. Students can succeed when universities offer targeted foundation knowledge taught in ways that develop deep learning and structured conceptions of mathematics.

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Chapter 6
The Maths Arcade: A Tool for Supporting and Stretching Mathematics Undergraduates

Noel-Ann Bradshaw

Abstract The Maths Arcade is an activity which aims simultaneously to support those university mathematics learners who are having difficulties, stretch more confident learners, and encourage the development of a staff-student mathematical community. The first Maths Arcade was set up at the University of Greenwich in September 2010, funded initially by a University grant for innovative teaching and later by the Mathematical Sciences Curriculum Innovation Fund of the UK National Higher Education STEM Program. The idea was developed and disseminated through conference presentations and workshops, and this has led to Maths Arcades being initiated in at least ten other UK universities, with interest from other academic disciplines such as business, computing, and engineering. This chapter discusses the motivation behind the initial idea as well as some of the different implementations. It also shows how this activity has been used to support and retain students, and how it has contributed to student success both academically and in terms of graduates' progression into appropriate professional careers.

Keywords At-risk students · Employment outcomes · Faculty-student interaction · STEM · Peer-mentoring · Belonging

Context

Students in England can study for a degree-level qualification in a variety of institutions. This can be a university, an institution conducted by a higher education corporation, an institution designated as eligible to receive support from funds administered by the Higher Education Funding Council for England (HEFCE), or a Further Education College, which also provides education for 16–18 year-olds. For the purposes of this study, we are going to be talking specifically about universities, which cater to over 80 % of the student population (Universities UK 2014).

N.-A. Bradshaw (✉)
University of Greenwich, England, UK
e-mail: n.bradshaw@gre.ac.uk

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Universities receive funds administered by the Higher Education Funding Council England but are currently also able to charge students tuition fees of up to £9000 per year; students have access to government-funded loans to pay for their studies.

In 2014–2015 the number of students going into higher education was around 30 % of 18-year-olds. The student population is mainly made up of 18- to 24-year-olds with 11 % classified as mature students (over 24). Of those students classed as UK or EU nationals 23 % are non-white (Higher Education Statistics Agency 2015).

Before 1992, degrees could be studied at a university or a polytechnic. As a result of the *Further and Higher Education Act 1992,* most polytechnics became universities. They are now known as "post-1992" or "new" universities. These universities, of which Greenwich is one, tend to have a greater diversity in the student body in terms of family income, social class, and cultural origin.

Background

The University of Greenwich (founded in 1890 as Woolwich Polytechnic and later Thames Polytechnic) comprises four faculties across three campuses in south-east London and Kent, UK. The University has a mix of mature students and school leavers among its 20,000 student body, with 39 % over the age of 24. Over half the student body is classified as non-white. The Department of Mathematical Sciences is part of the Faculty of Architecture, Computing, and Humanities and is situated at the Old Royal Naval College in Greenwich. The Department currently has 432 undergraduate students but in 2010, when this project was started, it had approximately 250 undergraduate students.

Challenges and Motivation

In 2010 the Department of Mathematical Sciences, like all mathematics departments, was looking for ways to boost student success and improve retention. As a result of "Curriculum 2000" and subsequent changes to the content of A-level mathematics in England, the Department (like many others) was experiencing great variation in the mathematical skills and confidence of its intake (Vorderman 2011). Some students, despite good grades in school mathematics, were having difficulty in keeping up with the taught material. At the other end of the spectrum, the Department had a number of students with exceptional ability who needed stretching.

The author's motivation for the Maths Arcade stemmed from reading the proceedings of a conference, *Addressing the Quantitative Skills Gap: Establishing and Sustaining Cross-Curricular Mathematical Support in Higher Education*, on mathematical support and, in particular, the keynote address by Hoyles (2010). In this Hoyles acknowledged the varying backgrounds and confidence of students

entering university to read quantitative subjects, but insisted that it is the university's responsibility to provide the necessary support. Also in these conference proceedings was a paper on the Maths Café at Portsmouth, which provided mathematics support for their students (Pevy 2010). At around the same time, the author was asked to review the new edition of the influential book *Thinking Mathematically* by John Mason and others (Mason et al. 2010) for the mathematics education journal *MSOR Connections* (Bradshaw 2010). In reading this book, the present author was struck by, amongst the mass of thought-provoking material, Mason's comments on the importance of working to develop and inspire our exceptionally able students. From these sources, the basic idea for the Maths Arcade was developed.

Definition of Retention and Success

The UK Higher Education Academy (Higher Education Academy 2015) described retention and success as follows:

> 'Retention' in the UK is about students remaining in one HE institution and completing their programme of study within a specific timeframe. 'Success' recognises that students benefit from HE study in a wide range of ways, including personal development and progression into the labour market or further learning.

Retention and success involve inclusion, ensuring the full and equitable participation in and progression through higher education (HE) for all students (HEA 2015). So one of the key questions for higher education institutes is: how they can best ensure that students complete their program of study? To answer this, it is important to look at the various factors which can cause students to drop out. Much research has focused on this in recent years. A summary of the research has been undertaken by Jones (2008), who cites Yorke and Longden's (2008) recent survey of students withdrawing from university, giving the following as contributory factors for non-completion:

- poor quality learning experience,
- not coping with academic demand,
- wrong choice of field of study,
- unhappy with location and environment,
- dissatisfied with institutional resourcing,
- problems with finance and employment, and
- problems with social integration.

Some of these issues, in particular, those around academic demand, problems with finance, and social integration were similar to those issues affecting students in the mathematics department at Greenwich. While acknowledging that some students drop out for good reasons, the Department hoped that more interventions could help avoid losing potentially successful mathematicians.

There are a large number of papers written on ways to aid the transition of students from school to higher education in different subject disciplines with Hodgen et al. (2014) and Grove et al. (2015) focusing solely on mathematics. Williams (2015) acknowledges that problems of transition to higher education mathematics courses used to be solely connected with the demands of "advanced mathematical thinking", whereas now the social and cultural aspects have led many higher education institutes (HEIs) to look at their teaching and learning practices. Again these ideas influenced the Department's thinking.

How to Measure Success?

For the purposes of this chapter we measure success in terms of the proportion of students passing modules or completing degrees, National Student Survey (NSS) scores on relevant questions, and student feedback on the graduate job application process. The NSS is a UK-wide survey completed each year by final year undergraduate students. The survey asks 23 questions to gather student opinion about their degree program. Despite the problematic nature of accepting student satisfaction as a measure of success (Braga et al. 2014), it remains an influential source of information that prospective students use to make their choice regarding which HEI to attend (NSS 2015).

Retention and Success

Department Strategy

The Department of Mathematical Sciences at Greenwich aims to recruit about 100 new undergraduate students each year. The various mathematics degree programs have a large applied content, with a strong emphasis on statistics and operational research. Representative employers and alumni have been consulted over new course content in recent years to ensure that the curriculum is preparing graduates for relevant employment.

As described above, the Department faces many challenges concerning its diverse student body, and as a result, staff have employed various innovations in their practice to tackle retention and student success. In 2008 the author instigated a peer-mentoring scheme (Bradshaw et al. 2011) which has continued ever since, run by different staff but following essentially the same format. Second-year students are trained to mentor groups of first-year students. Mentors are selected and trained during the summer between their first and second year and are then placed with a group of about six new first year students. If there are enough mentors then sometimes two are assigned to each group. Mentors are chosen carefully and given

appropriate training and guidelines as to how and when to contact new students. They play an active role during the new students' first week, in terms of helping them to settle into university life. This scheme has been found to be very successful, with several past students saying that they would not have coped so well had it not been for their mentor, and even that they would have dropped out at the beginning of their course but for the support of their mentor.

The author was also involved in the rejuvenation of the University Maths Society (MathSoc), both as a mature student and then again as a new lecturer. The Society encourages student involvement; organises academic and social events for new and current students; and produces a regular mathematics newsletter, *Prime Times*. Over the years, MathSoc has helped to enhance the community feel within the Department.

The introduction of the Maths Arcade was the result of further thinking about transition and what could be done with limited resources in terms of staff numbers and time. The intention was to simultaneously stretch the more able students, support those who were struggling, and also provide an opportunity for students to get to know each other and thus aid the transition between school and university and again between first and second year.

The Development of the Maths Arcade

Staff in the Greenwich Department felt that a key strategy to improve retention and success was to maintain a sense of community among its students, to encourage them to feel that they were part of a professional mathematical community. If new students were to develop friendships with undergraduates who were part way through their studies, they could be motivated by the success of students in previous cohorts, both academically and in career terms. The Department was particularly keen to help mathematics students overcome the shyness and social inhibitions characteristic of some of those drawn to the subject, and to develop stronger friendships, as well as to increase their attachment to the University and to their chosen discipline. Activities such as the encouragement of an effective student Mathematics Society (MathSoc) and the introduction of a mentoring scheme for new students had been successfully introduced with these objectives in mind.

To build on these activities, the Department wished to promote collaborative learning among students [motivated in part by Swan (2006) and by the work of Uri Treisman (Steele 2011)]. It also wished to tackle the problems noted earlier of students from diverse backgrounds, with some students struggling and others needing greater challenges. The Maths Arcade was created to address these issues, to provide access to help and support from academics, and opportunities for investigating more demanding mathematics, in an informal social situation.

Influenced by classic works such as Polya (1945) and more recent research by Burkhardt and Bell (2007) and Badger et al. (2012), the Department wished to encourage extracurricular mathematical problem solving among its students to help

the development of mathematical modes of thinking. Giving students time to experience a different sort of problem solving was at the heart of the initial Maths Arcade.

It was decided that the Maths Arcade should consist of a one-hour-a-week drop-in session offering a number of activities. Students and tutors might simply come to eat their lunch together, share, for example, mathematical gossip about the latest development in the attempt to prove the Goldbach Conjecture, discuss recent popular mathematics books, or show off a new mathematical magic trick. Students would be encouraged to bring any work they were struggling with so this could be discussed in an informal atmosphere. Puzzles and strategy games would be available, and these quickly became a major part of the attraction of the Arcade for students, with the opportunity to challenge and beat their tutors at simple games becoming a particular draw.

Getting Started

In the inaugural year the Maths Arcade was chiefly promoted to new first-year students, although students from other years, including postgraduates, were welcome. Importantly, staff were also encouraged to attend by advertising this session as one of their "office-hour" slots where they were available to see students. Staff attendance is particularly important for this activity and students often comment on the value for them of the opportunity for informal interactions with their tutors. Trowler and Trowler (2010) state that "interacting with staff has been shown to have a powerful impact on learning especially when it takes place outside of the classroom." It is this interaction that the Maths Arcade is keen to promote. This staff-student interaction is commented on positively by Croft and Grove in their discussion concerning progression within mathematics degree programs (Croft and Grove 2015).

In the first week of term, the second year student mentors were encouraged to bring their mentees to the Maths Arcade. This created strong interest among the new first years, and many of them stayed engaged and continued to attend, albeit for a variety of reasons.

Feedback from students indicated that some were attracted primarily by the games, whereas others came for the social interaction or to obtain help with the academic material. Some tried different games each week, while others played the same one, again and again, examining the different possibilities and strategies. For example, what difference does it make who starts; is it better to play defensively or to attack; when should one play safe, and when is it desirable to take risks? Unlike chess clubs which tend to be competitive, the activity was primarily social. Students were keen to discuss strategies and tactics, which develops their mathematical thinking in an unthreatening context. Indeed, at Maths Arcades in other universities, this strategic gameplay has often been the main focus of the activity and has

encouraged students to pursue topics in the study of strategy games and, in some cases, theoretical game theory for final year dissertations (Rowlett 2015).

What was particularly pleasing to the Department's staff was the diversity of the students who attended, which showed that the initiative was reaching students who might be at risk of poor performance or losing motivation. Before this, other events put on by the Department had tended to attract students from a certain sort of background. This one, however, attracted students of different ages, abilities, social groups, and mathematical background. It was a very successful way of encouraging the students to get to know each other across a whole year group and boosted the group spirit and morale of the cohort.

Social Interaction

It can be extremely hard for mathematics students, who are often shy, to start conversations and make friends but a game (or any similarly focused activity) provides a natural talking point and facilitates conversation between reserved students. Staff would begin playing games with a small group of students and then move on to another group, leaving the students to continue playing and get to know each other better. This strategy appeared to work, and during the year lasting friendship groups emerged around the games.

The students also liked the fact that lecturers joined in and, more importantly, that they could beat them at various games. This encouraged students to gain confidence, realising that they had the potential to become members of the wider mathematical community. One of the most memorable sessions was when a member of staff played the board game Quoridor with three students. The game involves balancing racing one's own piece with the need to spend time blocking opponents' pieces. Rather than everyone trying to outwit the other three opponents, it became obvious that the students were working in collaboration so that the lecturer would not win. It was great fun, and the students did not seem to realise that the lecturer did not come out too badly as it took three of them to beat her!

Events like this worked to enhance the cohesion of the cohort and to create an environment in which students felt tutors were "on their side" in helping them learn.

The Games

Because of the desire to increase interaction between students and to get them talking about the games and the strategies involved rather than just enjoying playing competitively, it was important to choose appropriate games. There are a number of suitable commercial board games on the market. One of the students' consistent favourites so far is Quarto! (BoardGame Geek 2015) (a game devised by the Swiss

mathematician Blaise Müller), which is described by Rowlett (2015). It contains playing pieces with four different attributes:

- Size—tall or short;
- Colour—light or dark;
- Fill—hollow or solid; and
- Shape—round or square.

The aim is to be the player to complete a row of four containing the same attribute; for example, four tall pieces regardless of colour, fill or shape, or four round pieces regardless of size, colour or fill. What adds to the interest of the game is that you do not choose which piece to play, but your opponent chooses your piece for you. So a winning strategy might be to try to engineer a situation where your opponent is only left with pieces that give you a win. This is easier said than done as it is hard to keep track of all the different possibilities that might produce a win. No two games are the same, and there are numerous ways that the students can investigate winning strategies.

A list of suggested games both for starting a Maths Arcade and also for a more established one can be found on the website of the Institute of Mathematics and its Applications (IMA) (Bradshaw 2015).

The choice of games is important. Those which have worked best at Greenwich have the following properties:

- simple, easy to understand rules;
- new to most people, so that there are no "experts" and new players do not feel disadvantage;
- quick to play—over in a few minutes, allowing several games in one session;
- offering potential for mathematical analysis of strategies and tactics; and
- sufficiently challenging so that there is no humiliation when a player makes a blunder and loses.

Quarto works well in this regard: games last about five minutes, and even experienced players often overlook winning moves, so that the games are good-humoured rather than intensely competitive. It offers opportunities for analysis—"what moves are safe in this position?", or "what will my opponent do if I give them this piece to play?". Players make strategic as well as tactical decisions. For example, a player who is confident in their ability to navigate tactical complexity might play to create positions with many unresolved threats of three like pieces in a line, forcing both players to be extremely careful, while a less experienced or confident player might play to block off such threats as soon as they arise. Some students at Nottingham Trent University have investigated other versions of the game (Rowlett 2014b).

Games like Quarto also offers students who are programmers the possibility of programming a computer to play the game, and thus to investigate different strategies. This is discussed further by Rowlett (2015). Such activities could be an excellent basis for a final-year project or group work, as has been successfully implemented at Salford (Bradshaw and Rowlett 2012).

Many of the games can be played with three or more players. In terms of mathematical strategy, that can be less satisfactory than the two-player version since one's chances of winning depend too much on the interactions between the other players, but multi-player games are socially rewarding and, for students studying decision mathematics, provide examples of multi-agent interaction.

The Greenwich experience is that games which are traditionally thought of as mathematical, such as chess, are less satisfactory in the Maths Arcade situation due to the emphasis on building relationships. Chess takes longer to play, has complex rules so that beginners cannot immediately play at a reasonable level, and is satisfactory only when the two players are well matched. A game which takes a significant time to play can have a greater negative impact on the loser whereas losing a five-minute game seems less significant because one can immediately try again! It is worth pointing out that more complex games like chess and Go can be used to build problem-solving stamina. However, the focus on friendship and relationship building at the Maths Arcade has meant that these longer games are actively discouraged.

Hex is the classic, short, strategy game independently invented by Piet Hein and John Nash and popularised by Martin Gardner (1959), in which two players take turns to play counters of their colour on a hexagonal grid, attempting to join two opposite edges with a continuous chain of their counters. Explicit winning strategies have been found for a 9×9 board but not larger boards. In the basic game, there is a definite advantage for the first player which is mitigated by a small change to the rules. Nash showed that Hex can never end in a draw as it is not possible to fill the board without there being a continuous chain from one side of the board to the other in one of the players' colours; a nice demonstration of mathematical analysis in a game. Indeed, there is a non-constructive proof that the first player has a winning strategy.

Other similar, short, strategy games include Pylos, Solomon's Stones, and Pentago. A little about their suitability has been written about by the author in an article for *Mathematics Today* (Bradshaw 2014).

Puzzle of the Week

To stretch the more able students a weekly puzzle or puzzles were introduced (Bradshaw and Rowlett 2012). These are similar in style to (and often adapted from) those recreational mathematics puzzles found in books by Martin Gardner, Raymond Smullyan, and other authors. Answers could be submitted each week, with prizes for the most correct answers over a term, and a scoring system was devised which was intended to maintain interest over several weeks. As the Arcade has grown and matured, some students come just to get this question of the week and spend their time in the Arcade working on it (despite the fact that the students can access it via the University virtual learning environment).

There is evidence from conversations, emails, and other student feedback that some students enjoyed and actively took part in this activity. However, it tended to be the case that after the first few weeks very few students submitted their solutions for the term competition, and indeed the competition provoked some unwanted behaviour: some, initially successful students were dropping out of the competition if they were not winning! As a result, the competitive aspect of the weekly puzzles has been suspended for the time being. More work needs to be done to investigate this, but current thinking is that many students are happy just to do the activity without competing and that the competitive element has not been successful.

Maths Support

Some of the students who attend the Maths Arcade regularly come purely to work on the week's tutorial questions and to ask for help when necessary. They do not always want to join in with the games but are grateful that staff are on hand to help and explain things when they are stuck, and they enjoy working in a social environment.

It was obvious from the start that some mathematics students came to the Maths Arcade who would not have wished to identify themselves as needing help by going to a tutor's office. However, they were happy to turn up at the Arcade, start work, and then casually ask questions without it looking as if they were having difficulty. Other students would migrate to the help sessions after having played some of the games, or would come to listen when they realised a useful mathematical topic was being discussed.

Previously in 2007 a drop-in mathematics support session had been instigated for mathematics students, but this had folded due to lack of uptake. Students felt that by attending, they would be indicating to their friends and tutors (and perhaps to themselves) that they were not coping with the course material. Drop-in maths support for students of other disciplines works well at Greenwich and elsewhere (Lawson 2015), but our experience is that it did not work for our maths undergraduates when this was the sole focus.

Outside Speakers and Other Events

During the first year of the Arcade outside speakers were brought in on a couple of occasions. For example, one of these sessions was on the mathematics associated with origami. While such events attracted a good audience, the sessions did not seem to be what the students wanted as they did not allow students as much time for interaction either between themselves or with staff. Our preference now is that such events are organised apart from the Maths Arcade.

On a couple of occasions games competitions have taken place at the end of term with one very tense and memorable final played on Quarto. Other similar competitions such as Countdown and memorising digits of pi have also taken place. The main benefit of these sorts of events seems to be that students really like the fact that staff compete alongside them, and it is just as possible for students to win as staff.

Initial Student Feedback

In the first year of running the Arcade the first year, students were asked, as part of their personal development planning, to write about a mathematics event in which they had participated. About two-thirds of the cohort chose to write about the Maths Arcade. The only negative comments received were that 1 h was not enough and that the timing might be better for some if it occurred after lectures had finished for the day. These were both acted on for the next year, although the Arcade has now reverted to 1 h a week due to problems with room availability. Positive comments included:

> I like to go to the Maths Arcade because all of my tutors attend it.
>
> The people who were once strangers to me when I first started [attending the Maths Arcade] are now some of my closest friends.
>
> I felt somewhat dubious about the word "enjoyable" being used but I'm glad to say I was quickly proved wrong.
>
> [It is] a really good way to meet people and get to know the lecturers in a more informal environment.
>
> Attending Maths Arcade has been a major help for me this year and a huge factor in me having such successful and enjoyable studies.

Initially, we had focused on the benefits to students and had not thought of the benefits to tutors. However, the staff attending have found these sessions particularly valuable, as they have enabled us to get to know the students in an informal setting and such interaction has helped to sort out student problems early before they have escalated.

Graduate Feedback

Many graduates have commented on how the Maths Arcade has helped them in the graduate job application process. They report that the communication skills and tactical and strategic problem-solving skills that they developed through this extracurricular activity have helped persuade prospective employers of their potential.

Table 6.1 Increase in student numbers and pass rate between 2009–2010 and the year following the introduction of the Maths Arcade

	2009–2010	2010–2011
Cohort total	87 students	164 students
First-year pass rate	91 %	96.4 %

Impact

The first year the Maths Arcade ran, 2010 to 2011, it was found that student attainment across all four first-year courses had improved on the previous year. The intake in 2010 was larger than in previous years due to changes to the admissions process, which meant that first year teaching staff and personal tutors were particularly stretched; and yet retention improved (Table 6.1).

Also, since starting the Maths Arcade, the response from students in the NSS regarding whether their degree has improved their communication skills has increased from 61 to 96 %; and the percentage of students who thought they were good at tackling unfamiliar problems has increased from 75 to 91 %.

It is hard to gain statistical evidence of the value of the Maths Arcade in helping graduates into their careers. Data from the government's Destination of Leavers of Higher Education (DLHE) survey are inconclusive and the survey's classification of graduate jobs is flawed but, anecdotally, students report that their confidence in problem solving and communication has been a major factor in their being successful in applying for graduate jobs.

Dissemination and Adoption Elsewhere

Following the initial pilot in 2010, the Maths Arcade at Greenwich has continued to run in the mathematics department each year. After internal dissemination there has been interest in the Maths Arcade from the engineering faculty and some staff in the business faculty have used the Arcade games with their students to increase their strategic-thinking skills.

Those involved in establishing the Maths Arcade at Greenwich have talked about it at conferences and in invited presentations at workshops on transition and retention. A condition of the HE STEM funding was that the Department present its experience at subject conferences which raised interest in the mathematics education community, as a result of which Maths Arcades have been established in other institutions. Some of these were set up with funding from the National HE STEM Programme Mathematics Curriculum Innovation Fund, others from an IMA grant and others from institutional or departmental funding. There are similarities between these Arcades, but they are not all the same.

As a result of a presentation at Maths Jam (a recreational mathematics conference held annually in the UK) (Rowlett 2014a) and events run by the IMA

(Bradshaw 2014), some schools have become interested and invested in some of the games, as they are often the sort that can be played by a wide variety of ages and abilities (the games often say "age 9–99"). Some of the final year students at Greenwich have actively taken games into schools and started clubs/Arcades. These have tended to be students in the Undergraduate Ambassador Scheme (UAS 2013) who gain school experience as part of their mathematical degree.

Differences

Some of the earlier Arcades have been described by Bradshaw and Rowlett (2012). An example of a successful implementation is the Arcade at Sheffield Hallam University. This is increasing in popularity because, having recently moved into a new building, the mathematics department at Sheffield Hallam now has its own space (Cornock 2015). They have a communal staff/student area which is ideal for Maths Arcade-style activities (Waldock 2015). This space has contributed to the Department's student-staff cohesion but, sadly, many departments, like Greenwich, do not have access to suitable space of this type.

Some Maths Arcades have used the games to inspire student project work. In the case of Salford (Bradshaw and Rowlett 2012) this was something that whole cohorts were involved in, whereas at other HEIs this has more often been on an individual basis.

Some Arcades, such as the one at Bath, have been positioned outside the mathematics department in the Maths Support Centre and so have attracted student involvement from other disciplines such as engineering. This has provided students with the opportunity for cross-discipline discussion but has limited the involvement of subject-specific staff.

The competition element has been used in Arcades such as Leicester, which has students competing in a house system. Sheffield Hallam has used Maths Arcade sessions to host high-speed Rubik-cube solving events, and a lecturer in that department has now developed a course which teaches group theory through Rubik cubes (Cornock 2014).

The Arcade in Manchester has used strategic games available on iPads as well as board games, and they are particularly keen to get input about this from Ph.D. students (Bradshaw and Rowlett 2012).

Further Research

In 2014 representatives from several Maths Arcades met in Sheffield to discuss evaluating this work. Under the oversight of Peter Rowlett (then at Nottingham Trent University), a student from Nottingham Trent undertook a study to look at the success of the Maths Arcade and to see if any lessons could be learned from the

different approaches, as well as to create simple instruction cards for the games (Webster and Bradshaw 2014). Five Arcades took part in this task (Greenwich, Nottingham Trent, Reading, Salford, and Sheffield Hallam), distributing a questionnaire to mathematics students who had and had not attended the Maths Arcade at these institutions.

The results indicated that the Maths Arcade aided the transition from school to university by helping students to be more relaxed around the staff, encouraging students to ask for help on other aspects of their course, and enabling them to enhance their mathematical thinking skills. These are all cited by Croft and Grove (2015) as being factors affecting transition and progression.

There were 295 responses to the survey with 124 (42 %) who had attended the Maths Arcade at least once. Full results can be found in Rowlett et al. (2014). Of those who had attended, 47 % said that they had made friends at the Maths Arcade, and 95 % said that they were happy with staff being present, although some said that they would like more interaction with staff. Of the free-text comments on the "best" things about the Maths Arcade, 31 out of 90 mentioned the games themselves, whereas 19 highlighted the social environment.

When asked what would encourage more frequent attendance of the Maths Arcade at Greenwich, the two most popular answers were: food and better timetabling. The former is a perennial optimistic student request but, for cost reasons, food and drink cannot realistically be provided; though the Department provides chocolate biscuits at the Arcade, and these are popular with students.

The Nottingham Trent research, and the feedback from our students has made the point that one of the most important factors of the success of a Maths Arcade is the timetabling. If this is at a convenient time and in a convenient location (with regard to the students' timetables) then students will attend. Ideally, the timetable can be managed so that all cohorts have classes immediately before or after the Arcade, and a midday timing will encourage students to bring their lunch to the Arcade. However, if the Arcade is on a day when students have no classes or have to wait for a long time before or after a class, then student attendance will be reduced. Unfortunately, the complexity of University-wide timetabling at Greenwich and the intense demands on the available space makes compromise necessary regarding the timetable.

The ideal situation would be where the Department can offer its dedicated space for the Maths Arcade. As noted above, Sheffield Hallam's department has just arrived at this fortunate position, and it will be interesting to see how their Arcade continues to evolve.

Conclusion

This chapter has discussed the motivation for the Maths Arcade and how it has been implemented in different institutions in the UK. It argues that it has been used both to support and to retain mathematics students, and discusses how it has contributed

to student success both academically and, anecdotally, in terms of progress into graduate careers. Some of the lessons from the recent research (Rowlett et al. 2014) mentioned in the last section might be useful for mathematics departments in other HEIs, or indeed, other disciplines, thinking of implementing something similar.

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Chapter 7
Practice and Practise in University: What Defines Success and How Does Online Assessment Support Achieving This?

C.J. Sangwin

Abstract This chapter reviews current assessments in technical subjects such as science, technology, engineering, mathematics, or computer science in higher education. We consider definitions of success in terms of stated policy aims and defacto examination practice. From this background we examine the rapidly changing nature of learning materials from a static physical textbook to online resources with interactive components. Automatic online assessment is a key component of contemporary online learning. The chapter describes some of the current range of tools, from those targeted as very specific subjects to more general methodologies such as comparative judgement. We consider how these new tools will shape students' work and how this might contribute to, or hinder, their success.

Keywords Higher education · Online assessment · Learning resources · Assessment design · STEM education

What does is mean to "succeed" in a technical subject such as science, technology, engineering, mathematics, or computer science (STEM) at the undergraduate level? At one level "success" can be defined precisely as doing what you are told to do in high-stakes assessments. However, professional practice may well have other characteristics, the assessment of which are not well served by traditional examinations.

This chapter will review definitions of success in university STEM disciplines looking at published policy statements such as benchmarks and professional society accreditation criteria. I then turn my attention to current assessment practice and what current examinations actually assess. From this background I look at the changing nature of learning resources in science subjects, particularly in mathematics, which include more interactive online activities including online assessment. How are online tools changing the activities students undertake, and the feedback they receive? How do these changing tools match up with the published criteria they seek to serve?

C.J. Sangwin (✉)
School of Mathematics, University of Edinburgh, Edinburgh, UK
e-mail: C.J.Sangwin@ed.ac.uk

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Criteria which define success can be found in published subject benchmark statements, which aim to describe the nature and characteristics of university program. In particular they try to describe the standards, in terms of attributes and capabilities, which need to be obtained in order that someone achieves an award of a degree. UK mathematics has, for example, Lawson et al. (2015), and for engineering education (Best et al. 2015; Alpers 2013; Lucas et al. 2014). In computer science the concept of computational thinking is emerging (Wing 2008). To cater for the variation in the background of the incoming students, universities, collectively, offer a very broad range of mathematics and statistics programs. Given this breadth of programs, Lawson et al. (2015) goes no further than specifying subject content as follows "Common ground for all programs includes calculus and linear algebra". Indeed, what is striking about curriculum documents in all STEM subjects is the lack of emphasis on specific curriculum content. Instead, these standards provide more general guidance and articulate the intended learning outcomes.

> Computational thinking is a kind of analytical thinking. It shares with mathematical thinking in the general ways in which we might approach solving a problem. It shares with engineering thinking in the general ways in which we might approach designing and evaluating a large, complex system that operates within the constraints of the real world. It shares with scientific thinking in the general ways in which we might approach understanding computability, intelligence, the mind and human behaviour. (Wing 2008, p. 3717)

Instead of curricula content, all these documents talk in more general terms such as developing habits of mind, and the importance of setting up problems (modelling), mastering techniques for solving particular classes of problems, and the ability to critically discuss whether the solutions to the model fit the real-world problem adequately. For example, engineers should "be skilled at solving problems by applying their numerical, computational, analytical and technical skills, using appropriate tools" (Best et al. 2015, p. 7). The report by Kilpatrick et al. (2001) discussed "five tightly interwoven" threads which make up mathematical proficiency. The first two, *conceptual understanding*, and *procedural fluency*, are relatively well established. For example, Sfard (1991) discussed concepts and concept formation in mathematics in some detail. *Strategic competence* is defined as the ability to formulate, represent and solve problems which arise in real-world situations. *Adaptive reasoning* is defined as the capacity for developing arguments and thinking about whole arguments, including logic, explanation and justification and reflection. *Productive disposition* is confidence in one's ability and an inclination to see mathematics as sensible and worthwhile. These threads elaborate on earlier frameworks and distinctions, such as that between *relational understanding* and *instrumental understanding* developed by Skemp (1971). While these threads are important to educational research, and influence some research-led teaching, it is not clear that they strongly influence current assessment design, particularly in examinations.

Central to the act of teaching are activities for students to undertake which are likely to produce the desired learning outcomes in students. These activities form the core of formative assessments through which students engage with the subject.

For assessment to be effective both the teacher and the student must accept joint responsibility. The teacher is responsible for structuring the enabling conditions and the student for engaging with them (Biggs et al. 2001). Furthermore, summative assessment aims to select and grade students' performance, and the results de facto indicate whether a student has successfully completed their studies. Benchmark statements also acknowledge the importance and difficulties of assessment. Typically, STEM subjects have a wider distribution of marks than humanities subjects, with some students achieving near-perfect solutions meriting very high marks while other students struggle even to get started on a problem (Lawson et al. 2015, p. 21). In the United Kingdom, a full-time undergraduate program of study is typically made up from individual 10 or 20 credit modules totalling 120 credits per year. A survey of assessments used in university mathematics departments in England and Wales is reported in Iannone and Simpson (2012). Of the 1843 individual modules they examined, over one quarter were assessed entirely by closed-book examination and nearly 70 % used closed-book examinations for at least three quarters of the final mark. It is still the case that success in university mathematics degrees is defined by traditional examination outcomes, and this is likely to also be the case across STEM.

What do these examinations actually ask students to do? To answer this question, Smith et al. (1996) developed a taxonomy of question types, with the goal of using this to construct examinations which assessed a range of skills. Pointon and Sangwin (2003) applied a very similar taxonomy to 486 questions taken from first year university examinations and found that 61 % of the marks for questions required only routine calculation. A further 20 % of the questions required proof, but these proofs tend to be rather well rehearsed. It is not clear the extent to which these are, for the students taking them, a memory test or require a genuine attempt to write a proof. As Smith and Petocz (1993, p. 139) say "Most students do no more than learn proofs by rote, reproducing them as necessary in their examinations, often with mistakes". Note that the examinations analysed by Pointon and Sangwin (2003) did not appear to require students to demonstrate much strategic competence beyond selecting a technique from a well-specified repertoire. Given these assessments appear to me mainly procedural, it is not clear that students taking these courses have a serious opportunity to develop the kind of productive disposition to mathematics which Kilpatrick et al. (2001) envisaged. "Far too often it seems textbooks and examinations would seem content to set only straightforward questions on technique requiring little in the way of a synthesis of ideas and knowledge" (Howson 2013, p. 655).

Across the STEM disciplines, policy documents set out the broad characteristics, such as problem solving, which are cited as valued by the professions. These concepts and higher order competencies are largely based on a foundation of lower level skills. "To be *trained* is to be prepared against surprise. To be *educated* is to be prepared for surprise" (Carse 1987, p. 23). That is to say, training provides specific knowledge and expertise which will be useful in the future. Encountering new situations is often uncomfortable, and training not only avoids this discomfort but enables individuals to respond effectively and efficiently within well-understood

domains. Indeed, the whole purpose of agreed and published engineering standards is to avoid every engineering situation becoming a novel problem-solving exercise. There is safety in working to a proven recipe. In order to practise a skill you need appropriate tasks, and tasks have to be assessed. Therefore such training is valuable, and it is very well served by existing traditional examinations. In this Chap. 1 consider the changing nature of resources in the form of textbooks and newer online assessment systems which are designed to support the associated assessment activities. Many of these resources are designed to help students develop basic skills in mathematics, that is, they are designed as a traditional training in mathematical techniques. In addition, the educated graduate still needs the resources, emotional as well as skills, to respond to a surprising situation outside their training. In due course, I discuss the Moore teaching method in which the primary activity in the class are problems which the students undertake. I then discuss how technology is being used to scale the assessment of students' work in problem-solving classes.

The Changing Nature of Learning Resources

Until very recently the primary source of practice tasks was printed traditional textbooks. There has been considerable research into mathematics textbooks as artefacts to support teaching and learning, developing theoretical frameworks through which to consider interactions between the teacher, the students, the textbook and mathematics itself (Shield and Dole 2013). A model for how textbooks are used, framed within activity theory, was developed by Rezat (2006) who acknowledged that "the textbook is a historically and culturally formed mediating artefact". Rezat (2009) he emphasises the use to which textbooks are put by students and concludes with insights into dispositions towards mathematics. "Learning mathematics comprises mainly learning rules, applying rules and worked examples to tasks, and developing proficiency in tasks that are similar to teacher mediated tasks" (Rezat 2006, p. 1267).

Unprecedented changes are taking place to the nature, production, and distribution of textbooks, both at school and in universities. To appreciate the profound speed and scale of this change it is important to understand that, in the United Kingdom at least, mathematics textbooks have been remarkably stable. That is to say, historically there were few books, they were very widely used and they were in print for many years. Many were in print for over half a century, and so it is instructive to retrace history for some considerable time to justify the stability and longevity of mathematics texts. As a starting example take Hutton (1836), which was in print from 1798 until at least 1849. The author, Charles Hutton, wrote a number of very popular and influential textbooks of which Hutton (1836) was his last major work.

> Like the *Dictionary* and the *Treatise on Mensuration* it was to have great effect on mathematics education, not only through its many editions, but also for the influence it had on succeeding writers. Countless examples could be given of the nineteenth-century authors who in their writings give credit to Hutton and cite these works as sources for their material. (Howson 2008, p. 69)

Only a couple of years before this the first edition of James Wood's text was also published (Wood 1801). Wood's book was first published in 1795 and remained in print until 1876 (81 years), however during that time the book had numerous editions and revisions. The preface to the 13th edition (p. vi) states that during the period 1801–1848, 32,000 copies were printed in 13 editions. Wood died in 1839 and his book continued to be edited by Thomas Lund who gradually introduced new material and continually revised the text. Two other very popular textbooks, Hall and Knight (1962) and Bonnycastle (1836), also have others contributing after the death of one author. This is a contemporary phenomenon, for example Erwin Kreyszig (1922–2008) first published his popular *Advanced Engineering Mathematics* in 1962. Posthumous editions, with new material, continue to be published in his name, for example the 10th Edition of the international student version in May 2011.

Not only were books in print for many years, but there is strong evidence for stability of text and exercises. In particular, there evidence can be found for the influence of one author on another by looking at acknowledged interdependency. Both Hall and Knight (1896, 1962) were in print for over 50 years, and the authors acknowledge previous authors in the preface to their book.

> In enumerating the sources from which we have derived assistance in the preparation of this work, there is one book to which it is difficult to say how far we are indebted. Todhunter's *Algebra for Schools and Colleges* has been the recognized English text-book for so long that it is hardly possible that anyone writing a *text-book* on Algebra at the present day should not be largely influenced by it. (Hall and Knight 1896, p. vii)

Todhunter (1897) had five editions between 1858 and 1897 (39 years) and Barrow-Green (2001, p. 189) suggests that the total British sales exceeded 150,000. Todhunter was accused directly by Lund of plagiarism (Barrow-Green 2001, pp. 197–198) and perhaps as a response he acknowledges his sources more fully than many.

> The chapters on Surds, Ratio, and Proportion in my Algebra are almost entirely taken from Dr Wood's Algebra. I have frequently used Dr Wood's examples either in my text or in my collections of examples. Moreover, in the statement of rules in the elementary part of my book I have often followed Dr Wood, as, for example, in the Rule for Long Division; the statement of such rules must be almost identical in all works on algebra. (Todhunter 1897, p. vi)

Indeed, there are sections which are appear to be copied verbatim. Evidence can also be found for international influence of one algebra textbook on another, for example, Bonnycastle (1836) was also influential in the United States. "It is evident that Bonnycastle's text was the first popular algebra textbook used in American

Schools. … This book to a considerable extent set a pattern for the early algebras to be used in the U.S" (Nietz 1966, p. 48).

Bonnycastle's algebra is described by Heller (1940) as a watershed in mathematics textbooks because he pioneered the systematic use of exercises. In particular Day (1820), which was abridged and published as Thompson (1848), was an enduring and very popular textbook based on Bonnycastle. Heller (1940) also examined the exercises in a wide range of algebra textbooks and traced heredity in the exercises these books contained.

Disruptive Technology

These textbooks represent an identifiable and continuous chain of history from Bobbycastle in the late 1790s until the 1960s, a period which includes the French Revolution and the start of the space race. While there were certainly other textbooks, the presentation of algebra in the most popular textbooks was remarkably stable during this period. We can be confident that the exercises these books contain was the staple mathematical diet of generations of school students in algebra. In the United Kingdom, this tradition came to an abrupt and identifiable end with the School Mathematics Project, which set out to depart from traditional textbooks.

> The Project was based on the work of individual teachers in schools, not of university lecturers or members of committees nor self-professed "educationalists". And the numbers were huge. In the first decade roughly fifty were involved in the writing and testing of text books; over two thousand had attended the teacher-training conferences; ten times as many would have used or had contact with, the SMP books in classrooms up and down the country. … One of the original authors recently wrote "… I realise now how idealistic we were. We set out to create exercises where no two questions looked the same so that students were faced with new challenges all the time. This was a reaction to the Durell type texts which had long exercises of very repetitive questions. …" (Thwaites 2012, pp. 139–140)

A *disruptive innovation* helps create a new market and value network, and eventually disrupts an existing market and value network by displacing an earlier technology (Bower and Christensen 1995). The SMP was disruptive in the sense of the style of material and in involving large numbers of teachers in the development of the books. The SMP also ran workshops and other events for teachers' professional development. However, SMP retained a very traditional book format through a respected publisher as a commercial venture. Publication of mathematics textbooks is currently in the process of much more profound disruption. Do current students really want a textbook which is a large physical volume? The convenience of mobile devices for reading and searching has eclipsed the need for large reference works. For example, the *Encyclopaedia Britannica* was in print for 244 years, but ended print production in 2012. Wikipedia is arguably easier to search and access than dozens of large physical static volumes. Indeed, many contemporary textbooks already have a digital version and many have companion activities such as online assessments.

A radical contemporary example is Mooculus, a portmanteau of "MOOC" (Massive open online course) and "calculus", see http://mooculus.osu.edu/ (retrieved June 2016). At the heart of this project is a 258-page traditional calculus textbook, presented as a PDF file. What is particulary unusual about this textbook is its completely open nature. The entire typescript of the book, in an editable format (LaTeX), is available for download. The book is licensed under Creative Commons (see http://creativecommons.org/, retrieved June 2016). As the name implies, Mooculus is much more than a textbook. The website provides access to an open calculus course, including online video lectures, online assessment exercises, and interactive "explorations". The explorations are interactive online activities and include graph plotters, step-by-step solvers, and other visualisation tools. There are also opportunities for students to submit edits and changes, although at the time of writing there appear to be few recent edits, suggesting in this case that the opportunity for edits does not necessarily result in large-scale community engagement. That said, the free availability of such books potentially disrupts the commercial business model of publishers, and provides students with free access to high quality books online.

Mooculus shares the software which delivers and assesses online assessments with the very popular Khan Academy, (http://www.khanacademy.org/, retrieved June 2016). The Khan Academy offers rather traditional skills-based practice exercises, instructional videos, and a "personalized learning dashboard" through an online website. The dashboard tracks users' mastery of skills and aims to "empower learners to study at their own pace in and outside of the classroom". Originally focused on mathematics, Khan Academy now additionally includes work on science, computer programming, history, art history, and economics.

Khan Academy has short instructional videos and exercises as its central feature, rather than a textbook. Indeed, the Khan Academy abandons a linear structure, giving users more choice over which topics to study and when. Users are rewarded with "badges" and "energy points" for completing assessments. Collecting these is undoubtedly motivating for some students, and the popularity of the site is indicative that its materials have fulfilled a perceived need by many of its users. The scoring of energy points brings mathematics closer to an online game.

Computer games are a serious business, and many people of all ages and backgrounds play computer games on a regular basis. Just as with novels, music, and literature, computer games are becoming acknowledged as culturally important activities and experiences. Of course, that does not automatically make computer games high art, but nor does it permit a continuing view of computer games as trivial. Games are big business and they are as diverse as their players. It it therefore not surprising that some educators look to games to promote learning. For example, Devlin (2011) considered the characteristics of an effective educational game in mathematics, and in doing so criticised the design of many contemporary mathematical games. In particular he criticises those who confuse mathematics itself with its representation, for example symbolic or diagrams. He also questions the value of skills-based practice of, for example, multiplication tables or basic algebra; see Cayton-Hodges et al. (2015) for a recent review of mathematical games. An early

example of a mathematical game, explicitly not about skills practices is *L–A Mathemagical Adventure*. Released in 1984, this classic text-based adventure game contained a number of mathematical puzzles which had to be solved along the way. Remarkably, it was still available in 2016.

Khan Academy is aimed primarily at school students, whereas the calculus in Mooculus is appropriate for undergraduates. Mooculus and Khan Academy both have large teams of developers, combining subject experts, web developers, and teachers who monitor online discussion. Arguably this has always been the case, with book authors, typesetters, illustrators, and production specialists contributing to traditional book publication. These skills now have to be supplemented by additional expertise needed for interactive technology both for explorations and assessment. The dynamic nature of updates to the websites means that materials evolve over time, rather than having a static publication date.

These developments are mirrored by commercial publishers. A notable example is from Pearson. Their MyMathLab suite of products ties together online assessments with video, interactive materials, and traditional printed books. The online exercises are randomly generated from templates and come in a variety of styles, including multiple choice and algebraic input. There are online tracking tools to help keep students motivated, directing them to the next assessment and informing teachers of what each student has done. Teachers can create assessment regimens for their students online from pre-existing questions tied closely to the published textbooks; see http://www.mymathlab.com/ (retrieved June 2016). Allen and Seeman (2013) provide a more general survey of the state of online learning in higher education in the United States.

Non-linear and Adaptive Learning

Books are essentially a linear communication format and are often intended to be read in the order in which the author presented the material in the book. Online materials are potentially much more flexible, and the order in which material can be accessed (or made available) does not need to be restricted to a linear format. Adaptive learning systems change the order of presentation to take account of the previous interactions an individual has had. Central to adaptive learning systems is a detailed model of the skill a student is trying to learn. This model has to be expressible in well-defined sub-skills. The cognitive skills for mathematics and computer programming are well suited to this approach, and therefore naturally enough mathematics has been the subject of many projects which seek to automate tuition, see Sleeman and Brown (1982), Appleby et al. (1997) and more recently Heeren and Jeuring (2014). Central to the model are sub-skills which can be isolated. Questions are designed to test knowledge (in various senses) of these skills.

> What is problematical is acquiring the procedural knowledge that enables this inert knowledge to become the basis for effective action in the context of use. Production rules

> cannot be learned by simply being told. Rather, they are skills that are only acquired by doing. (Anderson et al. 1995, p. 171)

Tutorial software estimates the probability that the student has learned each of the rules in the cognitive model. In some systems the software estimates whether a student has learned an incorrect or "buggy" rule (Burton 1982). For example, in long subtraction of integers some students consistently take the larger digit away from the smaller digit. An answer such as 654 − 496 = 242 is consistent with this rule, and carefully designed questions can expose such misconceptions.

One lesson from the efforts to create adaptive learning and online tutoring software is the significant team effort needed to produce a working system. This needs (i) an expert knowledge model, (ii) a student knowledge model, (iii) a tutoring module, and (iv) an interface (Nwana 1990). Given the effort expended on developing these online tutors, it is important to reflect on whether expending a similar amount of effort on the design and development of more traditionally presented learning situations would demonstrate similar gains. Such control studies are rare, and difficult to conduct. What is really generating the learning gains? Is it the careful design, or is there something about being online? This remains to be seen.

What has become clear is that for a typical teacher, in a weekly teaching situation, it is impossible to develop online learning systems of a sufficiently high quality. This has been acknowledged by others, for example "The systems that we developed were inflexible in the way they had to be used and gave teachers no ability to tune the application of the tutors to their own needs and beliefs about instruction" (Anderson et al. 1995, p. 192). For this reason, more agile assessment systems are now in regular use which sometimes lack explicit models both of the student and the cognitive domain being learned. This does not mean they lack sophistication in a number of real senses. Many online assessment systems do have significant domain knowledge encoded, and examples will be given in the next section. This functionality is used to generate very specific formative feedback. In this sense they go well beyond what was possible in the 1990s with the technology available then.

Online Tools for Assessment

Most online assessment systems are internet based, using a website which manages a student's identity and tracks their progress through the learning materials. These materials often include online assessments. In some systems questions are provided as a quiz in a fixed linear structure, in others the system builds an internal model of the student's strengths and weaknesses and the system adapts the subsequent choice of questions (Appleby et al. 1997). At some appropriate point, the student is expected to engage with assessment, and a core part of this requires them to answer

a question. Any online assessment system will have a variety of question types of which multiple choice questions (MCQ) is just one.

MCQ are commonly associated with online assessment. There is general dissatisfaction with multiple choice as an assessment format (Hassmén and Hunt 1994; Hoffmann 1962). The dissatisfaction includes potential problems with guessing, and with reverse engineering questions. For mathematics MCQ are particularly problematic as the relative difficulty of a reversible process is very different in opposite directions. For example, factoring a quadratic is more difficult than expanding out the brackets. When faced with a multiple choice question, the concern is that a strategic student does not answer the question as set, but checks each answer in reverse. This potentially reduces the validity of the question undermining the intentions of the teacher. To test the hypothesis that when faced with a question involving the inverse direction of a reversible mathematical process, a comparative experiment was undertaken to see whether there is evidence that students solve a multiple choice version by verifying the answers presented to them by the direct method, not by undertaking the actual inverse calculation (Sangwin and Jones 2016). This methodology compared students' answers on questions requiring a mathematical expression as an answer with responses to stem-identical multiple choice questions. The findings supported this hypothesis: overall scores were comparatively higher in the multiple choice condition, but this advantage was significantly greater for questions concerning the inverse direction of reversible processes compared to those involving direct processes. For example when asked to factor polynomials the evidence supports the hypothesis that students expand out the answers rather than actually factoring the given expression. To address these problems, a variety of very subject specific-question types have been developed. I consider just two of these, one for assessing students' ability to write fragments of computer code and the other which assesses answers which consist of mathematical expressions, for example an equation.

Online Assessment of Coding

Many students, including the majority taking STEM subjects, learn to program a computer as part of their degree. A basic skill is the ability to write short fragments of code, for example conditional statements, loops, and functions. When writing computer code in software engineering various developers have automated the assessment of fragments of students' code. For a review see Ala-Mutka (2005), with more recent examples in Usener et al. (2012) and Helminen et al. (2013). The students must enter a syntactically valid fragment of source-code which compiles correctly to object-code. Once this is done, the software automates testing the code to establish if it has the correct input–output behaviour. There are also various open sites which enable and encourage students to learn how to write code. For example, Codecademy [sic] https://www.codecademy.com/ (retrieved March 2016) is an interactive website that offers free coding classes in various programming

languages including Python and PHP. It includes rewards such as badges to motivate users and social elements including a user forum where participants can discuss coding and gain help.

Assessment of Mathematics

Over the last 25 years there has been a growing community of practice of automatic assessment, in which a student enters an answer which is a mathematical expression, and software establishes the mathematical properties of that answer using computer algebra; see Sangwin (2013, Chap. 8) for a recent review. There are many systems implemented, but most have the following characteristics. Internally there is a question template from which the software generates a random version of the question in a structured mathematical way and automatically generates a full worked solution which reflects this randomisation. The student solves the given problem, perhaps using a pen and paper in the traditional way, or using computer algebra as a tool. Typically the student must enter an algebraic expression into a computer as their answer. Systems vary on precisely how students enter their answer, with the most popular options being a typed linear syntax or a drag and drop equation editor. Once the system has a syntactically valid expression it automatically establishes mathematical properties of this answer using a computer algebra system. On the basis of properties established (or not) the system generates outcomes, including feedback and a score. The system stores data on all attempts at one question, or by one student, for later analysis by the teacher. As a typical example of contemporary assessment software for mathematics I consider STACK, a project which I designed, implemented and maintain. This system uses the computer algebra system Maxima to support the mathematical processes (Sangwin 2013).

A typical assessment situation is shown in Fig. 7.1. A randomly generated question has been displayed and the student has entered their final answer as an

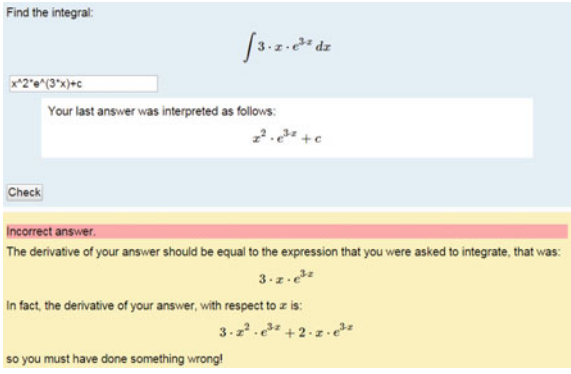

Fig. 7.1 Example assessment of the final answer using STACK

algebraic expression. This particular process, symbolic integration, is examined in virtually all traditional calculus courses of which I am aware. Furthermore, this kind of question is also typical of assessment of the kinds of reversible process for which MCQ are so problematic. In this case the expression is judged to be valid, and so the system has assessed this as an answer. Again, in the example shown in Fig. 7.1 the student is incorrect: the answer is not an integral of the expression in the question. The feedback shown in Fig. 7.1 is very specific to the student's actual answer, indeed it has been generated from a computer algebra calculation of the symbolic expression entered by the student. Note also in this example that the teacher has chosen not to display numerical marks to the student at this time. Whether formative feedback, as shown, or a numerical mark are available during or after the quiz is a choice which teachers need to make in each individual situation.

I note that it is not inevitable that technology will be used only to replicate tasks which test simple procedural skills. Technology such as STACK can be used to assess answers for a variety of tasks which are not traditionally set because they require the teacher to undertake a significant computation to establish the properties of the student's answer (Sangwin 2003).

Although online assessment is described as automated the teacher remains responsible. That is to say, when authoring the question the teacher must encode criteria which establish whether or not an expression is correct. The prototype mathematical properties include (i) algebraic equivalence with the correct answer and (ii) that it is written in an appropriate algebraic form, (for example factored). A computer algebra system is readily able to establish such properties, but note that using a CAS is much more sophisticated that using a string match or regular expression. It is also possible to encode criteria which establish if a particular answer appears to arise from a common mistake or misconception. If a student's answer appears to arise from a misconception or satisfies only a subset of the required properties, the teacher is able to encode the award of partial credit or feedback. Potentially automatically generated feedback is specific to the answer and directly related to possible improvement on the task, which is precisely the kind of feedback which research such as Kluger and DeNisi (1996) has suggested is most effective in a formative setting. Partial credit reflects a subjective value judgement, and few colleagues agree on the relative merits of partially correct answers and how many marks they should receive. Whatever decisions are made, because the criteria are objective and specified in advance the assessment is highly reliable.

As open source software which is freely available it is difficult to know how many people actually use STACK. In the year ending 1st April, 2015 STACK was downloaded 10,168 times, but this does not equate to numbers of live servers. To gather data from users, I undertook a survey during May 2015 (Sangwin 2015). There were 40 participants who used STACK and who completed a substantial part of the survey, and STACK is currently being used in eight languages. This collaboration on assessment infrastructure indicates a truly international endeavour. The survey also asked respondents to describe how they used STACK and the responses are shown in Table 7.1. The majority of users indicated both setting

Table 7.1 Purposes of STACK use

Type of use	Number (%) of respondents
Formative quizzes for registered students	30 (75 %)
Summative quizzes which contribute to a course mark	30 (75 %)
Online timed examinations	8 (20 %)
Open access practice site	10 (25 %)
MOOC or other open structured course	4 (10 %)

formative quizzes for registered students and summative quizzes which contribute to a course mark. This corresponds with the design purpose of STACK.

Eight people make use of STACK for online timed examinations. This is a change from previously reported use. Although the initial goal for developing such software was formative, it seems inevitable that some mathematics examinations will be conducted entirely online using this type of technology. I am aware of other, similar, software being used for summative examinations in mathematics; for example, Ashton et al. (2006) reported trials of automatic assessments in Scottish secondary school mathematics. When this happens, the attention of students and teachers will be focused much more keenly on CAA as an assessment format.

Problem Solving

When discussing problem solving a distinction is often made between a *problem* and an *exercise*. A problem is a question for which the process for solving it is unclear. Therefore it is impossible to classify a question as a problem or exercise: it is as much a function of the *particular student* as it is the mathematical processes which lead to a correct solution. As a consequence, one person's problem is another's exercise. This precisely encapsulates the distinction of Carse (1987) quoted above between education and training. Training transforms problems into exercises, but this cannot continue to happen for ever. Hence the question remains: how can genuine problem solving be taught?

There are many attempts to teach students to become more effective at solving genuine problems. For example, the Moore Method (Coppin et al. 2009), is a type of enquiry-based learning (EBL) developed by the influential Texan topologist Robert Lee Moore (1882–1974) for university mathematics courses (Parker 2004). Essentially, a Moore Method class works in the following way.

1. Problems are posed by the lecturer to the whole class.
2. Students solve these independently of each other.
3. Students present their solutions to the class, on the board.
4. Students discuss solutions to decide whether they are correct and complete.

Solutions are not imposed or provided by the lecturer, who chairs discussion before offering their own comments. The essential difference between a Moore

Method course and other problem-based learning approaches is the use of a coherent set of problems on a substantial mainstream curriculum topic, rather than isolated/independent problems, puzzles or investigations. One misconception regarding Moore's Method is that Moore simply stated axioms and theorems and expected students to develop the complete theory. Parker (2004) suggests that Moore actually gave significant help to his students, but that he managed to do so in a way which did not rob them of the intrinsic satisfaction which can be derived from having independently solved a problem. Moore was particularly successful in attracting and encouraging postgraduate students, many of whom adopted his teaching approach. As a result, variations of this method are still used, particularly in the USA, and named after Moore. This particular approach is cited here because it is one with which I have personal experience. After 6 years of running a Moore Method class I am surprised at the stability of the class and the consistency of the outcomes. Indeed, each year I ended up about two problems from the same place with little or no effort on my part to set a pace for the work. Students undergo a personal transformation as they develop their approaches to solving problems. However, this is not an easy process and the following caricatures the cycle of the class.

- Week 1: Anticipation. "What is this class going to be about?"
- Week 2: Excitement and enthusiasm. "Someone is going to take me seriously and this sounds like fun!"
- Week 3: Frustration. "Actually I'm finding these problems a bit difficult!" "So-and-so's presentation was awful. What a waste of time!"
- Weeks 4–5: Despondency, Doldrums and Despair. "I can't do these!"/"They can't do these!"
- Weeks 6–7: Rebuild confidence. "Actually, I can do some of them".
- Weeks 8–9: Adjust expectations. "Problem solving takes time, so how many problems do we expect to do?"
- Weeks 10–11: Collegiate conviviality. "So let's get on with it…"

This class takes a considerable amount of time, and students typically solve only one or two problems per week. This class is explicitly not about covering material efficiently in a traditional way. Every generation of students is likely to need to struggle to develop their own abilities. There is some irony, perhaps, that in order to become proficient and confident in problem solving you need to practise solving problems. Problem-solving classes are also likely to be effective only when the group size is relatively small, that is, of the order of 12–20 students in each group. Furthermore, this is not something which can be done either as a one-off activity or as an extra set of more difficult optional problems. Students need to be immersed in an environment where they are expected to attempt to solve problems themselves, where they need to make partial attempts and where they need to criticise the attempts of their peers. Such classes are much more expensive to run than traditional large lectures. While some colleagues do question whether an institution can afford to run such small classes, my view is that we cannot afford *not* to run them.

Clearly the choice of the problems in a problem-solving class is a key aspect. How does the teacher choose the right problems? Just as with traditional mathematics textbooks, there is a remarkable stability in the problems which have been used with the explicit intention of improving students' problem-solving abilities. For example, a version of the following problem first appeared in Europe in Alcuin of York's *Problems to Sharpen the Young*, written around AD775 (Hadley and Singmaster 1992) and has remained a popular problem ever since (Swetz 2012).

> A dog starts in pursuit of a hare at a distance of thirty of his own leaps from her. If he covers as much ground in two leaps as she in three, in how many of his leaps will the hare be caught?

Such questions are a part of mathematical culture and history, and have formed part of the education of many generations. Such problems are enduring cultural artefacts, just as are poems.

It is well known that many students find moving from word problems to setting up an equation which accurately represents it to be very difficult. Clement et al. (1981, p. 288) proposed the following problem to 150 undergraduate students taking calculus: "Write an equation to express the statement '*There are six times as many students as professors at this university*'. Use S for the number of students and P for the number of professors". Of the 150 calculus students, 37 % answered incorrectly and two thirds of incorrect answers were literal translation resulting in the equation 6S = P. See also Fisher (1988) who reported that students continue to perform poorly when attempting it. The majority of students also have difficulty with basic logical reasoning (Wason 1968). There is a growing body of research on how students learn to reason, and the psychological and cognitive basis for problem solving.

Colleagues have varied aspects of Moore Method, with some encouraging students to work as a group, both answering questions and formulating research topics of their own. Such teachers encouraged alternative solutions to be presented and discussed, helping students refine their sense of aesthetics and providing other strategies for subsequent problems. In all forms, a key aspect is that it is the students' responsibility to solve the problems for themselves. And, in all versions *the group* criticises these solutions and ultimately, together with the teacher, decides if a solution is complete and correct. This more social notion of correctness is somewhat at odds with the objective testing of routine problems. How, then can technology be used to assess problem solving such as this?

Comparative Judgement

The online assessment reported in previous sections has concerned developments which aim to provide very specific assessments in individual subjects. The more sophisticated the tool, the narrower the range of subjects, which can be assessed. At one extreme are multiple choice systems: very general but rather limited. At the

other extreme are very powerful assessment systems for individual subjects which are able to provide specific feedback and complex interactions but are often rather inflexible. Despite the efforts of developers to date, few systems genuinely assess higher order skills. For example, rather than attempting to assess solutions to complex problems, they typically assess answers to more routine problems. As I argued earlier, sustained problem solving is valued and expected by benchmark statements. Traditional examinations, and contemporary online assessment systems focus on skills. This is valuable up to a point, but what about online assessment of problem solving? Assessment of problem solving is also not well served by traditional examinations, but can online technology offer a novel opportunity? All the previous systems attempt to establish objective properties of the student's answer. By contrast, a quite different approach is used in comparative judgement (CJ).

In comparative judgement assessors are presented with pairs of student scripts and asked to decide which of the two students has performed "better" (Pollitt 2012). Ties are not permitted. The outcomes of many such judgements are combined to create a scaled rank order of scripts from "worst" to "best". In psychology the Law of Comparative Judgement (Thurstone 1927), is based on the robust finding that people make much more reliable judgements when comparing one thing with another than they are able to do when trying to make objective judgements of a single item in isolation. Comparative judgement makes use of this law to establish the relative merits of students' work. Comparative judgement appears to be robust even in the absence of precise assessment criteria, such as may happen during problem solving.

Work such as Jones et al. (2014) and Jones and Inglis (2015) investigated the use of CJ for assessment of answers in mathematical problem solving. They found that CJ does offer a mechanism which enables the design and reliable use of more open problems, such as occur in mathematical problem solving. CJ is being used in a wide range of disciplines, including those essay subjects where objective assessment criteria are much harder to specify. CJ is also being used in peer assessment, where students judge one another's work (Jones and Alcock 2014).

For comparative judgement to work, each script has to be used in a sufficient number of judgements, typically of an order of magnitude of 10. Computer technology is able to orchestrate the process of presenting work to a judge in a form suitable for an efficient judgement to take place, such as placing two photographs or text paragraphs side by side on a screen. Computer technology is also ideal for calculating the statistics. Note that the duality between scripts and assessors means that CJ can also be used to rank order the judges themselves, enabling the quality of assessment to be measured, and ineffective judges (who guess perhaps) to be eliminated from the statistics. Although the idea of CJ has been around for nearly a century, only with computer technology has it become really practical as a mainstream assessment format. Note that comparative judgement may be a useful tool for high-stakes assessment, but it is not designed to be able to give detailed or specific feedback, which other bespoke software is designed to do.

Conclusion

In this Chap. 1 reviewed the definitions of success in university STEM subjects, as articulated in published policy statements. I also considered current assessment practices, in which the traditional timed and unseen examination still predominates. This provided a background against which to consider the changing nature of learning resources, with a move away from static traditional textbooks to more dynamic online resources incorporating sophisticated interactive assessments.

This is a time of rapid change in the nature and availability of resources. At the same time, assessment formats are changing from paper and pencil work to a wide variety of online assessments. Students expect high-quality materials, and they are used to working online. CAA is currently most useful for formative assessment of core skill-based tasks. STACK, as shown in Fig. 7.1, is a typical example here. There appears to be a disconnect between what can be assessed by current technology and tasks which assess the stated goals found in published policy statements. In particular, current technology and current examinations focus on questions which test routine procedural skills at a range of complexity from simple to involved. Published policy statements speak in broader terms, particularly highlighting the important role of problem solving. Current exams often depend on short precise items perhaps to achieve acceptable scoring reliability. Comparative judgement appears to offer one promising solution to the problem of assessing more open-ended problems.

Regardless of the medium used for material—for example printed textbook or online materials—the quality of the curriculum design, the presentation and the assessment will be key in helping students engage with the subject matter: that quality of experience is key in retaining their interest and ensuring their success.

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Chapter 8
Success Strategies for International Students in China

Lin Guo

Abstract The trend towards internationalisation in the Chinese higher education sector has necessitated a focus on developing teaching strategies that lead international students to success. The case study in this chapter investigates the perceptions and performances of a group of 72 international students in an undergraduate course of International Economy and Trade. We designed and implemented a series of teaching interventions in response to some of the major barriers that international students face. The analysis of a student survey (as well as learning records) indicates that our teaching design had a significant impact on the learning behaviour of the students. It further points to a formative effect on the learning style of the international cohort. The results of the study highlight the importance of an international perspective in teaching design for improving the retention and success of this type of student cohort in Chinese higher education.

Keywords Internationalisation · Learning styles · Teaching design

Background

The degree to which a higher education institution has an international outlook has become an important factor in prevailing world university rankings, as well as a feature of potential differentiation in a global market (Hazelkorn 2009). The global mobility of students has increased steadily and this trend is expected to accelerate over the next decade (Altbach et al. 2009). There is also an increasing variety of international destinations for higher education available to students. China has traditionally been a major source of international students moving to other countries (Varghese 2008) but is rapidly becoming a growing destination itself for international students (Institute of International Education 2015). Evidence from China provides a unique perspective of challenges for a global higher education system

L. Guo (✉)
Wuhan University, Wuhan, China
e-mail: lin.guo@whu.edu.cn

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that is experiencing a rapid pace of internationalisation, and it can help to inform how to improve the success of international students in such a context.

The cross-border mobility of students in the world higher education system implies better access to global educational opportunities, but also poses challenges for students to succeed in foreign educational institutions. International students have high expectations about their success in higher education. As an important investment in human resources, the choice of higher education has an opportunity cost, and that of study abroad is even higher. It is natural that a higher return is expected. The investment decision to undertake education in a foreign institution signals strong ambitions for personal development and individual success. International students and their sponsors expect better outcomes—such as access to broader or different curricula as well as enhanced prospects of accessing improved opportunities in personal or professional promotion—than if the students undertook domestic education. Success in higher education abroad is therefore crucial for international students. They may attribute their satisfaction to aspects of their education, especially the qualification in desired courses, the attaining of the relevant degree, the rewarding learning experiences, and the positive feedbacks from job markets.

The International Students Survey (2015) in Australia shows that the most important factors influencing choices of where to study are the reputation of the education system/institution/qualification and the quality of research and teaching at chosen institution. The survey also highlights the expectations on learning satisfaction, service support, employability, safety and satisfactions in living, etc. (Australian Government, Department of Education and Training 2015). Similar expectations can be observed from international students in China too. Based on surveys on international students in Shanghai, China, Ding (2010) indicates that the expectations of foreign students in China on the opportunities of learning in both local and international working languages and doing part-time jobs, on a personalized support service, on the teaching styles and the efficiency of administrative procedures are actually higher than their actual satisfaction.

Success is subtle because it cannot be achieved without meeting challenges and overcoming unusual difficulties. Learning in a different language, becoming accustomed to new learning styles, and developing autonomy and independence in an unfamiliar country and environment are, among many other factors, typical difficulties and challenges for foreign students (Jiang 2010). It is not uncommon for international students to need to solve problems associated with these, and more, difficulties before succeeding in their study abroad[1].

As facilitators of learning (Brick 2011), lecturers aim to make a positive difference in students' learning and to assist students to resolve learning and personal challenges. Discussions about the academic performance of international students

[1]Russell et al. (2010) show that different ways of adaptions exist which affect the well-being of foreign students in Melbourne, Australia. Wang (2016) shows that the acculturalization of foreign students in Beijing, China has an impact on their well-being too.

are not limited to reflections on their individual efforts, but rather consider retention and success of students in a globalised higher education system[2]. The learning outcomes for international students have evoked vigorous debate about the responsibilities expected of different roles in the current system. This debate is highly relevant to improving success in higher education from an international perspective. When the cohort is becoming increasingly international, and international students are gaining more prominence as a group, strategies to improve their learning experience and promote their success will be an important focus of any such debate. The role of an effective lecturer and purposeful teaching design will be at the core of the case study presented here.

Challenges

Chinese universities located outside the capital city, Beijing, are accommodating increasing numbers of foreign students. Wuhan is the capital city of Hubei province in central China, and 80 higher education institutions and colleges are located there. In fact, Wuhan is ranked as the second-largest city of higher education in China after Beijing (Ministry of Education 2015). Wuhan University is one of the top universities in China and has opened international programs with various majors to foreign students, resulting in a rapid growth of international enrolments. However, student results soon showed that the international cohort underperformed in comparison with local students (Zhou 2015). Among other factors, it appeared that the existing teaching design did not meet the needs of this new cohort. The Economics and Management School has the second-largest international student cohort within similar courses at Wuhan University. In a newly opened international track designed for foreigners, the cohort are foreign students in China. Local students are separate in symmetric programs called as the "local (or traditional) track". Both local and international track lead to the same degree. A class of foreign students in such international program, thus, provides a good sample for teaching experiments. A case study based on such teaching experiments highlights challenges both to international students in a globalised higher education system and a lecturer's teaching design. The increasing internationalisation of Chinese higher education contributes new evidence to the global discussion.

[2]Wang (2014) highlights the rapid increase of educational internationalization of China and a relatively slower hierarchical structure adaptation. More specifically, the management of increasing international students in China calls for research with samples from the most pronounced provinces, as in Zou & Jin(2016) and Wang & Guan (2014). Song (2013) emphasizes the quality control and the support to student services in China.

Table 8.1 Regional distribution of the international students

		Africa	Asia	Europe	America	Oceania
Number	72	35	22	11	3	1
%	100	49	31	15	4	1

Case Study

Methodology

The chosen sample was a class of international students majoring in International Economy and Trade at Wuhan University, in a newly opened international program for foreigners in China. Students in the class totalled 72 and originated from countries across five continents (Africa, Asia, Europe, America, and Oceania), with an uneven distribution as indicated in Table 8.1. Students from Africa, Asia, or Europe made up 95 % of the students, with almost half from Africa, one third from Asia, and a quarter from Europe. There were no local students in the class. While categorising students by their continent rather than background is unusual, for this case study it provides an interesting first way to examine differences between students.

A series of teaching designs was applied to the class to observe the relevance, feasibility, and effectiveness of design on the success of international students in the sample. The results of this case study demonstrate significant impacts from the teaching design on the students' attitudes, and show evidence of learning effectiveness linked to program design.

Challenges and Interventions

Studying abroad is challenging and the typical difficulties for international students in this sample are representative. The course design focusses on addressing three major challenges to international students' learning:

- language barrier
- diverse educational backgrounds
- cultural diversity.

Language Barrier

Students in the class were new learners of the local language (Mandarin) and English is not a native language either for many of the students. Because the program is conducted in English, they may be learning to live and study in a foreign

language, which could impede their acquisition of the subject matter. To help the international students to learn English, they were provided with selected teaching materials to prepare and practise their linguistic capabilities for their major. In the students' first class, it was explained to them that the importance of learning the course in English is because it is the working language of their study major, International Economy and Trade. Professionals in such a major need to express information in accurate, professional language. The true challenge for language in the course is not about the common usage of English, but rather the technical terms, terminology, and structure of expressions. Students were encouraged to use the teaching materials to develop the vocabulary and grammar necessary to demonstrate their understanding of the subject content. This preparation was designed to equip the students to express themselves in the common industry language, eliminating the language barrier as a hindrance to the students' performance throughout the course.

Diverse Educational Backgrounds

Enrolled students emerge from high schools in their own country and the admission to Wuhan University relies on certification from the students' high schools of origin. There is no entry admission test. For example, it has emerged that some African high schools do not require mathematics courses to be undertaken, while some Malaysian high schools do require mandatory units at undergraduate level. The disparity in academic achievement becomes apparent during the course of study, which can result in frustration being experienced by the entire class.

To address this issue, we undertook to engage the students in collective learning by incorporating more inclusive learning activities in the course. We designed activities using two parameters: that students at different educational standards be able to participate and complete tasks; and that all participants should be able to understand and learn from each other to achieve the learning goals. We set an expectation of the students that they would each strive to improve their personal performance, as well as contribute to the common learning goals.

Cultural Diversity

To establish a code of conduct for learning in this class, the teacher and students collaborated to reach agreement on learning progress and the schedule, so that the students would develop self-discipline in adhering to the agreed code. Students are able to do this if they understand what they should achieve in the course, how it will be taught, and the reason for the course content and structure. In addition, students should be informed what and when content will be taught, and what standard they will need to achieve at each step in the learning process. This enables the individual student some measure of self-determination in reaching their best potential.

As a result of the major difficulties of international students and consequent challenges for teaching design, these targeted strategies have been implemented as a series of interventions aiming at achieving multiple goals in learning objectives, as listed in "Appendix". The course design was communicated to the students at the first class and implemented throughout the course. Both the perception and performance of students were measured.

Course Structure

The course in the case study is taught in a classroom with a capacity of 100 seats. The delivery of the course mainly happens in the classroom, partially complemented by online communication tools which are only for sharing information. The course is taught in three consecutive, 45-min classes in the morning of a regular weekday for 18 weeks, including examination periods. Activities in the classroom include lectures, quizzes, seminars, group discussions, presentations, and tutorials, and the hours spent on lectures are comparable to the sum of the total hours spent on other activities in class. Learning hours in the classroom are equivalent to 54 classes, and it is expected that the same amount of time will be devoted to self-directed study. The course evaluates both the regular efforts and the performance in a final test of students, which are weighted respectively as 45 and 55 % of their final grades. The final test is a written test with standard answers; while the regular efforts are composed of responses to various activities, including attendance, participation in group discussion, or contribution to teamwork, and marks in quizzes or presentations.

Findings

Measures on Learner's Attitudes and Learning Performance

There are many stakeholders involved in higher education, and many are responsible for learning outcomes to some degree. Some of the roles of those stakeholders are complementary. For example, the success of an international student depends upon their ability to be or become an independent learner, while their attitude towards learning greatly influences their ability to acquire learning. The learner's attitude and capability as an independent learner are vital for the retention and success of their global higher education.

Learner attitudes are crucial for success and failure in higher education because students are the principle agents of their learning. If the lecturer expects to affect learners' attitudes as one way to facilitate learning for international students, one needs to test the following hypotheses. Can a lecturer affect learners' attitudes by teaching designed for international students? Do learners perceive the purpose of

Table 8.2 Opinions on helpfulness of the course design to learning

Experiments	Yes	No	Unknown	Total	Helpfulness (%)
Course schedule	60	1	1	62	97
Guide to assignments	59	1	2	62	95
Online news digest	58	3	1	62	94
Web application	57	4	1	62	92
Quiz	53	2	7	62	85
Seminar	47	1	14	62	76
Case study	52	1	9	62	84

the design? Can international students share with the lecturer the same vision of success in higher education? Can the efforts from the lecturer effectively help learning? Different answers to those questions may lead to diverging approaches towards the performance of international students. That is, positive answers point to an active role of educators in the success of international students and in meeting the demanding qualities of an internationalized higher education, while negative answers will lead to different solutions.

To assess the learners' attitudes in the sample, a learning experience survey was conducted after all learning activities were completed. Sixty-two responses were received. In the questionnaire, students were asked for each of the seven experiments (see Table 8.2 for the list): "Is it helpful for learning? (Yes or No)"; and "In which way does it help? (Multiple choices)". The options for the multiple choices were actually the purposes of the teaching design, formulated in different ways. The responses to the questionnaire are reported and discussed in the next section, to assess the impact of the teaching design on learners' attitudes.

A further question to answer in the case study is: how well have the international students in the sample performed in the course that was subject to teaching design experiments? The individual records of academic performance are analysed, and a comparative analysis is made by region of origin in order to contrast the outcome of learning for students from different parts of the world. Specifically, comparisons have been made among African, Asian, and European students for attendance ratio, contribution to teamwork, the grade in the final test, and overall performance.

The reason why the analysis of sub-sample is based on a regional division is twofold. On the one hand, the division by region aims at highlighting the most pronounced feature of the education globalization, the mobility of participants to tertiary education, which implies a contrast of their origin and destination. On the other hand, the origin of students is given to the teacher of course with their name and ID number, which made such an analysis feasible. Even though any individual may be heterogeneous in many other aspects worthwhile for exploring, the lack of reliable data on personal information in this sample doesn't allow for other analysis on personal abilities. However, the regional contrast in this case study doesn't indicate to any regional stereotypes, to the contrary, the results from experiments analysed in this case study call attention to the variability of regional impacts on learning performance. Comments on learning behaviours of students analysed here

should not be considered as general comments on a broader population, neither should the regional division be viewed as the main determinant of a particular behaviour. Actually, I tend to say that reactions of students in learning activities in a globalized education system are affected by the variety of cohort, which will be further developed based on analysis of learning behaviours observations. In the following paragraphs, it will be briefly introduced how different four aspects of students' behaviour in learning were assessed.

For assessing attendance behaviour, students were required to register their attendance once a week in class, by a signature on the attendance table. The numbers of signatures were counted as attendance records for calculating the individual attendance ratio as the proportion of presented weeks in total weeks. We then can compute the level of attendance for students from different continents, and contrast their behaviours of attendance to see whether the effectiveness of the teaching measures may vary regionally, according to different backgrounds of culture or education.

For assessing participation in the learning process and contribution to the learning community, the contribution to teamwork is evaluated. Teamwork is one of the major components of the learning process to encourage application, communication, and reflection on course content. Students were randomly (according to the order of their student number) divided by the lecturer into teams of similar size (3–5 persons) to work on an assigned task. The learning effectiveness can be observed both internally and externally. Internally, team members can do peer review and evaluate an individual's contribution to teamwork; externally, the lecturer and other students can observe the outcome of teamwork, which is a result of general participation and contribution of team members. Both external and internal evaluation were applied to the teams' work. The teamwork assignments were presented before the whole class so that other teams and the lecturer could evaluate the overall performance of the team. Moreover, each team member filled in a peer review form to give anonymous remarks on their evaluation of the contribution levels of all members of their team. Contribution levels can be equally or unequally distributed within a team; in the latter case, high or low contributions of each member need to be specified on the peer review form. The opinions of each team in this class have been consolidated and contrasted with the external observations to assess the reliability of information. It turns out that the peer reviews and the external observations were highly consistent. The consolidated evidence on efforts in teamwork was used as the measure of contribution to teamwork.

The outcome of learning is measured by grades. The grading is a mark out of 100, and the passing grade is 60 out of 100. The final test is a grading test and is easily evaluated by observing the distribution of grades. The evaluation of the overall performance of a student in the course depends not only on their grade in the final test but also on those of their regular efforts; the latter is a weighted average of grades from various activities in the learning process, including quizzes, inquiries, roundtable discussions, debriefings of group discussion, debates, and case studies. Students had the chance to gain higher grades through diversified tasks, and were encouraged to participate and to demonstrate their strong points. The grade of the

final test and the final grade of the overall performance in the course are therefore analysed separately.

The attendance to class, the contribution to teamwork, the grade of final test and the grades from various activities in learning process are analysed in the following way. For each of the four aspects, the performance of students is classified into four levels (I, II, III, and IV). In order to compare the general performance of students from each region, an index of a weighted average is used as a proxy for the average level by region. The average index was calculated by weighting the level (1, 2, 3, or 4) by the percentage of students in each level. The value of the average index approximately indicates the location on the scale of four levels, and is used as a ranking of performance for different groups. For example, in Table 8.3 the index for attendance of 2.06 represents a level in the third tranche (III), but a score very close to the lower boundary of the second tranche (II), and would imply a better ranking than 2.64 or 3. Such index for measuring overall performance and ranking students from different regions will be used in the following Tables 8.3, 8.4, 8.5 and 8.6. Both the average and the distribution of performance in different levels are compared across regions. A detailed report on attendance, teamwork, the grade in the final test, and overall performance will be presented in sequence to evaluate the impact of the teaching design on learning effectiveness.

Table 8.3 Attendance ratio

Attendance	Africa		Asia		Europe	
I	11	31 %	8	36 %	2	18 %
II	15	43 %	3	14 %	1	9 %
III	5	14 %	0	0 %	3	27 %
IV	4	11 %	11	50 %	5	45 %
All	35	100 %	22	100 %	11	100 %
Average index	2.06		2.64		3.00	

N.B. Tier I represents 90–100 % attendance; Tier II represents 75–89 % attendance; Tier III represents 60–74 % attendance; Tier IV represents attendance lower than 60 %. The average index indicates the position on the scale with four tiers and a value of index closer to 1 implies a better ranking

Table 8.4 Contribution to teamwork

Teamwork	Africa		Asia		Europe	
I	3	9 %	4	18 %	4	36 %
II	6	17 %	1	5 %	0	0 %
III	6	17 %	4	18 %	3	27 %
IV	20	57 %	13	59 %	4	36 %
All	35	100 %	22	100 %	11	100 %
Average index	3.23		3.18		3.00	

N.B.: “Distinguished” as category I; “Average” as category II; “Moderate” as category III; “Low” as category IV. The average index indicates the position on the scale with four tiers and a value of index closer to 1 implies a better ranking

Table 8.5 Grades in final test

Final test	Africa		Asia		Europe	
I	2	6 %	3	14 %	4	36 %
II	16	46 %	9	41 %	0	0 %
III	12	34 %	7	32 %	3	27 %
IV	5	14 %	3	14 %	4	36 %
All	35	100 %	22	100 %	11	100 %
Average index	2.57		2.45		2.64	

N.B.: Scale I includes grades of 90–100; Scale II includes grades of 75–89; Scale III includes grades of 60–74; Scale IV includes grades below 60. The average index indicates the position on the scale with four tiers and a value of index closer to 1 implies a better ranking

Table 8.6 Grades of overall performance

Final Grade	Africa		Asia		Europe	
I	1	3 %	2	9 %	4	36 %
II	24	69 %	10	45 %	4	36 %
III	5	14 %	7	32 %	3	27 %
IV	5	14 %	3	14 %	0	0 %
All	35	100 %	22	100 %	11	100 %
Average index	2.40		2.50		1.91	

N.B.: Scale I includes grades of 90–100; Scale II includes grades of 75–89; Scale III includes grades of 60–74; Scale IV includes grades below 60. The average index indicates the position on the scale with four tiers and a value of index closer to 1 implies a better ranking

Impact of Teaching Design on Learners' Attitudes

The results of the learning experience survey confirm that there was a significant impact from the course design on learners' attitudes. Students who agreed with the helpfulness of the design were in the majority (as indicated in Table 8.2) and, on average, they agreed with at least one formulation of the purpose. The results demonstrate that the students perceived the purposes of the design and agreed upon its usefulness to their academic success.

Impact of Teaching Design on Learning Effectiveness

Attendance

The attendance ratio of each student is ranked into four tiers. Tiers I–IV represent high to low levels of attendance.

African students dominated the population of the sample and a feeling of community seems to have played a role in their behaviour. They seemed very happy to see their closest friends in class, they were seated around each other, and they often came and left in groups. The feeling of being an important part of the group may have strengthened their behaviour towards attendance.

The attendance of Asian students is the most polarised which lowers their average. Asian students stand out for full attendance: 8 out of 22 Asian students recorded full attendance, while it was only 4 out of 35 for African students and zero for European students. However, while attendance was routine for half the Asian students, the other half seemed to be the opposite and they were also very laid-back in class. The frequent absence of this latter half presented difficulties for following normal progress in class, which in turn may have frustrated their attendance further. When attendance is not an imposed discipline or a moral doctrine, Asian students seem to diverge into two opposing types, driven by either the inertia of routine or otherwise a lack of willpower. The country of origin and gender do not seem to explain such polarisation, since both full-attendance and frequent-absence students may have come from the same country and been of the same gender.

European students were the minority in the class and they did not seem to coordinate on attendance or gather together in classroom, which made them even less pronounced in presence. Higher cross-border mobility of students makes more international students present in the most popular education destinations like the U.S. and the Europe, while the presence of American or European students in less popular education destinations like China is emerging too. For European students, their study in this class in China must offer a dramatically different experience to that from the internationalisation of higher education in their home countries. Nevertheless, higher cross-border mobility of students makes both situations visible in the progress to internationalisation of the worldwide higher education.

Contribution to Teamwork

Contribution to teamwork is ranked into four categories: distinguished, average, moderate, or low. “Distinguished”, as category I, is those who played a leading role in their team and often acted as the speaker of the team in presentations, and/or those who received highly positive comments from peers. “Average”, as category II, is those who contributed equally to adequate teamwork but did not make efforts to outperform. “Moderate”, as category III, is those who made a minor contribution to teamwork. Those who made a “low”, “weak”, or “absent” contribution to teamwork are in category IV.

The European students in the sample were outstanding at teamwork. The average performance of European students is ranked at the top, before both Asian and African students. More than one third of the European students were “distinguished” contributors in teamwork, which is double that of Asian students and four times that of African students. Weak contributors to teamwork account for almost

60 % of the population of Asian and African students, which is double or five time to the number of such European students. When we contrast this data to the attendance ratio, European students actually outperformed in teamwork. European students seemed to have actively led teamwork whenever they were present, while Asian and African students tended to be present but passive. The number of distinguished contributors among the Asian students was just half that for full attendance. African students' performance in attendance and their level of team leadership were actually inverses: three quarters of the African students had a relatively high attendance rate but the same proportion were below "average" in contribution. Education background, such as previous experience of working in teams, may explain such a disparity in activity. Such phenomena point to the necessity for careful teaching design for an international cohort in order to expose them to mutual communication and facilitate them to learn from each other.

Grades

Grades are ranked into four scales: "Excellent" (90–100) as scale I; "Fairly good" (75–89) as scale II; "Pass" (60–74) as scale III; and "Fail" (below 60) as scale IV.

In relation to the average grades in the final test, Asian students outperformed both the African and European students in the sample. However, more European students rated as excellent: four out of 11 European students achieved excellent marks in the final test, but only 3 of the 22 Asian students and, even worse, 2 out of the 35 African students. When we contrast the data to their efforts in attendance or teamwork, European students were efficient learners in the sense that the distribution of their efforts was consistent with that of their performance in the final test. Compared to European students, Asian and African students were less efficient in learning outcomes; the number of students who recorded in the top tranche in the final test were lower than such numbers in the top tranche for efforts in both attendance and teamwork. The issue seems more pronounced for African students, since only 66 % of the distinguished contributors to teamwork recorded excellent marks in the final test; while the ratio is 75 % for Asian students, and 100 % for European students.

When we look at the grades for overall performance, the above conclusions are confirmed in that European students ranked at the top in learning outcomes, while Asian and African students exhibited learning inefficiencies. The assessment of overall performance was designed to enhance learning outcomes by examining not only skills in the written test but also their regular performance in learning progress. If a student participates and performs well in various activities of learning the course, he or she has the possibility to achieve a better total grade than the grade of the final test. Such a design aims at stimulating the permanent learning and developing comprehensive abilities. The design turns out to have been effective for the expected general outcomes for all European students but only for part of African and Asian students. In regards to overall performance, the learning outcomes of the

European students had all advanced, but the African students only partially improved and Asian students even partially downgraded. Among the African students, the failure ratio remained the same and the excellence ratio shrank, but a significant proportion improved from "pass" to "fairly good". However, the Asian students' overall performance was no better than that in the final test, and one even dropped from "excellent" to "fairly good". Such a learning experience in an international cohort should have exposed Asian and African students to their relative weakness, compared to European students, in permanent learning and comprehensive abilities.

Discussion on General Effectiveness

In general, the learning efforts and outcomes of the chosen sample lie in the third category (III), which implies a distribution biased towards "Pass". Does such a distribution imply a successful or failed education?

If we take a normal distribution as the benchmark, the scores for "Pass" are on average suboptimal. Low entry levels for educational background may present a hurdle and therefore could explain this, but the lack of an entry test does not allow us to control for its exact effect in rigorous data analysis. Educators have to recognise it as a given factor.

If we take a closer look at the individual progress of each student, it was not uncommon for them to consider a "Pass" in all courses as an academic success; if their entry level was low then they at least substantially matured and grew into a better self. The survey was complementary to observation of such personal development as being an essential component of the international learning experience.

Further investigations of graduate capabilities and the competitiveness of international students after graduation would be helpful to appraise the real achievements and insufficiencies of internationalised higher education. However, short of a globally comparable data set, comparative analyses are not yet prevalent enough to draw conclusions about global implications for retention and success in internationalised higher education. International dialogues and joint research on country-specific experiences are therefore, at the current stage, critical for a better understanding of the success or failure of international students in globalised higher education. I hope that the experiments and their outcomes discussed in this case study will provide some evidence that can contribute additional perspectives into how to succeed in globalised higher education for international and domestic students.

Implications

Extended Stakeholders in an Internationalised Higher Education

The case study points to the potential effect of education on the learning behaviours of an internationalised cohort. Since the specific design for a target cohort can substantially enhance common visions of learning success and help students along the path towards the learning goals, educators are capable of leading successful learning; this is not spontaneous in an international cohort but requires guidance and help. Higher education has an important role to play in ensuring learning satisfaction for international students.

With the widening scope of globalisation, the cohort in world higher education will tend to be even more internationalised and the division between "domestic" and "foreign" students may become indistinct—they may all become just "international". In such a context, it will be invalid to accustom some of them (domestic or foreign) to an established rule of learning by the other sector (domestic or foreign). We can no longer completely attribute the success or failure of foreign students to random individual phenomena; however, the academic performance of international students will eventually put the success of higher education at stake, at least to the extent of its internationalisation.

Richer Measures of Success in Higher Education

The analysis of learning outcomes points to challenges in measuring success/failure in higher education. The judgement on success or failure in learning is significantly sensitive to the choice of proxy. Overall performance was not linearly correlated with marks in the written test. That is, students in the sample who were good at taking examinations were relatively weaker at other types of performance; and the efficient types of learners in the sample did not achieve the highest scores in the examination.

The increasingly mobile world education system allows for an expansion of the cohort and ought to enable a diversified mass to discover and develop their potential. The emphasis in internationalised higher education should be put on how to make it work by taking advantage of new attributes of the internationalisation in higher education, such as the diversification of cohort, the pluralism of value system, the contrast of different culture and the possibility of competing, assimilating and collaborating.

The design of higher education should be inclusive enough to promote learning efficiency and the balance of diversified abilities during the learning process. Through both competition and collaboration in class, international students need to learn to comprehend their comparative advantages in abilities and their competitiveness in a global context. Sufficiently rich parameters for evaluation are necessary to match the diversification of the cohort.

A New Culture of Internationalisation

One of stereotypes of Asian students is their respect to the discipline, the rule of attendance to class for example. However, when we look at the attendance ratio of the sample in study, the actual attendance behaviour makes a sharp contrast to preconceptions about the cultural characteristics of learners. Asian students is minority is this sample while African students is dominating the cohort. The collectiveness among African students seem to encourage their attendance to class, while Asian or European students lack such a connection with the community and behaved differently. The attendance behaviour can be affected by the relationship with the community.

It reveals that the cohort itself may be shaping the cultural background of such a newly formed multicultural community. The recognition of social identity, the codes of behaviour, and the sense of value may actually be formed (or at least substantially affected) by the learning environment provided by the internationalisation pattern of higher education. This will be demanding for educators, because we need to go beyond any simple division of learning styles into Western or Eastern or regional.

The internationalisation of higher education implies accepting pluralism as a convention. We therefore need to be sensible about the potential shaping power of the internationalised cohort, and be flexible enough to guide or create a desirable learning culture with respect to the teaching goals. This requires moving away from a prescribed approach and instead discovering one that takes good advantage of students' backgrounds to motivate learning for both the minority and the majority; these classifications are actually context-dependent too.

Internationalisation as a Powerful Tool of Learning and Teaching

The mixture of students from different regions has a significant implication for educators: internationalisation itself can be a learning tool in higher education. For example, projects in small groups allow for a micro-environment for each team member, and the impact of their original background in learning will be weakened. The breaking up of habitual groups in class along with teamwork by a mixed cohort give prominence to individual abilities and attributes. Cooperation in an international team accelerates the establishment of self-recognition, social codes, and values in the profession of international affairs; this in turn promotes personal development of capabilities for coping with potential challenges in a future career in international economy or management.

Conclusion

By using evidence from a sample of international programs at Wuhan University in China, this case study investigates the learning attitudes and the learning performance of international students in a Chinese higher education institution. The results of the study confirm that the teaching design can have a significant impact on the learning behaviour of international students. The analysis of the performance of these students highlights the shaping power of an internationalised cohort on its learning style. An increasingly globalised higher education system needs to be inclusive and flexible enough to adapt to the needs of its diversified cohort, and all open destinations of higher education face this challenge. The higher education system today is preparing global citizens for tomorrow. The success of internationalised higher education is bound together with that of its students. The trend towards an increased cross-border mobility in higher education calls for a global perspective on teaching design and an open-minded conceptualisation of higher education.

Appendix

See Table 8.7.

Table 8.7 Course design and list of learning activities

Difficulties for international students	Challenges for learning and teaching	Teaching design	Implemented experiments	Purposes
Language barriers	Learning in a different language	Selected teaching materials	Bilingual textbook Online News Digest	Language tools Reading guidance Vocabulary and language materials
		Practices in writing report	Module of report	Writing exercises
		Peer learning	Learning in groups	Oral skills Language practices

(continued)

Table 8.7 (continued)

Difficulties for international students	Challenges for learning and teaching	Teaching design	Implemented experiments	Purposes
Diverse educational backgrounds	Getting accustomed to new learning styles and skills	Various learning activities	Presentation	Communication skills Presentation skills Teamwork skills
			Discussion	Skills in dialogue and cultural exchanges
			Peer review	Critical thinking
			Web application Case study Seminar	Numerical skills Analytical and logical skills Application skills
Cultural diversity	Developing self-autonomy and independence	Communication of course information and requirements	Course schedule	Enhance awareness of learning progress Stimulate study on time Help with time organization
			Guide to assignments	Understand the requirements Serve as a guide for how to do homework Provide a model to follow
			Exercises Inquiry and Quiz	Self-learning Incentives for efforts in homework Incentives for attendance in class

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Chapter 9
Peer Assisted Learning: Strategies to Increase Student Attendance and Student Success in Accounting

Mauricio Marrone and Lilia Draganov

Abstract It is well known that extracurricular peer-learning programs such as Peer Assisted Learning (PAL) have an impact on student retention, success, and overall student satisfaction. However, for PAL to work as intended, higher participation rates are needed as student attendance remains one of the challenges faced by program administrators. In our study, we analysed the reasons why students attend PAL, and which strategies can be followed to increase students' interest in the program. This chapter outlines how targeted messages can encourage different cohorts to attend PAL, and assists PAL administrators with how to conduct their recruitment campaigns to be consistent with their universities' needs.

Keywords Peer-learning · Student participation · At-risk students · Program implementation

Introduction

Changes in higher education in Australia, in particular, the movement towards deregulation and the increase in competition from various providers, have shifted the focus to student retention and engagement. To retain more students and enhance their experience, providers are implementing new initiatives and reviewing those that are currently in place. The program discussed in this chapter is Peer Assisted Learning (PAL), which is derived from the Supplemental Instruction (SI)[1] program,

[1]SI was developed in the mid-1970s at the University of Missouri-Kansas City (UMKC). The program has been adopted by different institutions throughout the world, acquiring different names. In the UK, the program appears under the title of Peer Assisted Learning (PAL), which is also used in some institutions in Australia. In Australasia, the program predominantly has been called Peer Assisted Study Sessions (PASS) (Barry et al. 2012, p. 10). At the Faculty of Business and Economics at Macquarie University, the program is named PAL, and follows the model and principles of the SI and PASS programs. Because the literature predominantly refers to it as SI, the authors use this term throughout this chapter.

M. Marrone · L. Draganov (✉)
Macquarie University, Sydney, Australia
e-mail: lilia.draganov@mq.edu.au

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and incorporates its model. This program aims to support difficult subjects that are marked by high failure and withdrawal rate.

The indicators we used to measure the success of the program include student attendance, based on the idea that the more frequently students engage with the program the greater chance that they will persist and succeed in their degrees (e.g. Blanc and Martin 1994; Congos and Mack 2005; Rath et al. 2007). However, researchers often report student attendance as one of the greatest challenges of the SI program. To encourage students to attend the program, an understanding of the reasons why they attend must be developed. This chapter draws upon existing research to compile a comprehensive list of reasons why students participate in SI. Using these findings, we surveyed first and second year accounting students on their reasons for attending SI. A regression analysis was conducted to estimate the relationship between student characteristics and the reasons for SI attendance.

This chapter summarises the reasons why students attend SI; and how universities can tailor their messages to attract more students to SI sessions. Furthermore, the chapter reveals that using targeted messages could encourage different cohorts to attend SI sessions. To respond to the low-attendance problem reported by researchers, we believe there is a need to better inform program administrators on how to conduct their recruitment campaigns for PAL and similar programs. Creating messages that are consistent with student needs could encourage more students to engage with the program.

Background

In the mid-1970s, some units of the University of Missouri-Kansas City (UMKC) were faced with high attrition rates. To address this issue, a new academic support program, called Supplemental Instruction (SI), was developed with the purpose of enabling students to better understand the content, as well as to assist in the development of the study skills required by the students to be successful in the unit. SI can be defined as "a cooperative learning model for enhancing students' understanding of course material for inferring students' overall learning and reasoning skills" (Etter et al. 2001, p. 356). SI has three main characteristics. First, SI sessions are conducted for high-risk units, not aimed at students at risk (Arendale 1994); therefore, it is open to all students taking the unit. Second, SI Leaders are previous students of the unit, chosen to be leaders due to their performance in the unit, as well as their ability to engage students and to lead an SI session (Etter et al. 2001). One key element of SI is that leaders do not re-lecture the unit's material (Goldstein et al. 2014) but, instead, they practise a participatory pedagogy and answer specific questions about the content or the unit overall. Third, SI is often run in small groups, scheduled close to the time of the lecture (Etter et al. 2001).

The aim of SI is to help students comprehend the unit's material, hence improving their knowledge of the subject, their test scores, and overall unit grades (Arendale 1994). A positive correlation between final unit grades and SI attendance

has been found in a number of disciplines including accounting (Etter et al. 2001); economics (Dancer et al. 2015); mathematics (Duah et al. 2014; Fayowski and MacMillan 2008); English (Longfellow et al. 2008); and chemistry (Congos and Mack 2005). Furthermore, several studies thus far have linked SI attendance to higher rates of course completion (e.g. Congos and Mack 2005; Peterfreund et al. 2008) and assessment performance (e.g. Miller et al. 2012). Researchers have also examined the impact of SI on increasing student retention (e.g. Blanc and Martin 1994; Rath et al. 2007).

Regardless of the benefits of participation in SI, student attendance has been low. Duah et al. (2014) report on SI slots being disbanded due to low attendance, and on strategies such as encouraging students to attend via the social media platform Facebook and email. Problems with attendance have been reported amongst some fields such as mathematics (Duah et al. 2014; Harding et al. 2011); chemistry (Rath et al. 2007); and accounting (Etter et al. 2001).

To gain a better understanding of what motivates SI attendance, some studies have examined the reasons why SI participants choose to attend the sessions. In their research, Howitt and Harding (2000) found the following reasons: improving the chances of passing; getting a higher mark; getting additional practice; working with other students; and to gain a greater knowledge of the subject. In a similar piece of research, Price and Rust (1995) identified the following reasons: meeting other students; improving study skills; improving knowledge; receiving help with the language of the subject; increasing confidence; helping students understand coursework; improving the final grade; liking the SI leader; and liking the group. Out of these reasons, participants responded the most strongly that they felt that SI helped them with improving their knowledge, understanding the coursework, and improving their final grade.

Based on a mixed method study, Ashwin (2003) suggests that students attending SI elect a surface learning approach and that they attend the sessions to get an insight on what would be assessed rather than focusing on comprehension of the subject. He proposed that students may attend SI for the purpose of increasing "awareness of the assessment demands of the house and that these students had become more strategically oriented in their approach to studying" (Ashwin 2003, p. 159).

However, an improvement in academic outcome has not been the only reason outlined. White et al. (2011) found that one of the main reasons students attend is for a sense of connectedness with their fellow participants; their findings show that this was a decisive factor in the preliminary stages of attending the sessions. Zacharopoulou and Turner (2013) report that students realise there are significant emotional and social benefits, and researchers have also noted that students identify it as a place where new friends can be made (Kommalage and Thabrew 2011). Hence, the social aspects of SI can play an important role in attracting and retaining students.

Another reason that students may attend is to improve their knowledge of the topic. In accounting, Etter et al. (2001) found that SI participants feel more confident about their knowledge of the course material as a result of attending such sessions. In a similar study, Peets et al. (2009) suggest that SI helps to improve participants'

knowledge acquisition and retention of the unit material. Parkinson (2009) proposes that attendees seek a place where they can get additional help with their understanding of the unit material, as well as work through associated problems.

From previous studies into SI, we noted seven benefits that students can derive from these programs. The seven benefits are shown in Table 9.1, along with the authors who have identified them. These benefits are often communicated to students to encourage their attendance. There is a gap in our understanding of who is likely to respond to these messages, and if different student cohorts would react to these differently.

In this paper, we argue that even after controlling for prior academic attainment and student demographics, different student cohorts have different reasons why they attend SI. Therefore, using these findings we can attract a larger number of students by creating specific messages to target particular student cohorts.

Another gap is that previous studies of SI in the field of accounting have focused only on first year accounting units. However, as students and academics have realised the benefits of SI, it has been incorporated into higher level units including postgraduate subjects. Given that there is little discussion concerning intermediate accounting units, our study controls for the unit level to try to have an understanding if there is a different rationale for participation for the first year or second year students.

Table 9.1 Literature on reasons to attend SI

	Improve grade	Passing the unit	Receive extra help	Check my knowledge	To make friends	Study with people	Lecturer's prompting
Howitt and Harding (2000)	✓	✓	✓	✓		✓	
Price and Rust (1995)	✓		✓	✓		✓	
Ashwin (2003)	✓	✓					
Kommalage and Thabrew (2011)					✓		
Zacharopoulou and Turner (2013)						✓	
Etter et al. (2001)				✓			
Peets et al. (2009)				✓			
White et al. (2011)					✓	✓	
Parkinson (2009)			✓				

Methodology

The purpose of our study was to gain an understanding of why students attend PAL, and which strategies can be followed to increase students' interest in the program, controlling for their prior attainment, demographic status, student characteristics, and level unit. For this purpose, a questionnaire was developed and a survey was then completed. The following sections discuss the structure of the SI session, research design, and measures.

Program Structure and Design

The SI program was first established at Macquarie University, a large metropolitan Australian university, in 2006. The program supports first and second year accounting, finance, and economics undergraduate units. These units have been selected because they are perceived as difficult by the students; register high failure and attrition rates; and involve a large number of students (from 500 to 1500 students per unit). The program is based on peer-to-peer interaction and per study term there are 20 SI Leaders, who are responsible for session facilitation.

At the beginning of each study term, a team of SI Leaders is recruited by the SI Coordinator, based on their interpersonal skills and academic achievements. SI Leaders are students from more advanced years that have completed the units. The leaders undergo mandatory training, following the model developed by the Australian National PASS Centre at Wollongong University http://www.uow.edu.au/student/services/pass/centre/training/UOW021348.html. The training equips the Leaders with knowledge and skills for how to prepare and conduct their sessions; how to engage students in active learning; and how to help students develop a deeper understanding of the units that they are studying, using discussions, group work, games, and other active-learning strategies.

Between 54 and 60 sessions are scheduled per week, accommodating around 1000–1200 students with a capacity of 20 students per session. The sessions become regular revisions of the topics discussed in lectures. In consultation with unit convenors, content-specific worksheets with questions and activities are prepared before each session by the leaders. Participants are encouraged to bring lecture slides, textbooks, and lecture notes; and are encouraged to participate in discussions, solve the proposed problems, and engage in the learning process. During the sessions, students have an opportunity to clarify concepts that they were not able to understand while studying alone. They are also given an opportunity to share their concerns with their peers and the SI Leaders. Subsequently, the leaders are encouraged to raise students' concerns with the course convenor and lecturers of that unit.

Research Design

Our research design was focused on the motivation for students to attend SI, and how this relates to student characteristics. We collected data from six accounting SI classes. Two are first year units that cover introductory accounting topics, while the four intermediate units cover topics such as financial and managerial accounting, business law, and accounting information systems. The survey was voluntary. The instrument used for data collection was developed using the motivation factors that were observed in previous SI research. A standard Likert scale was used, where 1 denoted "strongly disagree" and 5 denoted "strongly agree".

Before commencing the study, ethical clearance was sought and received from the University's Ethics Committee. During Week 10 in Session 1, 2014, a questionnaire was given to all the students that attended the accounting SI sessions. Week 10 was chosen because it was towards the end of the semester, allowing students to have gained an understanding of the impact that SI can have on their studies. The week was also not too close to the examination period, when students would perhaps have been too stressed and thus apprehensive about spending time answering the survey. Participants were asked to give consent to allow the researchers to match their unique student ID with their attendance at SI sessions, institutional records, and their questionnaires.

All students present at the session were invited to participate. They were allowed as much time as needed to complete the questionnaires, typically requiring 10 min. The questionnaire gathered their views regarding their reasons for attending. Students who attended the session but did not fill out the consent form or answer the questionnaire were excluded from our sample. For the purpose of this study, the student's Pre-SI Grade Point Average (PGPA) as well as their grade in the unit were obtained from institutional records.

Of a total of 331 students who participated, 154 were female and 177 were male. The majority of the students surveyed were majoring in accounting. Table 9.2 provides a breakdown of the students who participated in the study in regards to age, gender, student status, field of education (FOE), SI unit, and age.

Measures

Based on the literature, we found that there are seven main reasons why students attend SI. Also, Macquarie University trialled a new approach in the relevant semester in an attempt to attract more students to the program. SI Leaders were asked to give a 3-min presentation in their respective units to illustrate to students what the SI sessions were about and why students might like to attend. To understand if this approach worked, a question about the presentation was also added to the survey. These eight motivations were then presented to students as statements (e.g. "I attend SI … to improve my grades") with a scale ranging from

Table 9.2 Student participant information

	Frequency	Percent
Gender		
Male	177	53.5
Female	154	46.5
Status		
Domestic	147	44.4
International	184	55.6
Field of education		
Accounting	209	63.1
Finance	34	10.3
Business	29	8.8
Economics	51	15.4
Other	8	2.4
Unit		
Unit 10 (1st year unit)	28	8.5
Unit 11 (1st year unit)	21	6.3
Unit 12 (2nd year unit)	72	21.8
Unit 13 (2nd year unit)	97	29.3
Unit 14 (2nd year unit)	59	17.8
Unit 15 (2nd year unit)	54	16.3
Age		
18–19	98	29.6
20–21	154	46.5
22–25	65	19.6
Over 25	14	4.2

strongly disagree to strongly agree. To validate the survey, SI Leaders and two independent academics were asked to evaluate whether the proposed questions effectively captured the topic being analysed.

To test the reliability of the scale of our items, Cronbach's alpha was computed. The reasons-to-attend scale appeared to have a good internal consistency, $\alpha = 0.77$.

Information from the participants' academic records was also extracted. Pre-SI cumulative GPA (PGPA) was included to control for students' previous academic results. GPA is a continuous variable measured on a four-point scale (HD/D = 4.0 {equivalent to A}, Cr = 3.0 {equivalent to B}, P = 2.0 {equivalent to C}, and F = 0). The residency status of students, either domestic or international, was also controlled for (STATUS). As controlled for by Jones and Fields (2001), students whose major is accounting have a vested interest in displaying greater levels of effort/motivation when compared to students who are undertaking other majors. Hence, Field of Education was used as a control variable.

Data on gender were also collected (GENDER). Previous research has investigated whether gender plays a role in determining success rates due to SI participation. Fayowski and MacMillan (2008) questioned whether gender would have an

effect on the final course grade, reporting no significant interaction effects. In another study, Peterfreund et al. (2008) investigated if there is a difference between the percentages of females and males when considering participants and non-participants of SI. They reported that males were under-represented in the SI sessions; however, for those males that did attend, the benefits were greater than for females. Similarly, Hodges and White's study (2001) shows that males were less likely to attend these classes.

Finally, as the survey was conducted for various accounting courses, the units were included to control for the different topics in the courses, as well as for the relative difficulties of the courses (COURSE).

Results

Students were asked to rate their motivations for attending SI from 1 (strongly disagree) to 5 (strongly agree). Table 9.3 shows the summary statistics for reasons for attending.

The top three reasons were: to improve my grades; receive extra help; and to pass the unit. However, the reason to make new friends was, on average, marked as neutral.

Multiple ordinal regression analysis was conducted to explain students' reasons for SI attendance, using PGPA and the characteristics AGE, GENDER, FOE, UNIT, and STATUS as predictors for each of the reasons. Base comparisons (or references) were set for each of these characteristics. In the case of AGE, students over 25 years were used as the base comparison. Regarding GENDER, the base comparison was males. For FOE, accounting major students were used; the rationale for this was the previously mentioned work by Jones and Fields (2001). The introductory unit ACCG100 acted as the baseline for UNIT. With regards to the variable STATUS, here we used international students.

In the next sub-sections of the chapter each of the statements (motivations) will be analysed in turn, paying particular attention to the independent variables that are statistically significant in explaining them.

Table 9.3 Reasons to attend SI

	Mean	Std. Deviation
Improve my grades	4.60	1.007
Receive extra help	4.48	1.005
Pass the unit	4.32	1.202
Check my knowledge	4.17	1.126
I am interested in studying with other people	3.42	1.283
SI Leader prompting	3.41	1.419
Lecturer's prompting	3.29	1.469
To make friends	3.11	1.363

Improve My Grades

The ordinal regression model was statistically significant, thus allowing us to better understand the relationship between the students' characteristics and the dependent variable "improve my grades", while including controls for the effects of several other predictors. The statistical summaries of the multiple ordinal regression analyses are provided below.

Overall, the regression model was statistically significant (chi-square = 44.05, $p < 0.005$ with df = 18). A Nagelkerke's R^2 of 15.8 % indicates a moderate relationship explaining the variance in the outcome variable. However, as shown in Table 9.4, only three independent variables were of statistical significance, i.e. PGPA, STATUS, and FOE (12).

The variable PGPA proved to be significant in explaining the relationship between the dependent variable "improve my grades" ($p = 0.002$) with an odds ratio of 1.40. This indicates that the odds of agreeing with the statement "improve my grades" increases by 1.40 for each unit increased in PGPA. This means that a student who scored one standard deviation (SD) above the mean score was 50 times

Table 9.4 Ordinal regression for "Improve my grades"

Variable	Estimate	Std. Error	Wald	95 % CI
PGPA**	0.33	0.11	9.27	0.12 to −2.77
Age (18–19)	−1.13	0.84	1.83	−2.77 to −1.81
Age (20–21)	−0.18	0.83	0.05	−1.81 to −2.26
Age (22–24)	−0.56	0.87	0.42	−2.26 to 0
Age (over 25)	0[a]			
GENDER (male)	−.04	0.28	0.02	−0.6 to 0
GENDER (female)	0[a]			
Unit 10	−0.48	0.64	0.56	−1.74 to −1.77
Unit 11	−0.56	0.62	0.82	−1.77 to −1.78
Unit 12	−0.63	0.59	1.16	−1.78 to −1.87
Unit 13	−0.7	0.6	1.37	−1.87 to −2.2
Unit 14	−0.55	0.84	0.42	−2.2 to 0
Unit 15	0[a]			
STATUS (domestic)*	0.83	0.33	6.44	0.19 to 0
STATUS (international)	0[a]			
FOE (others)	0.1	0.91	0.01	−1.67 to −1.71
FOE (finance)	−1.01	0.36	7.81	−1.71 to −0.53
FOE (business)	1.04	0.8	1.69	−0.53 to −1.46
FOE (economics)**	−0.55	0.47	1.4	−1.46 to 0
FOE (accounting)	0[a]			

Pseudo R^2: Nagelkerke 0.14

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

[a]This parameter is set to zero because it is redundant

more likely to rate this reason higher than a student with the average (mean) PGPA. Similarly, a student who scored one SD below the mean score of PGPA was 50 times more likely to score this reason lower than a student with an average (mean) PGPA. Similarly, domestic students were 2.48 times more likely than international students to rate this statement higher, even after controlling for PGPA, GENDER, FOE, and AGE. Students majoring in economics were 2.8 times less likely than students majoring in other areas to agree with the statement.

Pass This Unit

The statistical summary of the ordinal regression for the reason "pass this unit" is provided in Table 9.5.

This ordinal regression model also proved to be statistically significant (chi-square = 50.73, $p < 0.001$ with df = 18), and explained 16.1 % (Nagelkerke R^2) of the variance in the outcome variable. As shown in Table 9.5, the variables UNITS, STATUS, GENDER, and students completing the business major were statistically significant. Students studying the second part of Unit 11 were 7.26

Table 9.5 Ordinal regression for "Pass this unit"

Variable	Estimate	Std. Error	Wald	95 % CI
PGPA	−0.11	0.09	1.66	−0.28 to 0.06
Age (18–19)	−1.38	0.84	2.69	−3.03 to 0.27
Age (20–21)	−0.99	0.83	1.41	−2.61 to 0.64
Age (22–24)	−0.55	0.86	0.4	−2.24 to 1.15
Age (over 25)	0[a]			
GENDER (male)***	0.81	0.25	10.69	0.32 to 1.3
GENDER (female)	0[a]			
Unit 10**	1.52	0.53	8.27	0.49 to 2.56
Unit 11**	1.84	0.53	12.23	0.81 to 2.88
Unit 12**	1.51	0.49	9.5	0.55 to 2.47
Unit 13**	1.57	0.5	9.91	0.59 to 2.55
Unit 14**	1.98	0.7	8.01	0.61 to 3.36
Unit 15**	0[a]			
STATUS (domestic)***	1.21	0.28	19.03	0.67 to 1.75
STATUS (international)	0[a]			
FOE (others)	0.46	0.83	0.31	−1.17 to 2.09
FOE (finance)	0.06	0.34	0.03	−0.61 to 0.73
FOE (business)*	1.26	0.54	5.52	0.21 to 2.32
FOE (economics)	0.4	0.41	0.99	−0.39 to 1.2
FOE (accounting)	0[a]			

Pseudo R^2: Nagelkerke 0.15
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
[a]This parameter is set to zero because it is redundant

times more likely to select this answer than students taking the first Unit 10. Similarly, students taking Unit 12 (4.64 more likely, $p = 0.000$), Unit 13 (4.50 more likely, $p = 0.002$), Unit 14 (6.46 more likely, $p = 0.002$), and Unit 15 (4.58 more likely, $p = 0.005$) were more likely to mark this statement higher than students taking Unit 10.

STATUS was a strong predictor for this assertion, with an adjusted odds ratio of 3.35. This finding indicates that if other factors were held constant, domestic students were 3.35 times more likely than international students to rate this statement higher. Similarly, male students were 2.29 times more likely to rate it higher than female students.

To Receive Extra Help

The statistical summary of the ordinal regression for the reason "to receive extra help" is provided in Table 9.6.

The ordinal regression model was statistically significant (chi-square = 31.49, $p < 0.05$ with df = 18), and explained 10.8 % of the variance of the outcome.

Table 9.6 Ordinal regression of "To receive extra help"

Variable	Estimate	Std. Error	Wald	95 % CI
PGPA	0.11	0.09	1.37	−0.07 to 0.29
Age (18–19)	−0.99	0.83	1.43	−2.61 to 0.63
Age (20–21)	−0.8	0.81	0.96	−2.4 to 0.8
Age (22–24)	−0.48	0.85	0.32	−2.15 to 1.19
Age (over 25)	0[a]			
GENDER (male)*	0.55	0.25	4.66	0.05 to 1.04
GENDER (female)	0[a]			
Unit 10	0.33	0.58	0.33	−0.8 to 1.46
Unit 11	−0.02	0.55	0.0	−1.1 to 1.06
Unit 12	−0.04	0.53	0.01	−1.08 to 0.99
Unit 13	−0.03	0.53	0.0	−1.08 to 1.01
Unit 14	0.77	0.79	0.95	−0.78 to 2.32
Unit 15	0[a]			
STATUS (domestic)*	0.67	0.28	5.76	0.12 to 1.22
STATUS (international)	0[a]			
FOE (others)	−0.92	0.7	1.71	−2.3 to 0.46
FOE (finance)	−0.08	0.35	0.05	−0.77 to 0.6
FOE (business)	0.94	0.59	2.49	−0.23 to 2.1
FOE (economics)	−0.24	0.41	0.34	−1.03 to 0.56
FOE (accounting)	0[a]			

Pseudo R^2: Nagelkerke 0.09
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
[a]This parameter is set to zero because it is redundant

Table 9.6 shows that variables STATUS and GENDER yielded significant results. Domestic students were twice as likely (AOR = 2.11, $p = 0.008$) as international students to rate this reason higher, while males were almost twice (AOR = 1.82, $p = 0.02$) as likely as females to rate this statement higher.

Lecturer's Prompting

The model used to measure the predictors of "lecturer's prompting" to increase SI attendance was statistically significant (chi-square = 42.30, $p < 0.001$ with df = 18), with a Nagelkerke's R^2 of 12.5 % that indicates a moderate relationship explaining the variance of the outcome variable. Table 9.7 shows that the variables PGPA and AGE were statistically significant. Students that rated this reason highly were 1.36 times ($p = 0.000$) more likely to have a lower PGPA than a student with an average (mean) PGPA.

Students aged 18–19 were 3.6 times less likely ($p = 0.025$) to agree with this statement when compared to students over 25 years of age. Similarly, students aged 20–21 (3.53 times less likely, $p = 0.024$) and 22–25 (5.1 times less likely,

Table 9.7 Ordinal regression for "Lecturer's prompting"

Variable	Estimate	Std. Error	Wald	95 % CI
PGPA***	−0.31	0.08	16.82	−0.46 to −0.16
Age (18–19)*	−1.29	0.57	5.04	−2.41 to −0.16
Age (20–21)*	−1.29	0.56	5.33	−2.39 to −0.2
Age (22–24)*	−1.61	0.59	7.42	−2.76 to −0.45
Age (over 25)*	0[a]			
GENDER (male)	0.2	0.21	0.96	−0.2 to 0.61
GENDER (female)	0[a]			
Unit 10	0.37	0.47	0.62	−0.55 to 1.29
Unit 11	0.89	0.47	3.56	−0.03 to 1.81
Unit 12	0.36	0.44	0.65	−0.51 to 1.23
Unit 13	0.12	0.45	0.07	−0.76 to 0.99
Unit 14	1.13	0.58	3.8	−0.01 to 2.26
Unit 15	0[a]			
STATUS (domestic)	−0.1	0.22	0.22	−0.53 to 0.33
STATUS (international)	0[a]			
FOE (others)	−0.81	0.66	1.52	−2.11 to 0.48
FOE (finance)	0.0	0.29	0.0	−0.56 to 0.57
FOE (business)	−0.05	0.37	0.02	−0.78 to 0.68
FOE (economics)	0.56	0.35	2.6	−0.12 to 1.24
FOE (accounting)	0[a]			

Pseudo R^2: Nagelkerke 0.12
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
[a]This parameter is set to zero because it is redundant

$p = 0.006$) were also less likely to agree with the statement when compared to students over 25 years of age.

SI Leader's Prompting

At Macquarie University, SI Leaders provide a 5-min presentation on SI during the first lecture of the semester in units that offer SI sessions. A logistic regression was performed to determine the predictors for this being an influence. We found that this approach was statistically significant (chi-squared = 39.93, $p < 0.05$ with df = 18) and explained 11.9 % of the variance of the outcome. There were three important predictors for agreement with this statement: PGPA, UNITS (specifically UNIT10 and UNIT11), and again AGE. Students aged 18–19 were five times less likely ($p = 0.008$) to agree with this statement, while students aged 20–21 and 22–25 were 4.8 ($p = 0.009$) and 5.4 ($p = 0.007$) times less likely respectively. Students of UNIT10 were three times more likely to agree with this claim, while those of UNIT11 were 3.4 times more likely to agree (Table 9.8).

Table 9.8 Ordinal regression for "SI Leader's prompting"

Variable	Estimate	Std. Error	Wald	95 % CI
PGPA**	−0.22	0.08	8.34	−0.37 to −0.07
Age (18–19)**	−1.61	0.61	6.97	−2.8 to −0.41
Age (20–21)**	−1.59	0.6	7.11	−2.76 to −0.42
Age (22–24)**	−1.66	0.62	7.11	−2.88 to −0.44
Age (over 25)	0[a]			
GENDER (male)	−.12	0.21	0.34	−0.53 to 0.29
GENDER (female)	0[a]			
Unit 10*	1.07	0.47	5.08	0.14 to 1.99
Unit 11**	1.24	0.47	6.83	0.31 to 2.17
Unit 12	0.69	0.44	2.43	−0.18 to 1.56
Unit 13	0.63	0.45	1.95	−0.25 to 1.51
Unit 14	0.76	0.57	1.77	−0.36 to 1.88
Unit 15	0[a]			
STATUS (domestic)	−0.28	0.22	1.54	−0.71 to 0.16
STATUS (international)	0[a]			
FOE (others)	−1.26	0.66	3.64	−2.55 to 0.03
FOE (finance)	−0.13	0.29	0.19	−0.7 to 0.44
FOE (business)	−0.45	0.37	1.5	−1.18 to 0.27
FOE (economics)	0.39	0.35	1.25	−0.29 to 1.07
FOE (accounting)	0[a]			

Pseudo R^2: Nagelkerke 0.11
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
[a]This parameter is set to zero because it is redundant

Knowledge Checking, and Social Aspects

The models used to measure the predictors of dependent variables "to double-check my knowledge", "I am interested in studying with other people", and "to make friends" indicated that they were not statistically significant.

Discussion

The aim of this research was to understand how the reasons for attending SI might be influenced by students' demographics and characteristics. From the existing literature on the topic, we identified seven main reasons why students participate: Improve my grades; Pass the unit; Receive additional help; Lecturer's prompting; Check my knowledge; To make friends; and Studying with people. In this research, we have incorporated the reason "SI Leader's prompting" as it was being trialled at Macquarie University at the time.

This chapter presents the steps taken in deriving the study's conclusions. Firstly descriptive statistics of the study are presented, showing that the three main reasons for students attending SI were to improve my grades, receive extra help, and pass the unit. This analysis is broken down further by examining the effects of being an international or domestic student, as well as of being enrolled in first year or second year units. To gain a deeper understanding of students' motivations to attend SI, ordinal regressions were then performed using the reasons students attend SI as dependent variables, while the independent variables were students' GPA, age, gender, field of education, and residency status.

There are three interesting conclusions that can be derived from the study's findings. The first finding is that lecturers' prompting of SI encouraged students of lower GPA to attend. In other words, when the lecturer announces SI, their message is received by the students who have lower GPAs and who are possibly more likely to get a lower mark in their unit. These findings may encourage lecturers to promote SI in their classes, as sessions that help students "pass the unit". This could lead to a more targeted message since, while not significant, it would appear as though students with higher GPAs would be less likely to select the reason "pass this unit". Of interest is that some universities call their peer assisted programs PASS. As noted from findings from this research, using this title may help attract students to attend if their aim is to pass the unit. However, this may not be as effective in targeting students with higher GPAs, nor international students.

The second finding is that domestic students agreed with statements that were related to outcome (i.e. "improve my grades" and "pass this unit") more often than international students. Given that domestic students tended to place greater emphasis on these reasons as well as "to get extra help", it may be that they are more extrinsically motivated.

Contrary to expectations, while much of the literature highlights the social aspects of SI, the statements "to make friends" and "I am interested in studying with

other people" were not found to be statistically significant. This is of interest because the existing literature often mentions the social aspects of SI as benefits of the program (e.g. Kommalage and Thabrew 2011; White et al. 2011; Zacharopoulou and Turner 2013), but our findings do not support this. These statements were on average rated neutrally by our sample as a reason.

Conclusion

We set out to determine the reasons why students attend SI, and to align these to student characteristics and demographics. The survey we conducted suggests that the three main reasons are: to improve my grades, receive extra help, and pass the unit.

Through ordinal regressions, the study revealed a link between certain student characteristics and the reasons why students might attend. On the one hand, students with a higher GPA might be more likely to participate as a result of wanting to "improve my grades". On the other hand, verbal prompts offered by lecturers or SI Leaders could tend to be more persuasive in attracting students with a lower GPA. Domestic students could rate the reasons such as "get extra help", "pass the unit", and "improve my grades" higher than the international students.

A contribution of this study to the literature is to better inform academics and SI administrators about how to best target potential participants based on the unit, age of the cohort, GPA of the students, residency status, and gender. For example, if students consider a class to be easy or if it is an introductory class, the reasons for attendance may not be to pass the unit, but rather to improve their grades. This also applies when one wishes to attract students that have higher GPAs. International students seemed to be less likely to go to SI because they wanted to improve their grades, pass the unit or receive extra help; domestic students were more likely to agree with these statements when compared to international students. As well, the evidence presented in this chapter suggests that lecturers who make an announcement in class regarding SI will be able to better target students with lower GPAs, as well as mature students. As such, it could be suggested that for lecturers to be more effective, they should mention reasons that tend to appeal more to students with lower GPA(s) (i.e. pass the unit). Another interesting finding is that social aspects did not yield any significant relationships, and the reason "to make friends" was rated the lowest (mean = 3.11, SD = 1.363) of all.

Finally, some important limitations of the paper need to be considered. First, the study was conducted in only one semester. As well, the current study has only examined SI participants' reasons for attendance in one Australian university. Therefore, an area of future research would be to gain an understanding of whether reasons for participation are similar for students at other Australian universities.

Additionally, more research is needed to understand why international and female participants come to such sessions. It would also be interesting to assess the effects of other strategies on attracting students to SI. For example, other institutions attract students by sending emails to students, placing information on the learning

management systems (e.g. Blackboard, Moodle, and Canvas) or in public booths in the first week of the semester. Other reasons to attend SI should also be explored, such as "because it is free", "because all my friends go", as well as other elements of intrinsic and external motivations.

This chapter provides seven reasons why people might attend SI sessions. Then, information is provided on how these motivations might be perceived by participants. Using the findings presented in this chapter, practitioners aiming to attract a greater number of students to SI sessions may be able to enhance the design of their recruitment campaigns to better target students.

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Chapter 10
Student Representation in Large University Courses: A Model of Student Partnership

Janise Farrell and Isabella Dillon Savage

Abstract There is growing recognition of the value of programs of student representation and collaboration in strengthening student engagement. The Faculty of Business and Economics at Macquarie University, Australia, implemented a program of course-based student representation. Initially, the program ran in four units. The initiative was evaluated through interviews with four unit convenors and eight student representatives. A thematic analysis was conducted to establish participant perceptions of the program's efficacy. The insights gained assisted in the planning and implementation of the program across nine units during the following semester, at the end of which, students were surveyed on their views on the program. The benefits found, issues raised, and lessons learned over the two semesters are presented and discussed. The results provide valuable insights for other large faculties on how course-based student representation programs may be most effectively implemented.

Keywords At-risk students · Student representation · Faculty-student interaction · Student engagement

Background

The rapid expansion and diversification of the student population has seen universities direct their focus to programs designed to facilitate student success and retention. Initiatives to increase student engagement, both inside and outside of the classroom, are a key component of such programs, as there is a strong correlation between engagement and success on a variety of measures (see Trowler 2010, for a review). The importance of engagement for retention is well established.

One way to enhance student engagement is to include them as partners in a learning community through programs of student governance or representation

J. Farrell (✉) · I.D. Savage
Macquarie University, Sydney, Australia
e-mail: janise.farrell@mq.edu.au

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(Little et al. 2009). Such programs may function at the institutional, faculty, departmental, or course level. In this chapter, the implementation and evaluation of a course-based program will be discussed.

A large and growing body of literature has shown student governance programs to have multiple benefits for the student representatives involved (i.e. Astin 1984; Astin 1992; Kuh and Lund 1994; Lizzio and Wilson 2009; Rowe et al. 2013; Schuh and Laverty 1983). A successful course-based representative program may also improve the engagement of the wider student body in a number of important ways.

First, having a program of representatives or model of student government within teaching courses may increase the perception of fairness. According to Lizzio et al. (2007), a student's psychological identification with an academic department is strongly indicated by the perception of the fairness of that department. Students define fairness in this context in relation to two main factors: firstly, the experience of respectful partnerships between staff and students; and, secondly, "systemic fairness"—the accessibility of information and existence of procedures for effective problem solving. Including a representative program in courses has great potential to increase the perception of fairness and, thus, increase students' sense of belonging and connectedness. Research has shown that students who feel a sense of belonging to and connection with their learning environment show higher engagement levels and are less likely to withdraw from their studies (Zhao and Kuh 2004).

Student feedback may also lead to improvements in the teaching and organisation of the courses. Student evaluation of teaching through formal questionnaires has not been shown to be effective in activating improvements (see Spooren et al. 2013, for a review). This is problematic as research indicates that students may become sceptical and disengage from feedback mechanisms if there is no ensuing action (Harvey 2003; Watson 2003). Timely feedback gathered and conveyed through course representatives may be more valuable to teaching academics than end-of-semester questionnaires and, as a result, have greater impact. Effective course representative programs allow teaching staff to implement changes throughout the semester, benefiting both current and future cohorts. Course improvements have the potential to lead to greater student engagement and higher success rates.

Formal end-of-semester surveys and course representative programs can also be compared by locating each among Ashwin and McVitty's (2015) *degrees of student engagement*. Formal questionnaires limit student feedback as the questions are chosen by the institution. As they are 'fixed objects' which are not changed through the students' engagement, student involvement is limited to *consultation*. In contrast, course representatives are empowered to seek feedback on topics of concern to students and to also communicate unsolicited student feedback. They engage with a faculty-led program to transform feedback processes. As a result, course representative programs involve students more substantially in a *partnership*.

Another way course representative programs may improve the engagement of the larger student group, is by reducing the perceived distance between teaching staff and students. A representative can be both a "voice for students" and a "voice

of students" (Carey 2013), acting as an intermediary between the convenor and the student body.

In the context of higher education in North America and increasingly in the UK, course representation is the norm. However, it is by no means common practice in many other countries. As with all the chapters in this volume, readers are invited to keep an open mind about the different initiatives and adapt them to their current circumstances. We have much to learn from each other.

Implementing a Program of Course Representatives

Macquarie University places great importance on the inclusion of students as partners in their formal learning and aims to increase student representation on all levels of academic governance (Macquarie University 2016). The Faculty of Business and Economics (FBE) views the inclusion of students as partners in their education as a valuable opportunity to improve the student experience and course quality. For this reason, the Faculty has implemented a course representative program. The role of the course representative is to gain feedback from other students and, while protecting the students' anonymity, report it to the convenor in two reports each semester. The program permits timely feedback to teaching staff on aspects of their course, including the structure, content, and teaching.

One goal of the program is to encourage the engagement of students who are underachieving academically. For this reason, the program does not aim to favour high achievers. Résumés and references are not sought, and grade point averages and tertiary entrance rankings are not considered. The candidates are selected based on their interpersonal skills and well-considered responses during interviews, and their reliability in attending the training. This allows the deliberate inclusion of students at risk of academic failure in the program. The benefits of this policy are threefold: (1) we are able to increase the engagement of as many students as possible; (2) the program acts as an entry point to other on-campus programs that students may not otherwise be eligible, or have the confidence, to apply for; and (3) convenors gain feedback from students who may be struggling with the content and expectations, in addition to students who are more academically confident.

The program was piloted in four units in semester one (S1) with a total of 28 representatives. In semester two (S2), the program ran in nine units with a total of 45 representatives. The convenors' participation in the program was voluntary and not a directive from university managers. The representatives were recruited through a notice on the Learning Management System (LMS) and during an initial lecture in each unit. Successful candidates were selected after an interview.

The representatives were trained to elicit feedback from students and to present it constructively. They compiled written reports which were forwarded to the convenors, who then organised meetings for further discussion if desired.

Representatives who completed all program requirements were rewarded with a written reference as well as points towards the University's Global Leadership Program.

Methodology

The objective of the study was to evaluate the efficacy of the course representative program. For S1 this was done through an analysis of themes identified in interviews with participating representatives and convenors. At the end of S2, students were invited to complete a survey on their thoughts on the program.

A qualitative research design was used in S1 in order to gain an understanding of participants' perceptions of the effectiveness of the program. Structured interviews were conducted with individuals in preference to focus groups in order to capture in-depth reflections on personal experiences and outcomes, and the results of program processes.

All 28 of the S1 representatives, and all four convenors of participating units, were invited to attend individual interviews. As the interviews were conducted during the mid-year break, a relatively small number of representatives were available: eight representatives, including one international student. All four convenors were interviewed. For this discussion the representatives' names have been changed. Although the domestic representatives came from diverse cultural backgrounds, only traditionally "English" names have been used here: Anna, Bianca, Caleb, Daniel, Ethan, Felix, and Gavin. A Chinese pseudonym, Yi, has been provided for the international student, to highlight her responses. It is valuable to gain the perspective of an international student as this group may experience challenges in negotiating governance processes in order to have their voices heard in a foreign university. The convenors are referred to here as Convenors 1 to 4.

Participants were asked 16 open-ended questions, and encouraged to expand upon their responses. The questions asked during the interviews are included here in Appendix 1. There was some overlap in the questions asked to course representatives and convenors. Other questions were asked to either representatives or convenors in order to elicit reflections on experiences specific to each role.

The audio of all interviews was recorded and transcribed. A thematic analysis of the interview data was then conducted, with reference to the recommendations of Braun and Clarke (2006). All interview excerpts were coded using an inductive, or 'bottom up' approach, in which the semantic contents of the data led the process rather than any particular theoretical frame. Codes were then collated into themes. The most prevalent themes expressed by representatives and convenors, respectively, were then established. Only dominant themes related to the program's impact, the logistics of the receipt of feedback from students, the convenors' responses to the program, and suggestions for improvement will be presented here.

At the end of S2, students enrolled in participating units were surveyed on the program using Qualtrics software (https://www.qualtrics.com). The survey

questions are included here in Appendix 2. There were a total of 241 respondents across the nine units, but not all respondents answered all questions. The gender balance between respondents was very close: 121 females and 120 males. 83 % of respondents were domestic students and 17 % were international students. The students' survey responses will not be discussed here, except as necessary to illustrate a theme, or within quotes.

Findings and Discussion

The following discussion will detail the most important findings of the evaluation process, including predominant themes across the S1 interviews and S2 survey responses. The program's benefits will be presented, followed by the most significant issues raised and lessons learned for the effective implementation of a course representative program. An analysis of the dominant themes of the interviews indicated that the program was a success for all stakeholders: convenors, students, representatives, and the University, itself.

Increased Insight into the Perspective of "the Other"

The program facilitated a two-way flow of information between students and convenors that allowed each to better understand the experiences and perspectives of the other. The representatives interviewed commented on the increased interaction made possible and the insights gained. Caleb felt that the program allowed convenors to see their courses through the eyes of a student.

> I think the idea of course rep really gave a perspective of how the students saw the subject and then if the teachers saw it different, they could sort of see why the students have seen it this way and what the students really need help with … because as a teacher you can sort of see it one way and you don't understand or you wouldn't see it from a young, different perspective, I guess. And they already have all the knowledge of the subject, whereas if you're starting fresh and you're starting with a basic knowledge, it's a lot different.

The convenors agreed. As Convenor 3 said, "I think it is very effective, because I heard all the problems, all the advantages and disadvantages that students experience." Likewise, the program gave the representatives insight into the reality of the convenor's situation, which they could then communicate to the students. Anna commented:

> I think it gave me a behind-the-scenes look about how teaching staff create courses, how they respond to students and also the limitations and the strain on resources and time that they have … because I genuinely felt from [Convenor 1] that she was doing her best. She was really, really open. She would do anything to improve the learning experiences of students so that made me feel really, really great but I also understood that she could only do so much within the scope of time and resources that she had, so it made me more

> understanding … It was really eye-opening to realise what sort of burden she was under, so I think it helped me communicate with students that she would love to do all this, but realistically there was only so much that she could do.

Bianca also reported an increased awareness of a convenor's role and situation, which positively impacted on her engagement with the course.

> I sort of learned that the lecturers actually want to improve the course all the time, so they're not just doing their job and then walking away and going home. They're actually motivated and really want the students to learn, and that in turn makes me feel like I'm in a safe and happy learning environment and they always want us to do well, which motivates me to do well as well.

Communication with the convenor also assisted representatives to gain a better understanding of the limits to what the tutor was permitted to do. The knowledge of such limitations can reduce any feelings of resentment the students may have towards the teaching staff.

An increased awareness of the effort convenors expend in improving their courses and helping students learn has benefits for the student experience and engagement levels. The communication of this knowledge to regular students can create similar experiences throughout the student cohort. Indeed, when Convenor 3 was asked if he thought the students contacted him less this semester than in previous semesters, he said, "I think it's more. I found when I'm listening to their problems and their concerns, I think I found students coming more often to my consultation compared to prior semesters."

Benefits for the Unit Convenor

The convenors who participated in the pilot program had varying aims, and at the end of the pilot session they felt that these aims had been met. Convenor 3 said, "My aim was that I would like to know everything about what was happening in my course, what the students think about the course… and all this information was passed on to me."

Convenor 1 had redesigned a unit that is compulsory for students across different FBE degree programs. She described the program as being invaluable for reactions to the new design.

> This course was redesigned for the beginning of the year and so I was really keen to get some early feedback on what was working and what wasn't working. The forums are pretty good online to give us a lot of feedback, but there's nothing like someone sitting in the tutorials saying to their course rep, 'This is killing me. I can't do this' or 'I don't understand this'. So that type of information, regularly, was useful.

The benefits for Convenor 1 were also clear to her representatives. As Anna said,

> I felt like this actually made a difference because being a newly redesigned course, there wasn't much, well I think there were gaps of certainty, so I think we played some sort of role in reassuring [Convenor 1] that the course was headed in the right direction. I also

> talked to people who failed the course previously with the previous structure and they found that this one was much better for them and they learned a lot more… The feedback that I received from students was overwhelmingly positive… that they prefer having still some maths but then having that balanced out with theory. I think that reassured [Convenor 1] that the course that she has come up with is more appropriate.

An important benefit that was not reported by any of the convenors as an initial aim was being able to gain an understanding of what was happening in the tutorials. As Convenor 3 said, "For example, sometimes I hear that a particular tutor was quicker in discussing this particular issue and so forth, so it does help me to know more about what's happening." Convenor 1 and Convenor 4 also took advantage of the program to consult the representatives on their ideas about specific aspects of the unit. Use of student representatives in this way has been discussed by Carey (2013), who highlighted the potential for students to become partners in their learning by taking a collaborative role.

Course Representation as a Valuable Form of Feedback

The convenors considered the course representative program to have greater value than the end-of-semester surveys. One reason was that the feedback could be delivered during the course, rather than at the end. As Convenor 2 said, "There's no point just waiting to the end then fixing it. You've already made one batch unhappy by not fixing something."

The program was also considered more useful than existing channels of real-time feedback, such as online forums and email contact. Convenor 1 commented on the value of having meetings with representatives: "I'm pretty sure I would have got feedback elsewhere to say that the tutorials were inconsistent, but having that… being able to actually have that meeting with them and take a deeper dive into it, I understood it more fully."

The Course Representative Program as an "Investment"

A theme across all four interviews with convenors was that the program had created more work for them and impacted on their time, but that this effort and time was an investment in the quality of their units. When asked if the program made any aspect of her work easier or harder, Convenor 1 said:

> I wouldn't say easier because it then created more work for me to improve the course, but it resulted in a better outcome. So 'easier' not so much, but 'better', yes. It means more work, but the payoffs are better. I didn't see a downside of it.

Likewise, Convenor 3 said, "It's more administrative work, definitely… and I spent more time (on that) compared to the prior semester, but the result was better, I think. That's the main thing."

When asked if any aspects of the program made his work harder, Convenor 2 said,

> Why would it? At the beginning I said, 'OK let's say it is (more work) then it will limit administrative work later, so the net effect is less.' So it reduces what you would do… You're wasting time (without the course representatives) because you're not getting the right information anyway because what you've been told to you personally is bias. So as an economist, it's actually more efficient information, so I think its net effect is less work.

Convenor 4 agreed:

> It took some of my time, yeah. I probably did more than what was formally required because I met with them more than once, but that was my own wish to do so… but I wouldn't actually say it was harder. As I said before, I'm convinced it's good and I think we should do it. It's just some investment.

Benefits for the Students

The benefits for students are described here by the convenors and representatives. There were many perceived benefits for students. First, the presence of the representatives provided a channel to give feedback that was less intimidating than approaching teaching staff. Many students, particularly first year students, would be understandably uncomfortable in providing feedback directly to teaching staff. As Ethan said, "The students aren't always gonna go to a teacher to voice their concerns, but they can more than likely speak to somebody who's just in the course and that's what happens."

Anna said that speaking to a representative allowed students to feel more secure.

> The students saw me as an intermediary that would be less intimidating to approach than going directly through staff. [Convenor 1] had no way of identifying who said what, so I think they felt more comfortable being completely honest about any misgivings they would have about the subject.

Among representatives there was a strong perception that the program had given students a greater voice, with a belief expressed that the feedback gained was largely representative of the views of most of the students. They also reported that a key benefit for students was the ability to have their concerns addressed.

The convenors also provided strong indications that the program benefited students. Convenor 3's concern was to reduce the number of students withdrawing from his unit. He sensed that the program allowed students to feel more comfortable that their concerns were being passed to him and dealt with. As discussed, a perception of fairness is an important element of student engagement (Lizzio et al.

2007). The perception of greater student contentment was a pleasing outcome for the convenor.

When asked if he thought the representatives had a role in improving the course, Convenor 2 referred to evidence in the end-of-semester surveys, "Yes, exactly, because they gave specific things that needed attending to, which were attended to and then judging from the surveys later, obviously the students appreciated all that."

Further, when Convenor 2 was asked how effective he thought the program was in giving students a voice, he replied:

> Ah, as opposed to before? Obviously there 'was' a voice because it was never done before. The only voice was post-semester. So yeah, of course it gave students a much more active voice this time. Because with the end-of-semester surveys, I guess the first year they'll do the surveys, but then you'll see the students in second and third year, they get tired of filling it in because really they're filling the survey to help another batch. 'It's already finished now. My comment will make no difference to me' … because the surveys are actually seen after exam results are released as well. But with this, students know, 'It's only week 4. What I say can actually make a difference to me, so I might give some constructive feedback.'

Benefits for the Course Representatives

The representatives reported experiencing numerous benefits from participating in the program. There were positive effects on their own student experience, engagement and performance. Most representatives interviewed reported that holding the position motivated them to do well in the unit and led to greater engagement than they sustained in others. For instance, when asked if being a representative was a good experience for him, Felix said,

> It certainly was. It certainly gave me a motivation to really pay attention to what was being taught and how, (and) what other people thought about what was being taught as well… and I think because of that I probably did better in the course actually, than I otherwise would have if I wasn't a student representative.

The role may assist international students to integrate into their new environments. When asked why she had volunteered for the program, Yi commented that she had been seeking a way to cope with homesickness.

> Being an international student with deep homesick, I was eager to find out a way to release my homesick and get myself adjusted, so that I can focus on something much more valuable as well as contribute what I am able to do.

The experience of being a representative also improved Yi's student experience and increased her confidence.

> Most importantly, it further helped me learn to undertake responsibility. And also the job encouraged me to avoid shyness and bravely talk to my classmates, who were unfamiliar to me initially. Furthermore, I got to realise that, besides academic study, I should focus more on social experience which could improve my all-around ability.

All representatives reported an improvement in confidence, and interpersonal and leadership skills. Many reported that the role helped them gain the skills they would require as successful graduates. For instance, Ethan said:

> I told Isabella (S1 program coordinator) in my initial interview with her that I wanted to develop my personal communication skills and being able to speak to everyone because if I want to go and work in the business world, I need to be able to communicate with… everyone. And doing this allowed me to be a lot more confident, especially speaking to teachers as well. It's a lot harder to connect with someone of a higher age or something like that.

The course representative program encourages the development of the practical communication skills required of business school graduates. The findings echo that of Kuh and Lund (1994), who found a significant correlation between participation in student governance and the self-reported development of practical competence, including decision-making ability, organisational skills, and dealing with systems and bureaucracies. The potential for a student representative program situated within a business faculty to develop business-relevant skills is particularly meaningful. The program clearly has the potential to enhance the graduate capabilities of students.

Benefits for the University

This program has additional benefits for the University itself. Engagement and identification with the University is important throughout a student's enrolment and also for the success of alumni programs. The interviews revealed that the representatives saw being able to contribute to the University as important. Participation as representatives also made students feel more involved with the University. As Gavin said, "It made me feel more like a part of the University, and that I was giving something back."

The program also appears to be beneficial in increasing the value of "citizenship" within the Faculty. Anna said:

> I think it was a really, really good experience and if the opportunity was presented to me again I would totally go for it. I really liked hearing what was working, what was not, and actually feeling like I could have an impact on the learning experiences for students and also for the teaching experiences of staff.

During and after both pilot semesters of the program, many representatives contacted the program coordinator to say that their enjoyment of the role had inspired them to ask if there were additional ways they could become involved with the Faculty and the University. Many representatives went on to apply for, and attain, other on-campus leadership roles. Increased engagement with the institution and interest in seeking further opportunities within it was similarly reported by Rowe et al. (2013) in their description of a UK program of student representation.

Issues Raised and Lessons Learned

The evaluation of the pilot session of FBE's program showed it was a significant success for all involved. It also highlighted some significant issues, relating to the importance of:

- program promotion and increased accessibility of the representatives;
- representatives having the opportunity to build rapport and trust with students;
- creating strategies to deal with misinterpretation of the role, particularly among international students; and
- closing the feedback loop.

Each issue will be discussed further in the following section.

Lack of Awareness: The Importance of Support

Although the convenors greatly valued the program, during the pilot session some did not adequately enable it. While most convenors placed the representatives' email addresses on the LMS, most did not introduce them during a lecture. For that reason, representatives needed to be very proactive in making the students aware of them. Daniel said, "I did cooperate with another student representative and we actually introduced ourselves to the whole lecture and so everyone knew about our existence."

Ethan mentioned the low numbers of students who approached him, and explained, "[It's] because they don't really announce to the class, like we never had anyone say… I had to literally walk up and just give a quick two-minute speech, saying, 'Look, I'm the course rep. If you have any concerns, come and see me."

Convenor 2 acknowledged the issue himself:

> I don't know how many students were actively aware. I didn't explicitly advertise it. I didn't know if I was supposed to. I thought I should. It was there on (the LMS). Ah, the team downstairs (Learning & Teaching) conveyed it to the students. I didn't do anything more, so… ah, I don't know if every student was actually aware.

This situation created difficulty for representatives. In some units, students only received information about the program during recruitment in lectures. Additionally, some representatives needed not only to introduce themselves but to explain their role as well. Gavin said:

> When I communicated my role as course representative, students often needed clarification on what that meant. Some even initially thought it was academic-related, in the sense that I could help with homework and so on. I think without decent explanation, my role was not inherently clear to some students.

Like many other representatives, Gavin suggested that more awareness be created about the program.

> The program could become more effective if it was made more aware of, throughout the student body. I think the process and methods of gathering and reporting feedback were effective, but unfortunately not enough students participated for it to truly voice the feedback of a wide range of students. In future, students need to be more aware of the course representative and how effective they can be in improving the course.

The S2 survey of students in participating units also highlighted the importance of adequate program promotion. Of the respondents, 76 % knew that there was a student representative program. However, in most units around a quarter of the respondents who knew about the program did not know who the representatives were. The Faculty's two largest first year units had the lowest recognition levels. In fact, in the largest unit, the majority of respondents (58 %) were not aware of the identity of the representatives. Evidently, it is important to ensure that the representatives are introduced in each lecture stream of large courses. However, the students' additional comments make it clear that it is not sufficient to introduce the representatives once in an early lecture, with many students recalling the representatives' introduction but subsequently forgetting who they were.

The vast majority of suggestions made in the S2 survey responses related to the need for increased program promotion and greater publicity for the representatives. In particular, students felt that the program needed to be more consistently promoted throughout the session, with most of them suggesting that this should take place in the lectures and tutorials; others recommended that more announcements be made on the LMS, or that reminder emails be sent to students. Students also felt the representatives needed to be introduced in each lecture stream and their photos, names, and contact details made available on the LMS.

The second-highest number of suggestions was made about the need to improve the accessibility of the representatives. The main request was for increased ways to contact them. Some students wanted a dedicated forum; while many others requested an increase in the number of representatives in each unit, and, echoing feedback given by convenors and representatives, to place one representative in each tutorial.

It is clear that such programs need effective practical support from the teaching staff and program coordinator, through the introduction of representatives in lectures and/or tutorials and an explanation of their role. Fortunately, the importance of promoting such a valuable program was eventually understood by convenors. For instance, after the pilot semester, Convenor 2 realised how important it was to create awareness of the program, saying he would do so in the first set of lecture slides: "I think if they know from the outset, that's better for everybody."

Student Shyness and Discomfort: The Importance of Familiarity

A considerable amount of credit for the program's success is due to the proactivity shown by the representatives in gaining student feedback. The representatives

found that most students did not approach them, which they attributed to a number of factors. As discussed, the lack of awareness of the program was problematic. Due to the low numbers of representatives during S1, lack of accessibility was also an issue. Other factors were internal to the students: such as shyness, discomfort, reticence and lack of interest.

It is clear that the shyness and social discomfort of students, particularly first year students, was an important factor in their reticence to approach the representatives. For instance, Caleb said, "I know to an extent some people, especially first year students are very quiet, so… even if they had had issues, I know that some students would have not said anything." Yi also commented that students seemed either too uncomfortable or bored to talk to her about study-related issues.

Bianca reported that student shyness was part of the feedback from students to the convenor. "One of the issues that was raised was that some of the students felt a bit uncomfortable in their learning environment and a bit shy."

In the S2 survey of students, 83 % of respondents who knew the program was running reported not approaching the representatives themselves. Some students commented that this was because they did not know who the representatives were; and one student mentioned that they did not have the opportunity as there was no representative in their tutorial.

A further survey question addressed whether students felt comfortable giving representatives feedback. Among the respondents, 62 % said they were comfortable; 23 % answered with "N/A"; and many students commented again on the lack of opportunity to speak to a representative.

Unfortunately, 14 % reported not being comfortable in providing feedback to the representatives. One student provided a reason for this: "I think it would be better to have a course rep from the tutorial I attend rather than from the lecture. The chances of getting to know the course rep and being comfortable providing feedback would be higher." This comment highlights the need for students to be able to build relationships with representatives and for the role to be tutorial-based.

A clear theme found in the interview data is that students appear reluctant to approach people they have not formed a relationship with to give feedback. Most student-initiated contact came from students who had been able to build a connection with a representative, either through increased familiarity and proximity in the tutorials, or established and evolving friendships.

Daniel's comments reinforce the importance of students being able to become familiar with the representatives. "Most of them were first years so it's kind of hard to like talk, so what actually happened was I had to talk to them first, get to know them, then they would share their problems and good points about the course."

Once the students felt comfortable with a representative, they approached them readily. Ethan said:

> I got a lot of people coming to me, just saying, 'I like this' or 'This isn't working, we need this fixed.' There were a few people that were happy to voice their concerns. I know a couple of the boys that I used to sit next to would openly confess to me how much they dislike the course, or dislike how the teaching is working. Some others I had to approach to gain information.

Yi also acknowledged the importance of performing well in the role in order to build rapport with students. "I felt motivation and sense of fulfilment to do better in this role and in this course, as only in this way can my classmates be willing to trust me and share their ideas with me."

Interestingly, in the S2 survey, one student reported that the first person they met in the course was a representative, reinforcing the proactivity of the representatives in building relationships with their fellow students.

Misinterpretation of the Representative Role

An important issue uncovered both during the S1 interviews and on examination of the S2 survey responses was that of a misinterpretation of the boundaries of the representative role. As Gavin reported above, some students held the misconception that the representative could help them with their coursework. Students also thought the representatives could provide information on the course, or serve as a substitute for speaking to the teaching staff on problems experienced by students.

Bianca spoke about one student who approached her instead of the teaching staff. "One student emailed me about how he had to hand in his assignment late because he was sick on the day. I just had to explain to him the disruptions policy and what to do as well and to tell the convenor."

Lizzio and Wilson (2009) have previously discussed the problem of role ambiguity: a lack of clarity about expectations and the nature of the authority of the student representative role. In the present study, the role boundaries were clear for the program coordinators and communicated in the training, yet the role was misinterpreted by students. Unfortunately, Daniel's comments reveal that the misinterpretation also extended to representatives and tutors.

> Mainly students were asking about test problems… when dates are, what percentage this assessment is worth. So what I actually did… I went early to each tutorial and I also had a word with the tutor to ask if I could write on the whiteboard. I would write a little section, like my email and then what's coming up during the week, such as, "exam on the 1st of June" or something like this, and also where you could find resources, for instance, PAL sessions and then … like you can go on Macquarie's library website and you can actually find past papers …

All stakeholders need to be made aware of the duties and limitations of the representative role. The training given to representatives also needs to cover how to deal with inappropriate requests from students, as was highlighted by Convenor 4.

> I was wondering how they actually dealt with such enquiries or requests, because I had the impression that one of the students could handle it quite well and said, 'No, that's not my responsibility, and I'm not allowed to do that', while the other, I had the impression that she actually felt obliged to do so and actually met with students to discuss that and I don't think, for several reasons, that's actually good in that role … I think that raises then …

> expectations from the student cohort that can't be met. That puts too much responsibility on that student.

The S2 survey of student perceptions shed further light on the problem of role misinterpretation. Respondents were asked, "What is your understanding of the role of the course representative?" The responses showed that 69 % of domestic and 42 % of international student respondents had a good understanding, with answers given that the representatives were there to: (1) communicate student feedback, and/or (2) act as a bridge between the students and convenor to facilitate communication on the unit.

Of the domestic respondents, 14 % had a problematic perception of the representative role. Their answers fit into the following categories (in order of frequency): (1) communicate questions from students to the convenor; (2) help struggling students or fix students' problems; (3) be a source of information; (4) be an alternative to speaking to the teaching staff; and (5) evaluate tutors. If the answer, "I don't know" is included, the percentage of problematic responses increases to 24 %.

A larger proportion of international students had a problematic perception of the role. 27 % of international respondents thought the role of the representative was to solve students' problems. A further 12 % of international respondents gave other problematic answers, such as reporting they believed the role to be to communicate with the convenor on behalf of the students, and "consultation".

The word "help" featured heavily in international students' responses:

- "Help students in class."
- "To help students."
- "They help students to communicate with tutors and lecturers."
- "If I got questions or need help, I can find them."
- "Helping students to resolve the problems and providing supports."
- "Help me with any ACCG101 topics."
- "Help the communication between lecturer and students."
- "Help student to solve problems."

Of the international respondents, 15 % did not know what the role involved. With these groups combined, it is clear that 54 % of international respondents did not have a good understanding of the representatives' role. This may be the reason for the disproportionately large number of international respondents who reported that they did not find the representatives supportive when spoken to; 24 % compared to 14 % of domestic respondents.

While all other survey responses showed that international students were not disadvantaged or under-represented by the program, their misconception of the representative role does cause concern. It is clear that all students need to be made aware of the boundaries of the role, with particular attention being given to ensuring awareness among international students.

The Importance of Closing the Feedback Loop

The interview data showed that the representatives did not assess their respective convenors' responsiveness to student opinions consistently, with different representatives evaluating the same convenor differently. The inconsistency was due to some receiving more return feedback from convenors than others. This highlights how important it is for convenors to acknowledge each item of student feedback and communicate their response to each representative—either individually or as a group—and, in turn, to the students who provided the comments in the first place.

Each convenor received positive evaluations by their representatives, with dominant themes being the convenors' openness to student views and the active responses taken to implement changes or solutions. For instance, Gavin said, "I certainly think the teaching staff acted upon the feedback I provided them—swiftly and effectively."

Indeed, for the most part, the convenors were very responsive and implemented changes where they could. To illustrate, Convenor 2 said, "A lot of the things they said, I pretty much did straight away… I think I acted on every single point they made."

However, a few representatives had negative perceptions of their convenor's receptiveness. All negative comments related to a lack of return feedback. Some representatives were left wondering if the convenors had acted on the information, or planned to. Felix said, "Students seemed happy that I was passing information on, but what was being done with that information, I never really knew. It was just kind of, 'This will be really helpful. Thank you.' and then that was it." Ethan said of his convenor, "If he gets back to you, he gets back to you."

The lack of implementation of student feedback was upsetting to Yi, who said, "The suggestion showed on our reports should be highly considered and try to put into practice because they came from our utmost effort and our sincere voice."

Of course, not all feedback can be acted upon. A theme found across all four interviews with the convenors was the receipt of feedback on aspects of the course that could not be changed. Most convenors explained to individual representatives the reasons they could or would not be making corresponding changes. The representatives understood that not everything could be acted upon during their time in the course, and they were mostly content that their feedback may help future students. Anna said:

> [Convenor 1] was very transparent and she was very willing to work on any suggestions that we had. It's just that the frame of time that she had to implement changes was very short… She couldn't implement the changes this semester, but she's taking them on for next semester.

Unfortunately, while all convenors described the inability to act on all suggestions during their interviews, this was not explained to all representatives. This impacted negatively on the representatives. It is important the reasons for decisions be explained to them—not only does it increase the perception of the fairness of the

relevant processes, but it helps the representatives feel their roles have value. When asked if he had any suggestions for how the program could be improved, Felix said:

> Just probably more communication between the different levels of the program, between academics and the course reps. I probably could have done a better job as a representative, but once I passed information on, nothing really came back to me other than, "This will be great. I'll pass this on. Thanks for your help. The end."

In contrast, Gavin's comments, about the same convenor and unit, show the importance of convenor responsiveness for the representatives' perceptions of their own role. "Thanks to the responsiveness of the teaching staff, my small suggestions… formed from the student feedback… were implemented, and as a result, I believe my role has been worthwhile in improving the course."

Communicating on student feedback, even if it cannot be acted upon, can enhance the representatives' perception of the goodwill of the convenor. It can also make the representatives and, in turn, the students more confident that they are being given every opportunity to do well in the unit. This was shown clearly when Bianca said:

> One of the issues that was raised when we were at our meeting was that some of the tutors weren't going through the tutorial material fully, so some of the students didn't understand the concepts… but then the convenor said that he told them not to go through the concepts because those weren't the important ones, we only went through the important ones, so he did address our concerns as well.

Looking Forward

The course representative program has such value to students, convenors, representatives, and the University alike, that it is vital to take steps to ensure its continued success. As shown in the previous discussion, the most important aspects of the program to address, and hence also the most important recommendations for other course-based student representative programs, relate to (1) program promotion, (2) the accessibility of the representatives, (3) creating awareness of the boundaries of the representative role, and (4) closing the feedback loop. The solutions for many of the problems can contribute to solutions for other problems.

Program Promotion

It is vital that the program be promoted adequately throughout the semester. Promotion can take place in lectures and tutorials, and on the online LMS at key points: (1) the recruitment of representatives; (2) the introduction of representatives, including posting their photos and a generic course-based email address on the LMS; and (3) when representatives call for student feedback before reports are due.

The convenor can also use the lectures and/or the LMS to post their responses. In the case of the LMS, students are alerted through their university email addresses when announcements are posted, so this would also reach moderately disengaged students who are not attending lectures or tutorials, but are accessing their emails.

Increasing the Accessibility of Representatives

The research presented here has highlighted the importance of creating opportunities for students to become familiar with their representatives. To facilitate this, one representative should be selected from each tutorial group if possible. The importance of a tutorial-based role was highlighted by convenors, representatives, and students.

Although less feedback may be received through online modalities, it is also important to make it possible for students to contact the representatives through a generic email address, and perhaps through an online survey. One or two representatives in each unit could be given online roles.

Preventing Misinterpretation of the Role

In a study conducted by Lizzio and Wilson (2009), role ambiguity was named most frequently by student representatives as the greatest challenge they faced in the role. The present study showed that not communicating clearly or extensively on the role also results in confusion for students enrolled in the course.

The role's boundaries should be made clear during initial recruitment drives, candidate interviews, and the representative's training sessions, which should be compulsory. It is imperative that the boundaries are also made clear to the other students. They can be communicated at each key contact point described above in the discussion on program promotion. Promotion in initial lectures provides a powerful opportunity to educate students on what the role does and does not involve. Information on the program, emphasising the boundaries of the role, could also be included in orientation materials provided to international students. Each member of the teaching team should be made aware of the role boundaries when the program is first established.

Closing the Feedback Loop

To ensure the program's continued success, it is imperative that students do not perceive it as simply "ticking a box". Students should have confidence that the program is a genuine attempt to improve learning experiences. During the S1

interviews, dissatisfaction was expressed by representatives in relation to the perceived unresponsiveness of convenors, or uncertainty regarding how feedback was being used. This issue is also highlighted in the literature, with many authors stating that closing the feedback loop is one of the most important, and difficult, aspects of effectively capturing student data (Harvey 2003; Little et al. 2009; Watson 2003). Closing the feedback loop serves multiple purposes. It improves the likelihood of future participation; conveys to students that they are valued members of the university and are listened to; and promotes reflective practice among staff.

Australian and international institutions have trialled different approaches to communicating responses to students, including posting word clouds on the LMS, mass emails, posts on faculty websites, marketing-style brochures, and end-of-semester reports (Watson 2003). As the program moves forward and expands, finding ways to effectively communicate to students the changes resulting from their input, or the reasons behind inaction, should be a priority.

In S2 the report template completed by representatives contained a column for convenors to record their responses to each feedback item. This focus on convenor response was successful, and in S2 each convenor communicated their responses, regardless of whether changes could or could not be made. Some chose to use the response column to communicate to each representative separately, through the program coordinator. Others summarised their responses in group emails to the representatives, or for all students to see on the LMS.

Limitations and Generalisability of the Present Study

A limitation of the present study is that only one international student representative was interviewed. It was shown that many international students misinterpret the representative role as being one of support for students. Given that many international students apparently lack experience with student representative programs, further studies are needed to establish the best way to facilitate their inclusion as representatives and their understanding of the purpose of the role.

This study evaluated the efficacy of a program of student representation in the large business faculty of an Australian university. Naturally, other contexts may lead to different outcomes and experience different challenges.

Conclusion

Course representative programs take time and effort to establish, but the value of such programs is undeniable. The continuation and expansion of FBE's program will not only increase the representatives' accessibility and facilitate the collection of unbiased student feedback, so important for course improvement. It will also increase the number of students who have the chance to experience the significant

benefits of the program: increased engagement and feeling of belonging, the development of business-relevant communication skills, and enhanced opportunities for social interaction. The opportunity is particularly valuable for students at academic risk. Those benefits, in themselves, make our continued commitment to the success of the program worthwhile.

Appendix 1: Interview Questions

For Course Representatives:

1. How would you describe your role as course representative?
2. Why did you volunteer for the role of course representative?
3. How did you gather feedback from students?
4. Did students approach you to convey feedback for them?
5. How did you share that feedback with the course convenor?
6. Did the course convenor or tutor consult you on any issues?
7. Did you feel that teaching staff acted upon the feedback you gave them?
8. If the teaching staff did not act upon that feedback, did they explain why?
9. How did you provide feedback to the other students?
10. How do you think the other students saw your role?
11. Do you feel that you had a role in improving your course?
12. How effective do you think the course representative program was in giving students a voice?
13. Did participating as a course representative impact on your time?
14. Do you think being a course representative was a good experience for you, personally?
15. How could the course representative program become more effective?
16. Is there any particular training you think course representatives need?

For unit convenors:

1. How would you describe the role of the course representative?
2. Why did you agree to be involved in the trial of the course representatives program?
3. How did the course representatives provide student feedback to you?
4. How did you provide feedback to the course representatives?
5. Did consultation with the course representatives lead you to make changes in your course?
6. If you did not act upon the feedback, did you explain why?
7. Did you actively seek out the course representatives to consult them on issues?
8. Do you feel that the course representatives had a role in improving your course?
9. How effective do you think the course representative program was in giving students a voice?

10. Do you think the other students engaged more in the course because they had a course representative?
11. Did you find that students approached you directly less than in previous teaching sessions?
12. Did the course representative program meet your needs as a course convenor?
13. Were any aspects of your work made easier by participation in this program?
14. Were any aspects of your work made harder by participation in this program?
15. What changes would you recommend to the course representative program for future sessions?
16. Is there any particular training you think course representatives need?

Appendix 2: Student Feedback on Course Representatives Program

Q1 Please select your course. If you were enrolled in more than one course with course representatives, please complete a new survey for each course. You can access each survey in the iLearn site for each course. (Nine unit codes were presented for respondents to choose from.)
Q2 What is your gender?
Q3 Are you a domestic or international student?
Q4 Did you know that your course had course representatives? Yes/No

If 'No' was selected to: Q4: "Did you know that your course had course representatives?" respondents were redirected to Q12.
If 'Yes' was selected to: Q4: "Did you know that your course had course representatives?" respondents were presented with all remaining survey questions.

Q5 How did you hear about the course representative program?
Q6 Did you know who the course representatives were in this course?
Q7 What is your understanding of the role of the course representative?
Q8 Did a course representative ever speak to you or ask you to complete a survey in this course?
Q9 Did you ever contact or approach a course representative in order to give feedback in this course?
Q10 Did you feel comfortable about giving the course representative your feedback on the course?
Q11 If you spoke to a course rep, did you find him/her supportive?
Q12 Did you find it easy to provide feedback in this course?
Q13 Do you think the course convenor was responsive to student feedback in this course?
Q14 Do you have any suggestions on how we could improve the course representative program?

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Chapter 11
The Role of Leadership Education: Benefits and Challenges for At-Risk Students

Ralph A. Gigliotti

Abstract Student involvement in leadership education initiatives can have a notable impact on the undergraduate student experience. By actively participating in these initiatives, students have an opportunity to learn more about the concepts, strategies, and tools for effective leadership, while also enhancing their leadership behaviours through guided practice. These programs often provide critical experiences for self-awareness, discovery, and fulfilment. This chapter explores the importance of leadership education as one approach to cultivating student success in higher education, particularly in equipping at-risk students with the communication skills and co-curricular opportunities to succeed. As demonstrated by a number of existing programs, including the Emerging Leaders Institute at Villanova University, these opportunities create the conditions for students to increase their self-confidence, identify their leadership potential, and integrate a nuanced leadership identity into the way they make sense of themselves and the way that they live their lives as college students and aspiring professionals.

Keywords At-risk · Leadership · Leadership development · Intervention

Background

Leadership education initiatives, including formal leadership programs, individual leadership experiences, and structured leadership activities (Haber 2011) can have a significant impact on the undergraduate student experience. These initiatives are of

R.A. Gigliotti (✉)
Center for Organizational Development and Leadership, Rutgers University, New Brunswick, NJ, USA
e-mail: ralph.gigliotti@rutgers.edu

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increasing importance and popularity in colleges and universities within the United States.[1] Involvement in these leadership efforts may enhance the leadership competencies (Ruben 2012) of student participants, while also connecting students to the host of resources available on the college or university campus. It is through participation in these educational initiatives that students enhance their understanding of their current and desired strengths as a leader, all the while gaining a deeper awareness of their core leadership identity (Day et al. 2009; Komives et al. 2005). Furthermore, by actively participating in leadership simulations and activities, students have an opportunity to practice specific behaviours that are consistent with their leadership philosophies. Undergraduate leadership education initiatives provide a laboratory for student learning and development. Addressing the central theme of this text, this chapter will explore various elements of leadership education that can contribute to student success in higher education. As demonstrated by a number of existing programs, including the Emerging Leaders Institute at Villanova University, these opportunities are not limited exclusively to those students who currently identify themselves as leaders. Rather, it is often through their participation in these programs that students begin to discern their potential for leadership —critical moments that can lead to self-awareness, discovery, and fulfilment in pursuit of student retention and success.

Overview of Leadership Education in Colleges and Universities

A general premise underlying this chapter is the notion that leadership can, in fact, be taught (Day 2001; Parks 2005) or, as Bennis (1996) would suggest, leadership can be learned. Parks (2005) suggests that "a growing consensus among leadership theorists and practitioners is that in a networked society with power and information widely distributed, the presumption of 'born leaders' along with command-and-control leadership models are inadequate." (p. 4) Consistent with other writing on the subject, she points to the need for leaders to "enlarge one's capacity to see the whole board, as in a chess match" (p. 3) in order to best lead during these challenging and complex times. Drawing on instructional methods demonstrated by Harvard professor and leadership expert, Ronald Heifetz, Parks highlights the value of innovative approaches to leadership education, approaches that use the classroom as a "studio-laboratory" for learning leadership and living leadership. This emphasis on leadership education is not limited to the classroom and has certainly spread into the realm of co-curricular programming (Dugan et al. 2011; Zimmerman-Oster and Burkhardt 1999).

[1]For more information regarding the current system of American higher education, see Altbach et al. (2011), Bok (2013), Harper and Jackson (2010), Ruben et al. (2017), and Thelin (2011).

In their writing on the subject, Connaughton et al. (2003) describe leadership development as "a primary responsibility of colleges and universities" (p. 50). There is value in designing leadership education programs that are theoretically informed, highly focused, intentional, systematic, and multidisciplinary—programs that align teaching methods with desired outcomes, encourage direct application and reflection, and offer various opportunities for learning about leadership (Connaughton et al. 2003; Dugan and Komives 2007; Prince 2001; Ruben et al. 2017). These theoretically informed programs often address the various tools needed to excel as a leader and in many instances they create a space for the very "doing" of leadership.

College and university students can benefit greatly from their involvement in co-curricular leadership experiences. Astin's (1993) research was among the first to explore leadership development as a critical outcome of the undergraduate student experience. As summarised by Dugan et al. (2011), a number of leadership education initiatives typically have a notable impact on student learning, including faculty mentoring, formal leadership programs, involvement in extracurricular experiences, and participation in a wide array of individual leadership learning experiences (e.g. conferences, lectures, academic minors, and leadership-themed living learning programs). Leadership development remains a critical outcome of the undergraduate student experience (Astin and Astin 2000; Council for the Advancement of Standards in Higher Education 2009; Zimmerman-Oster and Burkhardt 1999), and formal leadership programs facilitate growth and development in this area as students begin to take on more nuanced and sophisticated leadership identities.

In the spirit of student learning and development, there is a growing body of research focusing on the increasingly complex ways that individuals define leadership and self-identify as leaders (Day et al. 2009; Lord and Hall 2005; Komives et al. 2006; O'Connor and Day 2007). This notion of leadership identity refers to the ways that one makes sense of who one is as a leader and the meaning derived from their involvement in groups through various roles. Drawing on Komives et al. (2005), Wagner (2011) suggests that "developing a leadership identity is more related to how one sees oneself as a leader, the ways in which that perception changes over time, and how one's identity as a leader integrates with one's other identities." (p. 95). The leadership development model presents a progression from awareness and exploration/engagement, both of which typically occur prior to one's collegiate experience, towards more advanced phases where students begin to integrate this leadership identity into their everyday experiences (Komives et al. 2005). As college and university students engage in more deliberate, complex, and immersive leadership experiences, they are better able to integrate this leadership identity with their other lived identities (Day et al. 2009). This line of reasoning suggests that as a result of participating in leadership education initiatives, students may better understand who they are as a leader and may begin to take on the role of leader in a myriad of settings. This leadership identity informs how they lead both personally and professionally.

As leadership education programs and services grow in quantity and scope, Haber's (2011) summary of the various types of initiatives is most useful. She differentiates these three common categories from one another:

> Formal leadership program: An intentional collection of leadership experiences that are integrated into an overall experience designed with the purpose of developing or enhancing leadership skills, knowledge, and capacity.
>
> Individual leadership experience: An element of a leadership program intentionally designed to develop leadership capacity. This experience, such as a course or retreat, when combined with other experiences comprise the various dimensions of a formal leadership program, but may also serve as stand-alone experiences unattached to a greater whole.
>
> Leadership activity: A specific event or activity that exists within the context of the individual leadership experience. This activity, such as a leadership inventory, assignment, or discussion, is intentionally aligned with the leadership development goals of the individual leadership experience and larger formal leadership program. Leadership activities often represent pedagogical approaches to enhancing student learning. (p. 232)

Haber goes on to offer a model for formal leadership programs that is comprised of three dimensions, including students, structure, and strategies (p. 235). There exists a wide range of curricular and co-curricular leadership education programs in colleges and universities. Although a summary of these types of initiatives is beyond the scope of this chapter, the *Handbook for Student Leadership Development* (Komives et al. 2011) is a useful resource for those involved with the design and delivery of these programs.

One final point about leadership development deserves mention at this point. Despite the value of individual leadership programs, experiences, and activities, leadership development is an ongoing process. According to McCauley et al. (2010), leadership development,

> is grounded in personal development, which is never complete. It is embedded in experience: leaders learn as they expand their experiences over time. It is facilitated by interventions that are woven into those experiences in meaningful ways. And it includes, but goes well beyond, individual leader development. It encompasses the development of the connections among individuals, the development of the capacities of collectives, the development of the connections among collectives in an organization, and the development of the culture and systems in which individuals and collectives are embedded. (p. 26)

Embedded in broader experiences, leadership training happens both formally and informally on the college or university campus. For example, as discussed by Ruben et al. (2017), the institutional culture has an extremely pervasive influence on the leadership learning that can occur. Ideally, the culture will support the types of behaviours and lessons that are being offered in formal leadership programs, yet this is often not the case. As they suggest, "The greater the contrast between the state of current and ideal organisational leadership practices, the more formidable the challenges that must be addressed in leadership development programming." Leadership education initiatives are subject to many of the same cultural challenges as other types of programs and activities in higher education. Furthermore, the impact on student leadership development can be notable and significant; but it is

also important to acknowledge the other influences on leadership learning that go beyond formal training and development. As a process, leadership development is never fully complete.

Involvement in extracurricular experiences is widely recognised as a critical dimension to student success and retention. Research by Astin (1975, 1984), Pascarella (1980), and Terenzini (Pascarella and Terenzini 1980), reinforced what Tinto (2006–2007) labelled the "age of involvement" in the 1970s and 1980s, focusing primarily on the first year student experience. Tinto goes on to outline the evolution of knowledge in the area of student retention (Tinto 2001; Upcraft et al. 2005), while still pointing to the centrality of student involvement: "Throughout these changes and the putting forth of alternative models, one fact has remained clear. Involvement, or what is increasingly being referred to as engagement, matters and it matters most during the critical first year of college." (Tinto 2006–2007, p. 4) This volume points to the wide array of factors that currently impact student success and retention in higher education, including, but not limited to, family context, educational background, high school experience, socio-economic status, faculty involvement, and connections with peers and staff. Involvement in leadership education initiatives may also be added to this set of factors that can positively influence the undergraduate student experience. The following section will highlight one particular case, the Emerging Leaders Institute at Villanova University, which creates the conditions for students to increase their self-confidence, identify their leadership potential, and integrate a nuanced leadership identity into the way they make sense of themselves and the way that they live their lives as college students and aspiring professionals.

Case Study: Emerging Leaders Institute

Following the approval of a new strategic plan in 2009, the Division of Student Life at Villanova University—a private, Roman Catholic university located in the suburbs of Philadelphia, PA—placed a renewed emphasis on co-curricular leadership education (Gigliotti 2015a, b). This increased focus led to the development of a new full-time staff position, along with resources for additional student leadership programs.[2] In an effort to connect with and support undergraduate students who were feeling disconnected from the community, the Office of Student Development, in collaboration with colleagues from across campus, developed an Emerging Leaders Institute for aspiring first year and second year student leaders. The guiding values of the institution, veritas (truth), unitas (unity), and caritas (love), provide guidance and direction for the many curricular and co-curricular offerings across the institution, including the Emerging Leaders Institute.

[2]More information on these new leadership programs, including an updated calendar of events, can be found at www.villanova.edu/leadership.

Encouraged to "get involved" at the beginning of their first year, undergraduate students—many of whom were actively involved in leadership roles in their high schools—would often compete for limited opportunities in a number of the more competitive student clubs and organisations. In the context of these moments of disappointment and rejection, described elsewhere as "problem indicators" in need of university attention (Gigliotti 2015b; Kingdon 1984), a need for more formal leadership education emerged as a division-wide priority. The goal of the Emerging Leaders Institute was to identify and recruit those students who were either dealing with the often multiple rejections or those students who lacked the confidence to apply for on-campus leadership roles in the first place. One strategy for recruiting these students was to solicit from current campus leaders and staff advisors the names and email addresses of first and second year students who had been rejected. The primary goal for the 2-day on-campus program was to enhance the leadership skills of these undergraduate students by focusing on the critical role of communication in both the application process and throughout any leadership experiences. Additional program goals include the following:

Students will be able to:

- identify their leadership strengths and areas of improvement;
- interact with other emerging leaders during interactive simulations;
- articulate their personal and/or professional leadership vision;
- understand various strategies for effective public speaking;
- practice their interviewing skills;
- receive feedback in a respectful and professional manner;
- identify organisations on campus that align with their strengths and interests;
- hold themselves and others accountable through the development of SMART goals; and
- articulate the mission of the University in relation to their student leadership experience.

Recognising that many of these disconnected students may have been rejected from certain organisations due to inadequate interviewing skills or haphazard approaches to getting involved on campus, the Emerging Leaders Institute addressed the importance of interviewing, public speaking, and goal setting in the context of student leadership. In addition to learning more about these topics through an array of brief presentations by university staff experts, the program also allowed for student interaction through leadership simulations. This combination of "learning" and "doing" allowed for a dynamic program that maintained student interest and aligned with multiple learning styles. Student participants, as a result of participating in the Institute, could learn specific strategies for public speaking, interviewing, and goal setting, while also having a safe space to practice these strategies through mock interviews, group presentations, and a public commitment to their identified goals. By identifying their unique strengths and articulating their personal and professional goals and interests, students could identify several leadership paths at Villanova. In particular, the students used the opportunity to

consider clubs and organisations for future involvement that aligned best with their goals, interests, and areas of strength, while also taking the time to draft specific goals for gaining a competitive edge during the summer months. Limited to 40 students each semester, participants who attended both sessions received a certificate of completion.

The first day of the program focused primarily on the mission of the University, effective communication skills, and the importance of articulating a leadership philosophy. In preparation for the second session, students were asked to consider the following questions as a take-home assignment:

1. Since your matriculation to Villanova University, what have you learned about yourself as a student, friend, and leader? In what ways have you changed or matured?
2. Outline the following items on a blank weekly calendar for this week: classes, work commitments, extracurricular activities, volunteer opportunities, social experiences, and leisure time. Looking at your "week-at-a-glance," where can you find the time to be more involved on campus or in the community? What is your current commitment availability? Are you satisfied with the ways in which you currently allocate your time? Does your schedule reflect your priorities as a first or second year student? What can you add, cut, or improve?
3. Identify a mentor on campus and schedule a meeting with this mentor. Your mentor may be a teacher, staff member, upperclassman student, or alumnus. Who can help you grow on your leadership journey at Villanova?
4. Complete an abbreviated Meyers Briggs Inventory. Based on your initial Meyers Briggs results, what are your core strengths and what are some areas that you can further develop, in order to be a well-rounded leader? Digging deeper, how can you best contribute to a student club or organisation on campus?
5. Having reflected on your past experiences, your current schedule, and your core strengths, let's now think long term. Reviewing the Student Development website for a comprehensive list of on-campus organisations, which club, activity, or extracurricular organisation will help you develop skills for your potential career? What specific strategies can you take to prepare for a future interview with this organisation?

The second session began with small group discussions of responses to the above questions. For the remainder of the session, students focused on a "Campus Improvement Plan" simulation, where they would consider a problem of importance to the campus community, identify realistic solutions for improvement, and present the findings of their discussion to the large group. This activity contributed to the development of new student initiatives addressing both disability awareness and student diversity on campus.

Based on the existing program evaluation data, the Emerging Leaders Institute was successful in meeting many of the aforementioned goals. As indicated in their evaluations, all student participants rated their overall experience in the program as "Excellent" or "Good", with nearly every participant suggesting that they would

"Definitely recommend" the program to other students on campus. As one student noted, "It was a great experience with an even greater staff and I learned so much in such a small amount of time." Another student commented on their growth as a result of the program, particularly by "learning valuable tips about interviewing, public speaking, leadership in general, and meeting some great people." Finally, as a third student mentioned, "I enjoyed meeting people who were largely different from one another and yet had a common goal—becoming a better leader. This desire led to productive discussions and group work. I feel I learned plenty about myself in relation to others." The anecdotal evidence points to the impact of this experience—along with a number of other student leadership initiatives—on student success at one particular institution.[3] Additional follow-up data with former participants of the Institute would help to advance these claims and could also strengthen future programs of this kind.

Conclusion

For the purpose of this chapter, it is worth acknowledging the focal audience for the Emerging Leaders Institute—those students who may have been losing or perhaps already lost confidence in their leadership potential. This vulnerable population of undergraduate students arguably has the most to gain by participating in leadership education initiatives. Yet, for any number of reasons, they are often the least likely to register for such a program. Perhaps some do not identify as "leaders," or recent rejections have led them to believe that they are not equipped with the skills for leading others. The impact of participating in leadership education initiatives cannot be underestimated. For some, it may be the deciding factor in continuing with their undergraduate degree programs. For others, their involvement in such a program may provide a spark of encouragement for achievement at the collegiate level and beyond. In many instances, their involvement in leadership education initiatives can have a cascading impact on their undergraduate experience. Their ultimate success probably is not limited to one program or initiative—yet, these short-term programs have great potential in restoring, renewing, or rebuilding confidence in one's ability to succeed.

As colleges and universities become increasingly diverse sites for learning and development, so too the opportunities for leadership education must evolve to meet the changing demands, expectations, and needs of enrolled students. These programs can continue to draw on rich sources of relevant leadership theory and practice to inform the content of these initiatives. Those responsible for designing

[3]The many opportunities for leadership development and extracurricular involvement, including the Emerging Leaders Institute, contribute to noteworthy retention figures as provided by the Office of Enrollment Management (http://www1.villanova.edu/villanova/enroll/statreports.html#retention).

and delivering these programs must also exercise care to recruit those students who might not typically volunteer for such a program. Leadership education initiatives—formal and informal, curricular and co-curricular, open and targeted—are uniquely positioned to meet students where they are and can play a critical role in their retention and success.

Finally, there is much discussion in the United States—and internationally—about the many challenges facing leaders across organisations and across sectors. Some question the preparation of leaders and their ability to truly lead with excellence in the face of these challenges. As I have noted elsewhere (Gigliotti 2015b), if leadership educators are unwilling to demand a more optimistic, collaborative, visionary, and transformative approach to leadership, who will? It is worth referring to the important question posed by Astin and Astin (2000) in their seminal study on *Leadership Reconsidered*:

> In short, if higher education must assume some of the responsibility for the poor quality of leadership that currently characterizes much of American society, it also has the potential to produce future generations of transformative leaders who will be able to devise more effective solutions to some of our most pressing social problems. The real question is how members of the academic community can collectively work together to transform themselves and their institutions with the aim of giving leadership development the priority it deserves. (p. 16)

This question continues to demand the attention of those who are committed to student retention. Leadership education initiatives—particularly those that are theoretically informed, highly focused, intentional, systematic, and multidisciplinary—can equip students with the concepts, tools, and strategies to succeed throughout their undergraduate experience and beyond.

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Part III
Transitions from University

Chapter 12
Three Modes of Work-Integrated Learning: Stories of Success

Leanne Carter, Jennifer Ruskin and Ashleigh Cassilles

Abstract The interest in work-integrated learning (WIL) in higher education has grown in recent years. Employers are demanding that graduates be work ready so WIL has emerged as an important strategy to achieve this. This chapter considers a university-wide initiative that gives every student the opportunity to have an industry-based experience built into their program, with a view to developing the graduate capabilities that are being requested by industry. The initiative is called Professional and Community Engagement and has been implemented in a variety of formats at Macquarie University, to enhance the development of employability skills and at the same time increase student success at university. The chapter considers the traditional internship model, business mentoring, and on-campus business problems presented as living case studies.

Keywords Work-integrated learning · Internships · Mentoring · Employability

Introduction

Universities and business schools are under pressure to demonstrate that they develop employable graduates (Bennis and O'Toole 2005). Work-integrated learning is one method for providing students with a path to transition from university to a meaningful working life (Mihail 2006; Garavan and Murphy 2001; Collin and Tynjala 2003). Work-integrated learning (WIL), also referred to as work-based learning or learning through participation, is characterised by the integration of theory and practice (Collin and Tynjala 2003). While universities tend to focus on abstract concepts and reflection, and industry generally offers concrete experience and experimentation, deep learning only takes place when all of these elements are combined (Meredith and Burkle 2008).

L. Carter · J. Ruskin (✉) · A. Cassilles
Macquarie University, Sydney, Australia
e-mail: Jennifer.ruskin@mq.edu.au

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In this chapter, we consider a series of cases from the Faculty of Business and Economics' (FBE) Professional and Community Engagement (PACE) program at Macquarie University. PACE has been offering industry-engagement opportunities to students since 2009. The program is part of a university-wide initiative to ensure that all students have the opportunity to engage with the community during their degree. As of 2016, FBE PACE is collaborating with more than 200 partners to provide industry-engagement opportunities for over 3000 students. The placements range from unpaid, 2-week, full-time internships to paid, full-time, year-long internships; and from industry- to classroom-based mentored student projects in which students develop solutions to real business challenges. Over the last 5 years, the PACE team has grown from two to seven members to support both the academic and administrative aspects of the program delivery. The key focal points that underpin the program are students, partner relationships, and effective pedagogy. The feedback from both students and partners has been overwhelmingly positive. Students benefit from the opportunity to develop new skills, reflect on how their skills are relevant in the workplace, and assess the compatibility of their WIL experience with their career intentions. Industry partners report that they receive real benefits from student contributions to productivity and problem solving.

Much of the WIL literature focuses on internships. The aim of this chapter is to contribute to the discussion about a range of modes for delivering WIL experiences. We begin with a brief review of the literature on work-integrated learning. Next, we identify success stories from FBE PACE that include several modes of experiential learning. In the remainder of the chapter, we discuss three modes of WIL: internships, business-mentored competitions, and classroom-based projects. First, we offer a description of each mode, followed by a detailed case modelling the successful implementation of that mode. For present purposes, success is defined as student-perceived beneficial career outcomes. We conclude by drawing on the three cases to offer insights for developing programs to offer each mode of WIL.

The Work-Integrated Learning Literature

Work-integrated learning offers many advantages for students. Through experiential learning opportunities, students develop both specialised skills (Dodge and McKeough 2003) and soft skills, such as networking and teamwork skills, and the ability to demonstrate initiative (Dunstan 2009). WIL provides students an opportunity to bridge the gap between the perceptions and reality of full-time employment (Gault et al. 2010). Participating in work-integrated learning increases the chances of a job offer from the organisation where they complete their experience (Ferns et al. 2014). For students, where a job is not a direct outcome of their WIL experience, the skills and confidence they develop help them succeed both in future job searches and employment (Smith and Worsfold 2015).

WIL has been operationalised in different ways in various university contexts. One of the most common and well-researched types of work-integrated learning is

internships (see D'Abate et al. 2009; Liu et al. 2011; Rothman 2007; Sapp and Zhang 2009; Dalby 2009). There are other forms of WIL, such as inviting guest speakers to present real-world problems (Burke and Moore 2003) and structuring opportunities to develop and present realistic solutions in a classroom context (Dietz et al. 2014), or through mentoring experiences (Jackson 2015). One challenge associated with the limited research into other modes of WIL is that it can be difficult for universities developing new programs to determine what mode, or combination of modes, will achieve their intended outcomes (Billett 2011).

PACE at Macquarie University

Overview

The Faculty of Business and Economics (FBE) is the largest faculty within Macquarie University. It is a specialist faculty with an international intake and a diverse cohort of students. The Faculty aims to develop graduates who will make a difference in the business world. Graduates should be up to date with global business trends and fully conversant with the latest debates across the business and economics disciplines.

The overarching PACE strategy across the University is to ensure that all new students commencing in 2016 have an industry-engagement learning component as a requirement of their degree, with associated credits and an academic program to support student activities. The philosophy underpinning the PACE initiative is that the University enters into partnerships of mutual benefit between the University; its students; and a public, private, or not-for-profit entity. The partners can be from within the University, based locally (in Sydney), in regional Australia, or overseas. PACE units and activities should assist the partner to achieve their mission and purpose. Partners and students must agree to abide by the roles and responsibilities in the PACE Activity Statement and Student Undertaking procedure. The choice of partners and activities must reflect the broad aim of the PACE initiative, which is to promote the well-being of people and the planet.

From a learning and teaching perspective, PACE units and activities are undertaken within an academic framework to develop the capacity and capabilities of students. PACE units must include mechanism(s) through which it can be established that the learning outcomes of the unit are being met. They must also contain the academically rigorous components of:

(a) orientation addressing stakeholder expectations, Macquarie's administrative requirements (and those of the partner), preparation for activities, and overview of the unit;
(b) scaffolding for skill and knowledge development which occurs throughout the unit and includes aspects of reflective practice;

(c) the PACE activity (i.e. experiential component), monitoring of the student during the activity to ensure they are making progress in achieving their learning outcomes, and assessment tasks; and
(d) final wrap-up and debrief including an evaluation.

PACE units help meet Macquarie's goal to produce graduates with highly developed personal, interpersonal, social, and cognitive capabilities. PACE activities range from work placements to local and international opportunities in volunteering, research, and community development.

FBE has followed a strategy of requiring a PACE unit to be embedded in each program and/or major. The unit is usually completed in the final year of the program and students apply their discipline-specific knowledge in a real-world setting. This is largely achieved through an on-campus industry-engagement experience, whereby FBE PACE brings the corporate community to the University for every student. In addition, students have the opportunity to undertake elective experiences through the offering of traditional internships, as well as mentored experiences and competitions with industry partners. This combined approach both meets the strategic aim of PACE and places FBE PACE in a good position to compare and contrast the success and impact of a range of WIL experiences. In the following sections, each of the modes of delivery of PACE in FBE is introduced and followed by a successful case implemented in that mode.

Mode 1: Internships

Internships involve students being selected by industry partners to work in their organisations on a part-time or full-time basis. These placements can be paid or unpaid and vary from 1 day per week to full time. The process for placing students begins with an industry partner request for one or more students. The FBE PACE team develops a job advertisement based on the request and recruits a pool of candidates. The candidates are reviewed internally prior to sending a short list to the partner for interviews, selection, and offers.

Students enrol in an internship unit that offers an academic foundation for linking their degree program with what they are learning in the workplace. Students participate in seminars that address business etiquette, making good first impressions, networking skills, ethics, and reflective practices. They complete assessment tasks that require them to identify their experiences and observations and reflect on what they have learned. For example, they identify ethical decision points in their workplace, consider the risks and consequences of an unethical decision, and propose strategies for reducing the likelihood that an employee or manager would make an unethical choice. In other assignments, students reflect on their own skill development through the internship experience. In the middle and at the end of the semester, the students participate in reflective and debrief seminars where they share their experiences and learn from the experiences of others.

One subset of internships is a co-op program, also known as industry-based learning (IBL). These types of programs allow students to undertake a full-time paid internship experience while studying part time. Co-op experiences are generally 6–12 months in length and offer undergraduate students sustained work experience in a real business environment (Fincher et al. 2004). Students work within their discipline area, such as marketing, finance, or human resources. They work closely with a supervisor who guides and mentors their work. Students are fully immersed in the organisation and the project(s) they undertake. (Note—in each of the case descriptions, both the partner and student names have been modified to protect the confidentiality of participants.)

Mode 1: Internships—Case Study

The first case involves a global business that develops, manufactures, and markets consumer healthcare products. This organisation offers year-long, full-time, paid internships for university students in their second or third year of study. Students participate in a rigorous recruitment and selection process before being invited to join the IBL program. Students are placed throughout the organisation in areas that are relevant to their academic background and skills, such as human resources, marketing, and sales. See Video 1 (Frazer Campbell-Cooper BCommerce—GlaxoSmithKline, https://www.youtube.com/watch?v=9v5EyWnmxNA) for an overview of one student's experience in an IBL placement. Macquarie University students participate in a thorough on-boarding and training program that integrates them into the organisational culture, provides them with the specific skills they need for their position, and builds a sense of being part of a team among the IBL participants.

These IBL interns have the opportunity to work in a "fun, friendly, and supportive environment" where they gain invaluable experience, according to Nancy. They are able to apply the theory they are learning in their university studies. Andrew comments, "The exposure and deep-dive into such a large, global company allows me to use the theory I have learnt and put it into action." The nature of the IBL program enables students to learn things beyond what they would learn in their degree program. Frank notes that the "cross-functional experience has meant I have gained experience in areas both in line with what I'm studying and wider areas of the business … and allowed me to develop my skills and capabilities." Shane adds that the IBL offers an opportunity to "reflect on what sort of person you want to be in the workplace and what sort of company you want to be a part of." Charlotte observes that her "colleagues treated me like any other employee. They've taken me under their wing, taught me, inspired me, and respected me." The interns perceive that this exposure and skill development will set them apart as they pursue their future careers.

Mode 2: Business-Mentored Competitions

In business competitions, students are assigned to groups and work for a semester to develop solutions to real business challenges posed by an industry partner. Student groups are mentored by staff members at the partner organisation. The partner organisation may propose several problem areas, and groups choose the area that interests them. There are multiple student groups working on solutions simultaneously, so the organisation benefits from a range of proposed solutions. Diverse student groups draw on the discipline-specific knowledge represented in their group to develop innovative and realistic solutions. This cross-disciplinary collaboration simulates creative processes in real business environments. Student groups pitch their solutions as part of a business plan competition. Groups may even compete with groups from other universities, as they do in the case below.

Mode 2: Business-Mentored Competitions, Case Study

Through a faculty-based PACE unit, students from a range of disciplines have the opportunity to develop solutions to real-world problems with the support of coaches and mentors from a top-tier international consulting firm. The unit involves a partnership among FBE PACE, the consulting firm, and an intermediary organisation. The intermediary is an organisation that provides technology and services that support universities offering experiential learning opportunities cost-effectively, and this allows Macquarie University to expand the scale of the PACE program. FBE PACE has had this kind of partnership in place to support business-mentored competitions since 2011 (see Video 2 for a sample business-mentored competition, Group prize winners Business Admin—Deloitte FASTRACK Innovation Challenge https://www.youtube.com/watch?v=tk25bt3hs4g).

The innovation challenge is a specially developed WIL program designed to give students a guided, real-world industry experience. It is a rigorous 12-week program that challenges students to develop an AUS$50 million innovation either for one of the consulting firm's clients or for national benefit. The program is designed to address the theory-practice skills gap at undergraduate and master's levels. The consulting firm reports that the standard graduates they hire often need more than a year of training before being ready to serve clients. The program closes this gap—new recruits who have completed the program have the soft skills of a second or third year employee. This is accomplished by exposing the students to teamwork, ambiguous criteria for success, and comprehensive feedback. Students receive industry feedback when their work is not up to par and they are required to raise their skills in order to deliver business-quality work. As one student, Walter, says,

> I've never worked so hard for any university program. However, the hard work was worth it. I cannot imagine I could experience this much exposure in the professional services industry anywhere else at such an early stage of my career. Moreover, the things I've learnt through this program have been more relevant, practical, useful (and more fun) than reading a boring ol' textbook!

Students work in teams that are intentionally diverse to include students from different backgrounds and studying a range of disciplines. Teams are explicitly organised in this way to create the potential for high performance. Justin notes,

> the time you spend with your team-mates over the semester is immense. We worked out that over the 13 weeks of the challenge, we spent over 100 hours in group meetings. That's not including background research, time [spent] talking on the phone, messaging etc…. When we found out we were through to the Grand Finals, we put in eight-hour days for five days straight.

Aside from the working sessions scheduled by each team, there are four face-to-face seminars. These take place off campus at the offices of the consulting firm. Being in an industry setting, students make an effort to assimilate in the environment by, for example, wearing professional attire. Each team is matched with the consulting firm's mentors and coaches, who provide the business context, expert advice, opinions, and network connections. These interactions are facilitated by access to the intermediary organisation's online platform that enables teams to share ideas, collaborate, get feedback, have discussions with their mentors, receive announcements, and submit assessment tasks.

Using both the face-to-face seminars and the online platform, teams go through an iterative process to develop their own solutions. First, they brainstorm a series of potential ideas and assess them for market potential and feasibility. Next, they select an idea to take forward and further develop. Then, they pitch their idea several times in different phases of development. Each time, they receive feedback from mentors, coaches, and peers. Based on the feedback, they then revise their idea. In the culmination of the innovation challenge, students pitch their business idea, complete with a written business plan, to a panel of Consulting International executives who have both funding and recruiting authority. Macquarie University undergraduate students compete against each other as well as master's and undergraduate students from other universities.

Students perceive participation in the program as adding value to their university education in a unique way that makes them marketable to employers. For example, Ella perceives that she "was lacking appropriate communication and interaction skills needed in a professional workplace environment" prior to participation in the innovation challenge. Charlie elaborates in his comment that

> "participating in the [innovation challenge] through PACE was one of the best decisions I have ever made … at the end of the program, I managed to secure a position at [an accounting firm]. During the interview process, Human Resources department was very interested in [my innovation challenge experience]".

Mode 3: Classroom-Based Projects

Classroom-based projects are similar to business competitions in that groups of students work together to develop and propose solutions to challenges raised by industry partners. The partners come to campus into the lecture theatre, as guest lecturers who present their business case study, or a real challenge faced within the organisation or the industry. This mode of offering WIL has several impacts. First, in most cases the student experience is in the classroom rather than in an office setting. Second, the challenges raised by industry partners can be situated within the content of the broader unit, whether it is marketing, accounting, human resource management, etc. The university lecturer can make direct connections between the industry challenge and relevant theory that may help the students understand and address the issue. Third, an on-campus mode allows educators to ensure that high numbers of students have access to a WIL experience, so the initiative is scalable and reduces reputational risk for the university. Not all students are suitable for individual placements for a variety of reasons; this mode overcomes these limitations. In one FBE PACE unit, over 800 students each semester have access to industry partners and propose a solution to a real industry problem. Video 3 (Group prize winners Business Admin—Tribal Warrior Association https://www.youtube.com/watch?v=BfngaSFZrwo) offers an overview of one classroom-based project.

Mode 3: Classroom-Based Projects, Case Study

The PACE marketing unit is a required component of the marketing major, and it is structured as a semester-long, on-campus, group-based project. It aims to investigate the various factors that influence the competitive position of an industry and the firms within it to achieve an ethical, socially responsible, and sustainable competitive advantage. The unit explores how marketing ethics and a social responsibility framework can be applied to develop a strategic marketing solution for the partner's corporate social responsibility (CSR) efforts.

The partner is a multinational conglomerate which is making breakthroughs in areas of technological and social innovation throughout Australia and internationally. The organisation sends five senior executives to present a real-life case to the students across 4 weeks of lectures. Students are privileged to have access to such senior executives from an AUS$93 billion organisation. Each executive opens the floor for questions at the conclusion of their respective presentation. In the final lecture, one senior executive presents the evolution of CSR within the organisation, noting that shared-value is not a new concept but rather one that is seen as a way to differentiate the global giant from its competitors. Examples of successful projects that have created shared-value across divisions of the business are presented to stimulate lively discussion among the students.

Students are charged with a brief to work in groups and create a strategy for CSR in a way that would strengthen commercial performance as well as contribute to solutions to significant global challenges linked to sustainability. When examining research findings and developing their recommendations, students are required to focus on the organisation's key priorities in terms of CSR and social innovation. Ultimately, students are to ensure that the proposed strategy provides a platform for innovation and sustained growth.

Groups of students work on their projects over 6 weeks, and then have the opportunity to present their findings to a panel of senior executives. The executives listen as each group explains their proposal for the CSR project and justifies it based on evidence from detailed research. The panel of judges provides feedback on each recommendation, based on feasibility and which options are realistic for the business. The top two student groups are then selected to present their findings at the partner's bi-annual CEO's meeting. Leading students have the chance to secure a week-long shadowing experience at the organisation's head office, as well as tickets to an exclusive event hosted as part of World Business Forum sponsorship.

Implications and Lessons Learned

The three modes of WIL offered by FBE PACE at Macquarie University enable the Faculty to ensure that every student in the Faculty participates in an industry-engagement learning unit at some point in their degree. The classroom-based project mode is built into the final year of every degree program. For those students who choose to pursue additional WIL experiences, there are units in which they can enrol to provide an academic foundation for an elective internship or business-mentored experience in their second and third years. Therefore, a student who thrives in a WIL environment and has the elective space in their degree program may enrol in up to five experiential learning units within the Faculty during their studies.

Internships offer students a direct simulation of work in their intended career, but they are administratively intensive to manage. Students have the opportunity to learn about their own strengths and weaknesses, develop skills to navigate any new workplace, and gain some insights into the fit between their personal preferences and their chosen career (Hynie et al. 2011). If appropriate placements are available, students can select internship placements that mirror their career interests and apply theoretical knowledge from their studies in the workplace. This particular contingency dictates a heavy administrative load for managing an internship program. A program requires many partners to offer the range of variables (field of work, organisation type, organisation size, etc.) that will be of interest to students.

Building partner relationships to host student interns is a time-intensive process and introduces risks for the program. Program staff may need to support new partners, and particularly smaller partners, with administrative processes, such as developing suitable projects and drafting appropriate offer letters. In addition,

off-campus placements pose risks both to students and to the program. Programs need to have rigorous workplace health and safety checks and safeguards in place. In addition, university programs require the resources to carefully screen applicants. A low-performing intern placed in a workplace with high professional standards can mean that partners do not receive the necessary deliverables, which can reduce the likelihood of future placements and potentially damage the reputation of the University. Partners can also be quite prescriptive about the types of students they are prepared to take, limiting opportunities for some students. To minimise these limitations, program staff must be prepared to educate partners about applying the same inclusive principles and policies to interns as they do for their employees (Mackaway et al. 2014). Attitudes toward gender, disability, ethnicity, and so on need to be carefully managed. Nonetheless, if relationships and risks are managed well, new partners can evolve into long-standing, committed partners who may host multiple interns in paid placements each semester in the future, as well as become involved in other PACE modes of delivery or, indeed, other types of relationships with the University such as research.

Business competitions offer students exposure to top-tier consulting firms that most people do not experience at any point in their career. Students benefit from mentoring and coaching by experienced subject-matter experts. While a few select students may be granted the opportunities for future work in a global consulting firm, all of the students learn the process of vetting ideas, developing solutions, and pitching plans to stakeholders. Through this process, students develop teamwork skills and gain confidence (Smith and Bath 2006). These skills are useful regardless of the career the students eventually pursue. One of the big challenges with managing a business-competition program is building the relationships to access a global consulting firm.

Access to such firms for business competitions can either be managed by a university program or by an intermediary firm. Intermediary organisations are built around relationship development, access to talent, and running inter-university competitions. This is their core business and they are cost-effective in delivering this opportunity. Intermediary organisations have the required depth of relationship with several top-tier firms to serve large cohorts of students and facilitate inter-university competitions across Australia. The access, guidance, and mentorship that students receive through a business competition can be life changing (Trede 2012).

Classroom-based projects allow students to experience real-world business problems for industry partners in a WIL setting on campus. This is an advantage for students who have outside commitments that limit their capacity to complete a work placement, or for students without the means or capacity to undertake an individual internship. In contrast to internships, students do not experience working in an office environment or developing a one-on-one relationship with a work supervisor, but they do have the experience of working with a team on an actual business project being mentored by industry partners. Students find both of these elements of classroom-based projects realistic and useful for their personal and professional development (Leong 2012).

From a university program perspective, there are three primary advantages to classroom-based projects. First, a unit convenor can manage the integration between classroom theory and applied learning. If there are knowledge and skills that are useful for addressing workplace challenges, the lecturer can ensure that students learn them. Second, classroom-based projects maximise the number of students served by each partner. This becomes particularly important as WIL programs grow and student demand increases. In a traditional internship program, a single partner might serve 1–30 students per semester; in a business competition program, a single partner might serve up to 500 students in a semester. With the classroom-based approach, a single partner may provide meaningful work experience projects at a large scale. Third, a university program can offer classroom-based WIL experiences to all students while limiting the risk to the university's reputation. One reason for extensive screening of candidates for internship placements is to ensure appropriate students are identified for each position. If a student does not possess adequate skills for a placement, there is a risk of damaging the relationship with both the student and the partner in the short run, and negative consequences for the university's reputation in the long run.

Conclusion

The suite of approaches to industry engagement for the students in the Faculty of Business and Economics at Macquarie University has been discussed and demonstrated. The three main modes of delivery have included traditional internships, business-mentored competitions, and classroom-based projects with industry partners. It is clear that there are many ways in which work-integrated learning initiatives can be implemented and integrated into the academic program for students.

Internships are most commonly identified as a way of bridging the nexus between theory and practice. When issues of scale are to be addressed, more creative approaches need to be adopted and tested. This has been achieved at Macquarie University through a variety of modes of delivery, some of which have been discussed in this chapter. Each year, more than 3000 students in FBE experience an industry-engagement unit which is built into their program of study. Some of these students undertake multiple units using their elective space to ensure they get as much industry experience as possible before they graduate.

It is also clear that collaboration and cooperation between industry partners and universities in the creation of high-quality, work-integrated learning opportunities is central to the success of any such program. Therefore, at Macquarie University we do our best to ensure there is a mutually beneficial outcome for both partners and students. The future challenges lie in the development of an evaluation framework that identifies quality assurance standards for high quality WIL, as well as

broadening the scope of activities and modes of delivery to ensure the appropriate scale can continuously be achieved as more universities call upon industry to support their curricula.

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Chapter 13
Sustainable Employability in Higher Education: Career Development Outside of the Curriculum

Clare Hurst, Justine Fowler and Georgia Scapens

Abstract Sustainable employability includes an ability to market oneself (prepare cover letters and résumés, manage an online presence, and perform in interviews) and whole-self development for long-term employability. This chapter explores the success of three different career programs in developing a sense of sustainable employability for students. The programs discussed are the Career Accelerator Program, which provides students with a week of networking sessions with corporate employers in their offices; the Mock Interview and Assessment Centre Day for actuarial student society members with mock interviews and an assessment centre with actuarial alumni; and the Undergraduate Research Scholarships Scheme linking undergraduate students with academics to participate in current research projects for up to 100 h over a period of 6–9 months. Each of these three case studies leads to the conclusion that career programs outside the curriculum deliver opportunities for students to practise, develop and apply their employability skills in realistic environments.

Keywords Career support · Undergraduate research · Faculty-student interactions · Employability skills

Background

The term sustainable employability, which refers to long-term employability, is typically used in an organisational development context and refers to programs and initiatives implemented by workplaces and governments to help an ageing workforce remain in employment (Molloy and Noe 2010). However, the term is also applied to students in higher education.

For at least the last decade, greater attention within the higher education sector has been given to student employability (Watts 2006). This is partly in response to

C. Hurst (✉) · J. Fowler · G. Scapens
Macquarie University, Sydney, Australia
e-mail: clare.hurst@mq.edu.au

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student motivation; for instance, the 2015 incoming student cohort of Macquarie University students was surveyed, and the majority were found to have been motivated to come to university to improve their employability (Macquarie University Learning and Teaching Green Paper n. d.). The focus on employability also reflects higher education's contribution to the development of a country's human capital (Watts 2006).

Graduate employment statistics are typically used to assess student employability but these look only at immediate employment. Watts (2006) suggests there is value in increasing the focus on sustainable employability as opposed to immediate employment. We interpret sustainable employability to mean that not only are our graduates employable and able to find their first job, but also that they are able to navigate their careers beyond that; that they have developed employability skills which can be adapted and relied upon as they continue their lifelong career journey.

Career Mission

The Macquarie University Career and Employment Service has a Career Development Consultant embedded in the Faculty of Business and Economics to run career development programs for the Faculty and to engage with academics on career development content in the curriculum. The Career Development Consultant's mission is to enable students to graduate with a sense of sustainable employability. For the purpose of this mission, sustainable employability includes:

1. An ability to market oneself. This includes preparing professional résumés and cover letters; confidence during interviews; managing a social media presence; and overall professional branding.
2. Whole-self development. This includes interpersonal skills, communication, problem solving, teamwork, resilience, networking, motivation, flexibility, and self-management.

Career Programs

Career development programs aim to achieve the sustainable employability mission by creating practical opportunities for students to experience and develop their employability skills, as well as providing an understanding of the use and application of these skills. We understand that employers around the world and across different industries increasingly seek the same key skills—communication and interpersonal skills; aptitude and problem-solving skills; teamwork and leadership skills; and passion and motivation (Graduate Careers Australia, 2014). Anecdotally, we find that employers also say they are seeking graduates who have common sense, maturity, and a capacity to triumph over hardship. The potential gaps that we

have identified in our graduates, and aim to address through our career programs, are: time management, self-awareness, networking, and taking initiative.

Our career programs are run outside the curriculum and focus on practical skills that are not included in academic units of study, including work-integrated learning units that look at the nature of the workplace and require students to reflect on their work experiences, but do not necessarily cover the skills required to *get* work. The career programs we run include:

- Workshops—these cover topics such as writing résumés and cover letters; performing in interviews; how to create a profile for LinkedIn; and how to use LinkedIn for networking. Faculty-specific workshops are typically run through an existing faculty program (such as a mentoring program), or a student society, in order to target content appropriately and gain student interest. These same workshops are also run centrally for the entire student body by the central careers service.
- Competitions—these are managed by the Career and Employment Service and have included a University-wide Start-Up Pitching Competition, an Investment Banking Case Study competition, and an inter-university consulting competition (Univative) where multidisciplinary teams of students solve real problems for employer partners.

This chapter contains three case studies, providing detailed examples of further types of career programs and initiatives we run in the Faculty of Business and Economics that give students the opportunity to acquire, develop, and use sustainable employability skills. Each case study includes statements and stories from the participants involved.

Case Study: Career Accelerator Program

Context

The Career Accelerator Program (CAP) aims to provide high-achieving students with an opportunity to develop advanced career-readiness skills through exposure to corporate cultures and practice interacting within a business environment. This is achieved through a week of workshops and networking events held inside the workplaces of a range of large corporate employers.

Employers participate in the CAP in order to gain early professional contact with an elite group of high-achieving students from Macquarie University, as well as an opportunity to showcase their workplace and culture. All of the participating employers to date have strong employer brands and run medium to large summer internship and graduate programs.

Most of the corporate partners come from the financial services sector where there is a large emphasis on employing high-achieving, well-rounded students for

internship and graduate programs. Employers who have previously engaged in the CAP include Macquarie Group, PwC, Commonwealth Bank, Optus, EY, Optiver and AMP. These employers seek students from a range of disciplines including accounting, actuarial, finance, economics, marketing, human resources, and law. There is an increasing employer focus on finding students who have excelled in studies such as statistics, data analytics, information technology, engineering, and mathematics.

Student participation is by invitation only. All interested students are required to submit their résumé and academic transcript as well as a short statement expressing their motivation for participating. All students accepted into the CAP must have a GPA of >3, out of a possible 4. This is due to the academic requirements of many of the companies for their internship and graduate programs. However, the criteria for participation is heavily weighted towards the student's well-roundedness, and their ability to engage enthusiastically and push their own confidence boundaries during the program. We have found that a smaller group of up to 40 students leads to more opportunities for personal interaction and networking between each student and the employers.

Activities

The CAP is held over 1 week during the 4-week winter vacation (July in Australia). The other Sydney universities offering similar programs do it in different formats: for example, Sydney University's Graduate Edge is run in the evenings over a number of weeks during a semester, and the University of New South Wales offers their program at the end of the summer vacation (February in Australia). We have found that running the program all within 1 week ensures the students retain their interest and focus on the program. Winter vacation is an ideal time as many summer internship programs are open for applications at this time and students are motivated by the CAP to apply.

The program typically involves two employer visits per day. Each employer visit lasts 2–2.5 h and includes an overview of the organisation and who they hire, as well as a skills development workshop. The sessions conclude with networking with recent graduates, graduate recruiters, and more experienced staff.

The skills development workshops cover a range of topics relevant to every workplace and the employability skills that students need including presentation skills, effective communication, personal branding, networking, interview and assessment centre skills, and use of LinkedIn. The topic is largely decided by the employer.

A closing ceremony is held on the final day of the program. The closing ceremony is a final chance for all students and employers to network. At the closing ceremony, students give a short presentation on what they have learnt with each

employer and thank them for their time and participation. The student presentations have received positive feedback from the employers, and they function as one of the ways for the students to be more active participants in the program.

Outcomes

Feedback from participating employers has been very positive. The employers greatly value the diversity of the group of students in the CAP. As well as being from a wide range of disciplines, the students are also from a range of cultural backgrounds and do not necessarily fit into the typical mould of a studious high GPA student.

The response from students has also been positive, as can be seen from these three students' stories.

Tim's Story

First year Bachelor of Business Leadership and Commerce student, Tim Wells, talks about how his confidence grew over the program.

> Being nervous is a bit of a personality trait for some people. I learnt a lot but I think sat back and I was a bit nervous at the start. That was the one thing I regretted, not asking more questions. I did ask some but I feel like if I were to come back, I would feel more confident and at ease asking questions. Towards the end of the program, I felt a lot more confident. On the final night, at the networking evening, I was going around talking to a number of people, compared to the start of the week where I was more reserved. And I have actually met up for drinks with a couple of the people I met and I keep in contact as well so it is great.

Jack's Story

Jack Feeney (Bachelor of Applied Finance and Bachelor of Economics) participated in the CAP in his second year of study. Immediately following the CAP he applied for a summer internship position at Macquarie Group and was successful. Jack describes how the CAP helped him secure his first job:

> CAP gave me the opportunity familiarise myself with the organisation before I submitted my application. Seeing inside the firm meant I could break down some stereotypes regarding the culture and learn more about the different divisions in the organisation. I was also able to mention my participation in CAP in my application, which I think helped me stand out from other applicants. Soon after the CAP, I was lucky enough to be selected for an interview. My interview was held in the same building as the CAP visit, which made me much less nervous. I had already seen the workplace in action, I knew the dress code. Also, CAP had given me the opportunity to network and talk with professionals, it was like a test-run with nothing on the line. This meant I wasn't as daunted at the interview when it

> really mattered, the fear factor had been taken away. I got the summer internship at Macquarie Bank, and at the end of it they offered me a graduate role. I loved the CAP experience and it helped me secure my first job.

Kelly's Story

Bachelor of Business Leadership and Commerce student, Kelly Ireland, participated in the CAP during her first year of studies. At the end of her second year, she was a finalist in the Chartered Accountants Australia and New Zealand Accounting and Financial Management Award and the Fusion Graduate Consultancy First in Family Award (both are national awards coordinated by GradConnection).

Kelly reflects on how her CAP experience helped her build her professional networks and career skills from the very start of her degree:

> The CAP was unlike other career development workshops I have been involved in, because each firm had their own perspective on graduate capabilities. The vast array of corporate cultures in the program meant I developed an understanding of not only the intricacies of each company, but was able to piece together the mass of knowledge into an encompassing and comprehensive set of skills that would boost my employability across the industry as a whole.

As these case stories show, over the week, students build their confidence levels and their ability to interact with strangers in a professional environment demonstrably. At the closing ceremony, all students mingle with the employers making final connections, asking further questions, and, in some cases, even securing job opportunities.

The CAP contributes to student sustainable employability by developing networking communication skills, as well as building actual networks of employer connections for students. These connections link with long-term employability as students will need to build upon these and make further connections in and across industries over their lives.

The CAP is now in its third successful year and is expected to continue.

Case Study: Mock Interview and Assessment Centre Day

Context

Working with student societies on campus is an excellent way to reach a number of students as well as embed career skills and improve student success. The Career and Employment Service partnered with the actuarial students society to develop a Mock Interview and Assessment Centre Day. The day aims to improve student confidence in the graduate recruitment processes, in particular in performing at

interviews and assessment centres (which are commonly used by large graduate employers).

The interview questions were designed to reflect commonly asked interview questions in the actuarial and consulting fields. The mock assessment centre component includes a technical scenario which the students must work on in teams, with a team presentation at the end. A typical scenario would consist of asking the students to assess whether Firm A should take over Firm B. Students are given background industry and company information and high-level financial information. The Mock Assessment Centre is strictly timed, to reflect reality. Students are typically given 30 min to work on the problem as a group and then 15 min at the end to present to the assessor panel and answer questions from them.

These questions and scenarios were designed to assess the student's competency across a range of skills commonly desired by industries of interest to actuarial studies students such as banking, consulting, finance, and insurance. Employability skills commonly assessed include teamwork, attention to detail, problem solving, and communication.

Activities

The 1-day program is for 20 students to simulate interviews and group assessment centres commonly used by employers. Twenty actuarial alumni (who are also past members of the Student Actuarial Society) are present as the interviewers and assessors, along with two members of the Career and Employment Service. The alumni are briefed by the Career and Employment Service prior to the program beginning to ensure they understand their role as assessors, and to give them tips on what skills they should be looking for and how to provide constructive feedback to students. Feedback forms are provided to the alumni to assist them with consistency. The forms for each activity were are based on real recruitment practices.

Students are then split into groups of five to complete the assessment centre activity, with five alumni present to assess and then give feedback to the students on their strengths and where they could improve. The staff from the Career and Employment Service sit in on several assessment centres and interviews to provide additional feedback. The students then rotate through the mock interviews with two alumni present for each interview. The alumni give comments on the students' answers and relevant skills such as communication, interpersonal, and presentation skills; this is given verbally at the end of the interview. Particular focus is placed on detailing behavioural interview questions with specific examples of situations, tasks, actions, and results (STAR method for answering behavioural interview questions).

The assessor panels confer privately about their opinions on the performance of each student in the team-based assessment centre scenario, and then deliver their feedback to the students. They report on both how the group as a whole and how each individual performed in the task.

A follow-up email is sent to the students outlining tips on interviews and résumés by the Career and Employment Service, as a future reference point for them.

Outcomes

Students have responded very positively to this event. Annika Srivastava, Vice President of the student society, describes why she believes the Mock Interview and Assessment Centre Day is a valuable opportunity:

> Our Mock Interview and Assessment Centre Day is a fantastic way to allow students to have a real life interview experience with professionals across a range of different companies including PwC, EY, Quantium and Finity. Students are able to improve on their skills with great feedback given so they can ace the real interviews. I believe this is one of our most valuable events for students who are in their second/penultimate year as they can really utilise this opportunity for future interviews and get the job they want. Acing an interview unfortunately requires more than a great GPA and this event teaches exactly that!

Although the interviews and assessment centre on the day are not real—there are no jobs or opportunities on offer—many students display a degree of anxiety and some have difficulty talking about their achievements and selling their abilities. The Mock Interview and Assessment Day therefore provides students with a valuable and rare opportunity to practise and build their confidence in a realistic practice environment.

Students have very few opportunities to practise interview skills in realistic but safe situations. For many students, the only interviews they have had, if any, are for part-time or casual work and the first professional interview they experience may be a real one, where the stakes are high.

While not the prime focus, feedback from the alumni has also been very positive, with several commenting on their own learning and the benefit of practising their recruitment skills.

The Mock Interview and Assessment Centre Day contributes to student sustainable employability by developing their self-awareness. Receiving individual feedback from alumni on how they perform in interviews and assessments centres allows students to reflect on their job-seeking strengths and weaknesses and to work to improve their employability.

The program has been run by the actuarial student society successfully for a number of years now and is intended to be used as a model for other student societies to copy.

Case Study: Research Scholarships Scheme

Macquarie University offers Undergraduate Research Scholarships to high-achieving students. This scheme allows students to work alongside a university researcher on a current project, whilst being offered the opportunity to develop a range of skills and receive one-to-one mentoring. To date, 95 students have participated in the scheme.

Activities

Researchers across the University are asked to nominate their projects for the scheme by providing a simple description of the project and the proposed student tasks. The projects come from a range of disciplines so that the scheme remains relevant for all students in the program—from macroeconomics to gender studies. All projects are then advertised to students, who are allowed to apply for as many projects as interest them, not restricted to their own disciplines.

Successful applicants are matched to their chosen projects and paid a small scholarship; in return they are required to contribute a set number of hours to the project (typically between 50 and 100) over 6–9 months. Flexibility is built into the program so that timing of the project work can match student and academic supervisor availabilities; they are not tied to one semester. The supervisors are free to allocate the hours however they choose, with the implicit agreement that they are responsible for introducing the student to a range of research activities, and that a significant portion of those hours will be spent working alongside themselves or another supervisor, thereby fulfilling the mentoring component of the scheme.

Outcomes

The Undergraduate Research Scholarships contribute towards whole-student development in a number of significant ways. Students learn a range of skills which they are then able to transfer to their wider study, and eventually apply to their profession.

> The skills I have learnt from the project have been directly transferable to my law degree and have helped me to complete research for my assignments this semester. I only wish I had known about some of these tips earlier in my degree! They've really helped me complete tasks more efficiently and thoroughly. (Anshul Potnis, Bachelor of Commerce with Bachelor of Laws)

One such transferable skill is teamwork, or the development of more general interpersonal skills. Students generally do not have an existing relationship with their program supervisors, and so are required to develop a good working

relationship with them. Sometimes students are required to work within larger research teams, thereby having to navigate the varying levels of seniority and allocation of tasks. This experience prepares them well for future employment.

> This project is very different [from my usual study] as I have a chance to work in a bigger team … Working alongside other researchers on this project has been a very enriching experience. I am very grateful that the project has accommodated my study exchange and since it is a long-term project, I hope I can join the team again next year when I get back. (Huong Ly Tong, Bachelor of Health, International Student)

Students are also required to use their initiative, at a level that is not otherwise expected of them at an undergraduate level. While the scheme encourages a close level of supervision, the nature of research is such that students are regularly required to work at home and may not see their supervisor for extended periods of time. This encourages the development of self-management and a high degree of flexibility. Students must monitor their own workloads, meet deadlines, and work on projects that are generally not the top priority of their supervisor.

> I appreciate [my supervisor's] flexibility in the process, and in allowing me to take the lead in the project and to be very independent. I find I tend to work better this way. He also provided me with a large amount of resources at the beginning to guide my thinking. (Bachelor of Finance with Bachelor of Economics, requested to remain anonymous)

The scheme also provides an opportunity for students to network with the research community and encourages open discourse around the wide range of research being done on campus. This discourse is generally otherwise restricted to the academic community, in which undergraduate students typically play no role. Through this scheme, all participants are shown a cross-section of the current research at the University, and those who successfully enter the scheme are then encouraged to attend cross-disciplinary networking events with both students and researchers present. Each year a selection of the scholarship recipients also present their research at the Australasian Conference of Undergraduate Research.

> The Undergraduate Research initiative has made my year more dynamic, fun, and interesting. I have been able to network with people who I otherwise may not have met, begun to understand deeper research concepts and methodologies (outside of my unit assessments) and used different technologies and software. (Marian Rakosi, Bachelor of Teaching, Early Childhood Education)

Overall, the scheme provides both an alternative to the typical corporate employability programs and a very practical experience of the reality of the professional world. Students must work with others, develop strong self-management skills, utilise various modes of communication, and develop a level of resilience when met with adversity throughout the process. Students are also required to track their own hours and progress, and although they are obliged to contribute a minimum of 50 h to their project, many are personally motivated to continue contributing beyond those hours or even to see the project through to completion.

> It's been a steep learning curve and given me a lot of insight into the world of research. Real-life issues of timing with various holidays, getting people together, and lab availability

> slow down the process, but that's to be expected and sometimes can't be avoided. So far I've spent about 13 hours face to face with my supervisor, but there's been lots of research and writing up procedures at home that I haven't kept a log of – it would be at least an extra four hours per week. [My supervisor] and I are in regular contact via email and I keep a log of any meetings and training. It's an amazing experience and I'm so grateful to [the University] for making it possible. (Julianne Pascoe, Bachelor of Psychology and Education, Primary)

Student Success Story—Oliver Morgan

In about 10 % of cases, the students have gained employment directly from their participation in the scheme. Oliver is one such example:

> My supervisor has been fantastic and become a valuable mentor in my academic career. The research scholarship initiative has opened up numerous opportunities for me and has led to my employment as a research assistant under my supervisor. (Oliver Morgan, Bachelor of Psychology, Honours)

Conclusion

The three case studies described in this chapter provide examples of how Macquarie University gives its students opportunities outside the curriculum to practise their employability sills. These extracurricular activities each provide concrete elements of realism for the skills development. For example: networking with employers in their workplace, performing in a realistic assessment centre, and working to actual deadlines on a research project. The programs also provide an element of safety for the students as they practise and develop in preparation for the future. Each program is closely supervised by University staff with support available to the students.

The fact that each of these career programs is extracurricular shows that students do value learning beyond the curriculum. Universities should ensure they provide sufficient funding for the support and development of extracurricular programs that can provide deeper engagement opportunities for students wishing to practise their skills in realistic environments. The employability skills practised in these career programs (networking, time management, presentation skills, taking initiative, problem solving, and teamwork) are essential for student success upon graduation —both occupational success but also in the sense of the development of the self.

Developing a sense of sustainable employability in our students relies on providing them with the exposure and ability to practise and experience key employability skills in realistic environments. Career programs outside the academic curricula are a vital way to practise skills in the context of future employment outside the University.

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Chapter 14
Transitioning to Professional Work: A View from the Field

Sally Hawse

Abstract This chapter explores the question: "what is a successful transition to professional work for an engineering graduate"? To answer this question, it considers the viewpoint of both recent graduates and more experienced engineering professionals. While graduation signifies successful completion of a higher education program of learning, philosophies of the work lifespan and career transitions present a broader view of the journey from student to professional. Responses to a questionnaire about the value of their engineering degree, and whether technical skills or generic and transferrable skills are of greater benefit to an engineering career, inform suggestions for how higher education and organisations can contribute to successful transition for graduates into the workplace. This chapter starts with a brief literature review and moves on to a discussion of transitions and workplace expectations. It then looks at new graduate and experienced professional views relating to the work readiness provided by formal engineering programs of study. The chapter concludes with recommendations for what academia and organisations can do to support the transition to work.

Keywords Engineering · Employability skills · Work readiness

Introduction

Changes across industry and the economy, shifting social values, increased demand for higher education, and globalisation are impacts which Edgerton (2001) identifies as significantly reshaping contemporary educational programs. He contends that program completion, participant understanding, and acquisition of the literacies required for effective work, citizenship, and personal fulfilment are the quality standards against which educational programs should be evaluated. Edgerton's (2001) viewpoint is particularly resonant for contemporary STEM (Science,

S. Hawse (✉)
Macquarie University, Sydney, Australia
e-mail: sally.hawse@students.mq.edu.au

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Technology, Engineering, and Mathematics) curricula. With dwindling enrolments and increased industry need, these disciplines have received policy focus and attention directed towards encouraging students to pursue careers in science and technology fields. Curricular and program responses incorporate teamwork activities, communication and professional skills, and the environmental and social implications of scientific solutions. Recent US data shows that these engagement and curricular reform efforts have been successful, with STEM enrolments increasing over the past 5 years, notably in engineering and biology (Arizona State University 2014; Jaschik 2014; The City University of New York (CUNY) 2015; UW-Madison 2014).

Research into how knowledge is produced in digital- and science-oriented economies, and the increasing diversification of higher education, indicates that the role of academia now ranges "from the most specialised research to the most utilitarian kind of training" (Gibbons et al. 1994, p. 71). In line with this view, Eraut (2009) hypothesises that vocational and professional education courses such as engineering degree programs claim to provide five main types of knowledge: (1) theoretical knowledge, (2) methodological knowledge, (3) practical skills and techniques, (4) generic skills, and (5) general knowledge about the occupation. These knowledge types cover foundational concepts and theories relating to the profession. They also take into account the ability to critique these concepts in relation to the role of the profession, its proposed new forms of practice, the way in which knowledge is created, analysed, and interpreted, and the practical capabilities of applying the domain knowledge in practice. This also includes: indirect or generic skills of numeracy, literacy, communication, critical thinking, and self-directedness; and knowledge of the values, modes of working, and career opportunities within the profession. This spectrum of knowledge areas suggests that the focus of higher education programs may be sufficiently diffuse to warrant ongoing effort to develop blended higher education-industry curricular models that specifically address the transition points between higher education and the workplace.

That is, as the focus of many university engineering programs remains largely theory-based, these programs may not always meet the professional needs of early career engineers, for whom significant challenges include the specific skills and knowledge required for navigating project-based environments with multi-disciplinary teams and cultures (Baytiyeh and Naja 2012; Finkel and King 2013). Baytiyeh and Naja (2012) observe that while engineering curricula provide the foundational and technical knowledge required to begin a career, the transition from student to the workplace is not well understood, and that "engineering students complete a highly structured curriculum, but a professional engineer works in a highly unstructured environment and performs multi-dimensional tasks" (Baytiyeh and Naja 2012, p. 4).

Career starters can benefit from greater understanding of the transition between university and the workplace. This highlights a compelling need for new professionals to apply, review, and extend their knowledge in practice, and for academic and organisational development programs to provide activities that support this need. Katz (1993) interviewed professional engineers in supervisory roles across

industry, consulting, and government. These representatives, who commonly employ engineering graduates, summarise challenges new graduates face when transitioning to the workplace:

Industry: The person coming out of school [university]—unless he's had either a co-op program or fairly extensive internships in the summer—doesn't know what industry is all about.

Consulting: The undergraduates are not well prepared for a job market. … They may understand some of the general principles in engineering, but they have difficulty in applying them from a practical standpoint.

Government: My problem has always been … that public health and the engineering curriculum don't really match in the first place. … Most of them [new engineers] would interview for a public health job … without really knowing what it is. (Katz 1993, p. 171).

Difficulties in transitioning to the workplace persist despite the increasingly widespread implementation of programs and activities to support the transition to work. University curricula and workplace professional-development responses encompass: capstone courses, work placements, training and professional development, inductions to organisational culture and modes of working, and early career mentoring programs. These latter offerings serve to transition and socialise novice professionals into the workplace, their team, or their discipline. Workplace induction and awareness programs provide opportunities to tailor learning and continuing professional development to solutions that assist new engineers to acclimatise to workplace social systems and to the complexities of moving from theory to practice. Nonetheless, as Eraut (2009) observes, transferring knowledge and concepts from an education setting to the workplace is "particularly difficult, because of the considerable differences in context, culture and modes of learning" (Eraut 2009). Wong et al. (2016) propose that the interaction of several complicated factors, such as the knowledge transfer gained from participation in work tasks and the design and composition of work teams, contribute to the transformation of a novice to an expert in the workplace. Working in teams, workgroup composition, supervision and coaching, and group processes influence this transformation, with implications for research into academic to workplace transitions.

Academic and Workplace Transitions

Wood and Solomonides (2008) consider the phases of change that students experience as they embark on a course of study and then go on to professional life. They suggest that "one of the roles of the transition from school to university is also to foreshadow the future transition to professional work" (Wood and Solomonides 2008, p. 119). The activities and programs that contribute to university induction

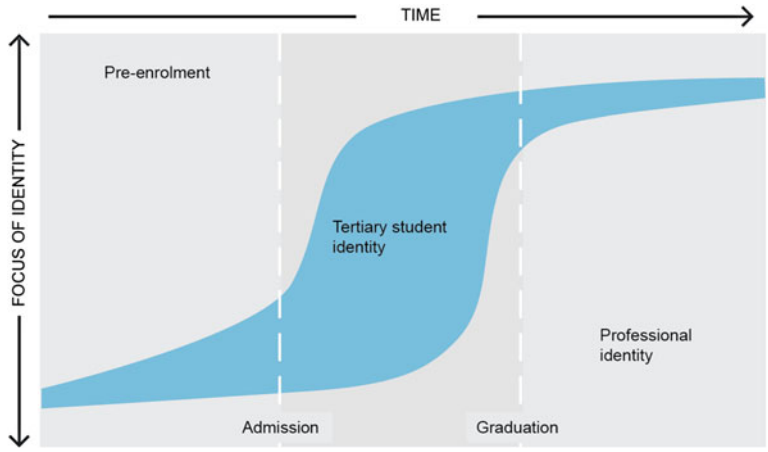


Fig. 14.1 A student's learning journey (adapted from Taylor et al. 2007, p. 2)

include: first year seminars and experiences, learning and study groups, writing workshops, and tutorials. These types of activities can also inform workplace onboarding programs, workgroup integration, mentoring, and task assignment for new career starters. In Fig. 14.1, Wood and Solomonides (2008, p. 120) present an alignment of Bridges' (2003) transition model to a student's journey from pre-enrolment to graduation, and their changes in focus and priority in acquiring a professional identity.

Bridges (2003) identifies that disorientation, frustration, and uncertainty often accompany change, and that the process of transition incorporates separation, transition, and re-alignment phases. This is similar to Lewin's (1947) theory of change, which incorporates "unfreezing" or breaking down the existing status quo, undertaking change activities, and then "refreezing" or anchoring the changes into behaviour and culture as norms. Wong et al. (2016) interpret these transitions from a workplace point of view as re-learning and re-education processes undertaken while novice practitioners acquire professional identities of the workplace and become more experienced workers. They argue that a range of factors is implicated in this change and knowledge-transfer process, including gender, workplace culture, and team-member proximity. Hays and Clements (2012) note that transition can be part of a transformative learning process. They suggest that support for the move from university to the workplace can include learning tasks specifically about the transition process. This presents opportunities for universities and employing organisations to work together to more directly influence learning during transition. Hays and Clements (2012) frame this opportunity as "a flexible period extending deeply into the curriculum and well forward into at least a graduate's first professional employment" (p. 13).

Sfard (1998) proposes that two metaphors describe learning. "The *acquisition metaphor* sees learning as a process of knowledge acquisition, while the

	School	University	Professional
Discourse	Limited academic	Academic	Discipline-specific
Identity	School student	University student	Professional
Learning	Very structured	Structured	Self-directed
Knowledge area	Disconnected	Structured, abstract & modelling	Flexible application in context

Fig. 14.2 Transitions and contexts (adapted from Wood and Solomonides 2008, p. 122)

participation metaphor emphasises that learning takes place by participating in the practices of social communities" (as cited in Tynjälä 2008, p. 131). Wood and Solomonides (2008) take a journey or lifespan development approach analagous to Sfard (1998) to the changes in discourses, identities, learning styles, and approaches to knowledge and capability transition points across school, university, and workplace. These contexts and changes are presented in Fig. 14.2.

Wood and Solomonides (2008) acknowledge the planned or structured learning of university and the symbolic or abstract modelling of university knowledge areas do not directly correspond to the more unstructured activity and outcome focus, and the more event-and object-oriented learning and knowledge, required in the workplace. Comparable summaries of the differences between formal learning and informal workplace learning are provided in Eraut (2009), Hager (1998), Hays and Clements (2012), and Resnick (1987), all of whom agree that the transition from university to the workplace involves changes in approaches to learning, and to the context in which knowledge is developed and applied. Hays and Clements (2012) outline key differences between academic and workplace learning. Their list in Table 14.1 highlights that workplace learning is characterised by uncertain objectives, and that learning is achieved through task accomplishment and shared efforts. These contribute to developing both individual experience and to producing organisational outcomes.

Learning with and through colleagues and workplace activities, poorly defined tasks and objectives, self-directed learning, lack of feedback, and multiple stakeholders and accountabilities are important differences between academic and workplace learning. Following the work-lifespan approach of Wood and Solomonides (2008), these differences can provide managers and organisational professional development with a starting point for structured programs that support the transition to work.

Finkel and King (2013, p. 1) note that, "industry is ever more demanding of graduates' employability and value." For Edvardsson Stiwne and Jungert (2007), employability "indicates that an employable person holds knowledge, skills and characteristics that makes that person useful and valuable in a specific context" (p. 1). This raises the question of what parts of the curriculum contribute the most to

Table 14.1 Comparison between academic and workplace learning (Hays and Clements 2012, pp. 8–9)

Academic learning	Workplace learning
Student learning key terminal objective	Learning instrumental or incidental. Organisational outcomes as primary goal
Learning about, of, and for, usually in the classroom or on campus, though increasingly virtual	Learning with, through, and in, usually onsite/part of work; sometimes sent to offsite training
Broad career-based or lifelong learning; acontextual. Theoretical and abstract	Specific task-oriented learning; context specific. Practical and applied
Learning usually one-dimensional, involving a given mode. Use of specific formula, process, theory, etc., required	Learning involving the whole person/multimodal. Whatever works to get the job done
Learning generally by oneself; sometimes with others (peers)	Learning generally from others (colleagues), gradually moving towards shared learning and mentoring
Low risk; accountable to self (or group members)	High risk; accountable to clients, colleagues, patients, etc.
Learners compete with other individuals for grade in prolonged or defined time parameters (e.g. one semester)	Transient/indefinite learning as a team or organisation; competition amongst teams or with external competitors
Simple: generally passive, planned, and predictable. Simulated, artificial, controlled, detached	Complex: generally active, purposeful, unpredictable, and spontaneous. Authentic and embedded
Transmission of knowledge from expert; student as "empty vessel" (learner as recipient)	Generation of knowledge through experience; all expected to have and contribute knowledge and skill
Prescribed learning outcomes and objectives; learner dependent on external authority for instruction and assessment. Learning task distinct from work or may be impractical and not usually applied. Teacher-directed	Learning tasks and situations vague and poorly defined; learners relatively autonomous. Learning tasks and requirements are embedded and virtually inseparable from work. Worker-directed
Periodic/frequent feedback provided by teacher, tightly linked to learning tasks	Infrequent or generalised feedback provided by manager; work, itself, source of most feedback
Producing while paying to learn	Being paid to produce while learning
Students can "master" the study game. They can learn to win the game without learning much that is meaningful or transferable. Often surface learning	Learners must learn to learn. Harder to learn superficially and win as the game continually changes. Often deeper learning with greater transfer

employability, and "if these skills are best learned within the educational context or within the context of work life, or work-based learning situations" (Edvardsson Stiwne and Jungert 2007, p. 8). While not as singular as the theory-practice divide, which claims that university provides theoretical grounding and the workplace provides practical application, this underscores that university and the workplace each play distinct and complementary roles in education and learning. This emphasises the need for new engineers to make judgements, create solutions, and

communicate results. It also highlights the importance of fostering these capabilities in workplace-designed development programs. As Katz (1993) identifies, each company has its own processes and culture for which no formal education program can prepare entrants.

Creating Professional Identities

Solving complex workplace problems with conflicting goals, employing diverse ways to achieve successful solutions, and managing non-engineering success measures and constraints are activities that can be leveraged to support the transition of early career engineers to professional practice (Jonassen et al. 2006). There are high levels of ambiguity in real-world engineering, and what new engineers perceive and learn about engineering work often depends on the quality of their interactions with co-workers and work groups (Korte et al. 2008). Socialisation is thus an important part of how novice engineers acquire the "habits of mind" or signature beliefs of their profession (Lucas and Spencer 2015). For Sfard (1998), this is also about seeing learning through the lens of "participation". She contrasts "learner-centric" or acquisition-oriented learning with "community-centric" or participatory-oriented learning practices. Aligned to the practices and values of the workgroup or organisational community, workplace learning is about participating in, contributing to, and potentially reshaping community practices and beliefs.

Developing a professional identity is therefore about being a part of a professional community and participating in the activities, ongoing development, and renewal of its practices and modes of communication. Winters, Matusovich, and Carrico (2012) note that novice engineers face unstructured, real-world knowledge application for which they may not have been prepared. This includes navigating a diverse range of unfamiliar workplace systems and barriers to access the resources they need. At the same time, these early career engineers may still be figuring out their identities, and goals for their careers (Lichtenstein et al. 2009; Matusovich et al. 2009; Polach 2004).

As with Sfard (1998), who proposes that learning a subject is also about becoming a member of a particular community, Melrose, Miller, Gordon, and Janzen (2012) define professional socialisation as "the process of learning a professional role and emerging as a member of an occupational culture". It is a process which links the world view unique to disciplines with a professional sense of self. Socialisation is also a means by which we acquire the knowledge, skills, and disposition that enable us to become members of a profession. It thus manifests as "the way we do things"—"a subconscious process whereby persons internalise behavioural norms and standards and form a sense of identity and commitment to a professional field" (Melrose et al. 2012, p. 2). From this position, Van Maanen and Schein (1979) highlight the ongoing importance of the work group, and that since socialisation involves the transmission of information and values, it is fundamentally about culture. As we progress through a career, we adopt various identities,

some of which may include: intern, colleague, manager, technical expert, or senior engineer. Better knowledge of these identities and how they are shaped and adapted to new selves can benefit new starter integration, the workplace-talent pipeline, retention, and engagement efforts.

Views from the Field

The research question explored in this study was: "what is a successful transition to professional work for an engineering graduate"? The research interest was in hearing the views of recent graduates and more experienced engineering professionals about what they believe enables a successful transition to the workplace. The study captured views relating to the work readiness provided by higher education curricula and graduates' assessment of the capabilities required of engineers in the workplace. The study methods were derived from the Tuning methodology. The questionnaire used was Manoliu's (2005) adaptation of the Tuning questionnaire for civil engineering. A summary of how the questions were tailored to engineering is provided in González and Wagenaar (2003).

Tuning is a higher education initiative aimed at creating diversity, cooperation, and academic exchange for European and international students and staff. Tuning methodology focuses on establishing and "tuning" student, academic, and employer reference points, and encouraging common understanding across a range of disciplines and key stakeholder groups. The Tuning process distinguishes three generic competences:

Instrumental competences: cognitive abilities, methodological abilities, technological abilities, and linguistic abilities

Interpersonal competences: individual abilities including social skills such as interaction and cooperation

Systemic competences: abilities and skills concerning whole systems; a combination of understanding, sensibility and knowledge; prior acquisition of instrumental and interpersonal competences required. (Tuning 2000).

The Tuning methodology seeks to establish reference points and to encourage convergence and common understanding across a range of university subject curricula. To accommodate both subject specialism and broader societal and employability needs, it includes generic and subject-specific competencies for discipline areas. While the Tuning process incorporates employer and professional body input, and acknowledges that industry is a key stakeholder and client, the outcomes are directed at university curricula. Utilising the Tuning methodology to inform workplace professional development helps to bring the process full cycle and to close the knowledge gap between higher education and workplace expectations and needs. Reid et al. (2011) point out that there is little information

Table 14.2 Tuning process graduate sampling (González and Wagenaar 2003, pp. 73–75)

Participant group	Sampling methodology
Graduates	A minimum of 150 graduates The graduates selected are to have graduated within the last 3–5 years The criterion of selection of the 150 graduates was at random

"regarding the relationships between graduates' expectations of working life and their employers' explicit expectations of them" (p. 54). They also recognise that a problem for both institutions and individual students is the "lack of real knowledge about the expectations and requirements of particular professions". Some of the challenges faced by these novice professionals relate to the nature of knowledge and the ways in which discipline-specific knowledge is enacted in professional practice (Reid et al. 2011, pp. 55–57). How experienced engineers view their profession through the lens of a graduate can contribute to better articulating these expectations, and supporting the transition to professional practice. The Tuning process sampling methodology is shown in Table 14.2.

An online questionnaire using the Tuning methodology was provided to participants. The Tuning sampling methodology for participant selection was derived from González and Wagenaar (2003). Responses were received from civil engineering graduates in the United States, Canada, India, and Australia. A total of 188 participants completed the questionnaire, with 74 % of participants male, and 26 % female. A screening question to identify only those respondents who had graduated from 2010 to 2015–2016 was provided. However, the data provided by respondents outside of this range provided the opportunity to examine similarities and differences in the views of experienced professionals and the new graduate target group. Table 14.3 summarises the demographic information provided by respondents.

Responses were received from those who had graduated in 1973 to those graduating in 2015–2016. The results provided views spanning 43 years. Following the Tuning process, the *New Graduates* cohort were identified as having completed an engineering degree within the last 3–5 years or the period from 2010 to 2015–2016. The *Experienced Professionals* cohort includes all others who completed the questionnaire. This group identified their graduation year as between 1973 and

Table 14.3 Summary of graduate demographic information

	New graduates	Experienced professionals	Total
Respondents	121	67	188
Years	2010–2016	1973–2009	43 years
Male	92 (76 %)	48 (72 %)	140
Female	29 (24 %)	19 (28 %)	48
Working in an engineering related field	62 (51 %)	53 (79 %)	115 (61 %)
Working in a non-engineering related field	16 (13 %)	8 (12 %)	24 (13 %)

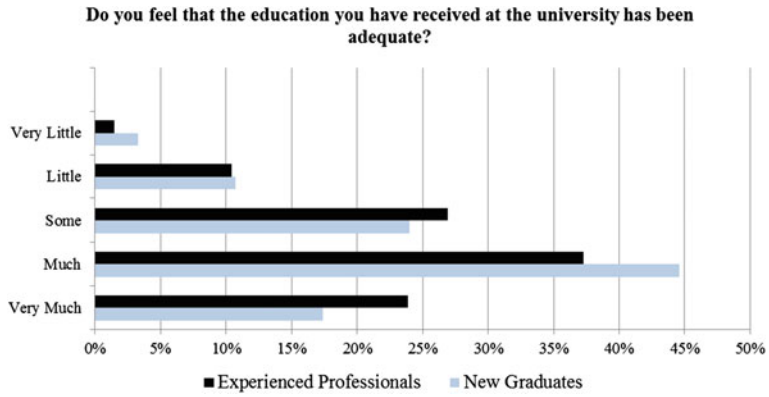
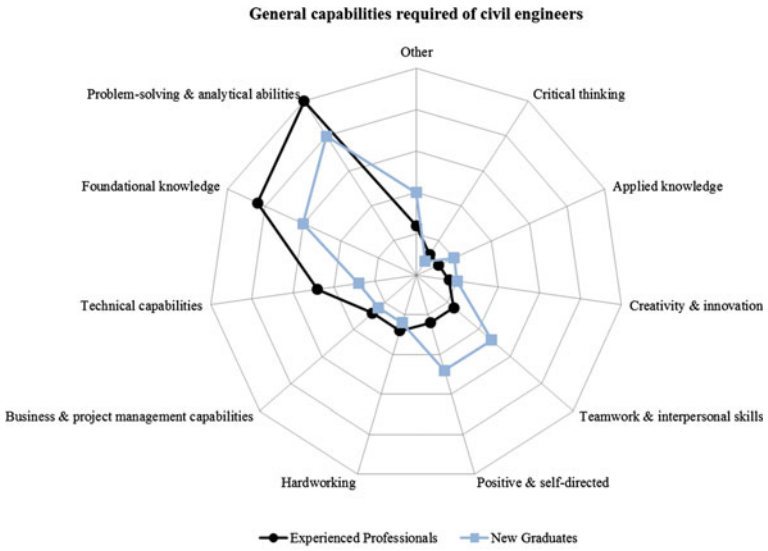


Fig. 14.3 New graduate and experienced professional views of their degree programs

2009. Respondent ages ranged from 18 (to graduate at 22) to 64. The new graduates group was comprised of 121 respondents, and there were 67 respondents in the experienced professionals group. Of the experienced professionals group, 79 % indicated they were currently working in a position related to their degree while, at 51 %, a much lower proportion of new graduates indicated they were working in an engineering-related capacity. This substantiates Palmer et al. (2015) proposal that engineering graduates are increasingly working in cognate industries. While the data obtained from the new graduate cohort presented a shortfall against the Tuning methodology, comparing viewpoints from new and experienced engineers provides a richness of information not otherwise available. Figure 14.3 illustrates the assessment of both groups about the suitability of their engineering qualification to employment in an engineering field.

There was consensus that university provides an adequate foundation for an engineering career. Participant responses indicate little significant difference in the value that new and more experienced civil engineering graduates place on their university education. The "very much" valuation results of experienced professionals presented in Fig. 14.3 may reflect that more experienced respondents are socialised into the engineering profession through seniority or career tenure and have become contributors to its knowledge base. The "much" and "very much" difference in appraisal between experienced professionals and new graduates suggests that university leavers have high expectations for a return on their degree. Matching this high expectation to those of the workplace can help mitigate the risk of unrealistic assumptions.

The Tuning graduate questionnaire requires respondents to evaluate a selection of capabilities against the level to which they are developed at university and their importance for work. Respondents are then asked to nominate and rank the five most important of these items according to their opinion. The ranking section of the questionnaire was adapted for this study to encourage respondents to freely nominate the five general capabilities they believe most important to career success in engineering (see).



General Capabilities	Experienced Professionals	New Graduates
Other	6%	10%
Critical thinking	3%	2%
Applied knowledge	3%	5%
Creativity & innovation	4%	5%
Teamwork & interpersonal skills	6%	12%
Positive & self-directed	6%	12%
Hardworking	7%	6%
Business & project management capabilities	7%	6%
Technical capabilities	12%	7%
Foundational knowledge	21%	15%
Problem-solving & analytical abilities	25%	20%

Fig. 14.4 New graduate and experienced professional views of general capabilities

Appendix 1: Tuning Questionnaire for Civil Engineering Graduates). Results were coded according to the key themes which emerged from these free-text responses. The top ten general capabilities were then prioritised according to the average percentage for each of the new graduates and experienced professionals cohorts. Figure 14.4 depicts the weighted average rating of differences and similarities in their views.

The picture that emerges is of a discipline with a strong technical and analytical nature. What also emerges is a cross-section of generational change and perhaps graphic endorsement of STEM curricular reforms to embed lifelong learning and transferable skills into the curriculum. Experienced professionals focus on balancing tool use and mental activities (Tynjälä 2008). The view from this group orients towards problem solving and analysis, foundational knowledge, and technical skills. While both groups show these are pivotal capabilities, this importance is more pronounced in experienced professionals, and is complemented by a focus on business skills such as time management, attention to quality and detail, and project management. For engineering professionals, the applied or "hard skills" required for engineering outcomes are the signature capabilities of an engineer. For

Table 14.4 Soft skills nominated by graduates

Positive and self-directed	Teamwork and interpersonal skills
Fast learner	Communication and interpersonal skills
Clear objective and perception	Multidisciplinary team work
Strength	ability to convince and Influence
Aptitude	Express ideas/thoughts clearly
Confidence	Teamwork
Learning the needs and demands	Ability to convey understanding to others
Focus	Good communication skills
Will	presentation
Effective learning	
Quick learner	
Positive attitude	
Self-motivated	
positive mindset	

experienced respondents, self-direction, teamwork and interpersonal skills, and knowledge application have likely become internalised through professional experience, and thus are not distinct from engineering practice because they are seen as baseline professionalism. This suggests that implicit and tacit knowledge contribute to situation-specific competencies, and places greater emphasis on experience-based judgements or know-how and practical wisdom. As Tynjälä (2008) points out, in workplace learning competencies are treated holistically, with no distinction between knowledge and skills.

Formal learning concentrates on mental activities. It separates knowledge and skills and produces explicit knowledge and generalised skills rather than the tacit or contextualised knowledge and situation-specific competencies of the workplace (Tynjälä 2008). New graduate responses agree with this view. They balance the technical skills with more personal and development-oriented capabilities. This distribution may reflect lack of experience in knowledge application and that, without this practical exposure, graduates concentrate on the academic and developmental aspects of their formal training. Table 14.4 lists the "soft skills" nominated by graduates which have been coded as "positive and self-directed" (12 %) and "teamwork and interpersonal skills" (12 %), and which together comprise almost a quarter of the overall capabilities they put forward.

At 20 %, "problem solving and analytical abilities" was the capability most highly rated by graduates. This agrees with Edvardsson Stiwne and Jungert (2007), who note that problem solving was considered to be significant by more than 90 % of students who responded to a capability-related questionnaire distributed to three successive cohorts of graduates from 1998, 1999, and 2000. The values articulated by new graduates also confirms Trevelyan's (2009a, b) assertion that engineering is both a technical and a social discipline. He notes that "engineers typically spend 60 % of their time on communication with other people, mainly close associates" (Trevelyan 2009a, p. 1).

While new graduate views may reflect an emerging transformative focus of engineering higher education programs (Grasso and Burkins 2010), we can also speculate that the values reflected by experienced engineers relate to the outcomes and deliverables focus of industry priorities. When asked to nominate the most important technical or specific skills required for success in an engineering career, the five main areas provided by experienced professionals constitute a taxonomy of workplace expectations for the engineering industry.

- Personal qualities
- Basic skills
- Practical skills
- Professional skills
- Interpersonal capabilities.

These competence areas generally conform to Eraut's (2009) taxonomy of the five types of knowledge provided by vocational and higher education programs: (1) theoretical knowledge, (2) methodological knowledge, (3) practical skills and techniques, (4) generic skills, and (5) general knowledge about the occupation. The distribution of these capabilities is illustrated in Fig. 14.5. This snapshot from engineering alumni suggests that "specific" has been interpreted broadly against aptitude, technical grounding, and professionalism. Problem solving and analysis thus emerge as capabilities specifically required by an engineering professional and are found in both Fig. 14.4 as a generic capability, and in Fig. 14.5 as a capability

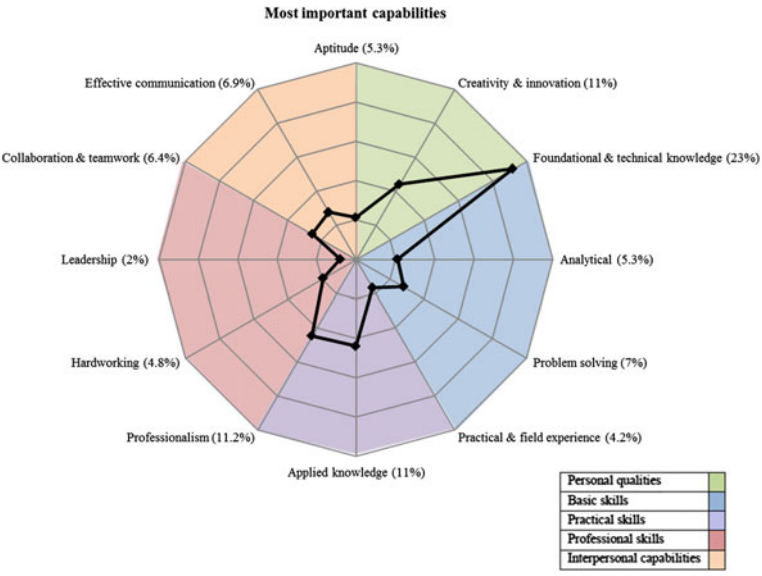


Fig. 14.5 Most important technical and specific capabilities nominated by experienced professionals

Table 14.5 Areas of competence nominated by experienced engineering professionals

Competence area	Individual capability	Percentage	Total (%)
Personal qualities	Aptitude	5.3	16.3
	Creativity and innovation	11	
Basic skills	Foundational and technical knowledge	23	35
	Analytical and investigative	5.3	
	Problem solving	7	
Practical skills	Practical and field experience	4.2	15.2
	Applied knowledge	11	
Professional skills	Professionalism	11.2	18
	Hardworking	4.8	
	Leadership	2	
Interpersonal skills	Collaboration and teamwork	6.4	13.3
	Effective communication	6.9	

specific to engineering. Table 14.5 lists the weighted average rating of individual capabilities that constitute each of the competency areas represented in Fig. 14.5.

While aptitude may seem to be a contentious choice, Hettich (2010, p. 99) observes that mastery of a work environment is heavily influenced by the values, beliefs, and experiences a graduate brings to the workplace. The closer the match of the graduate's "attitudes, expectations, and breaking-in-skills (e.g., work ethic, willingness to learn, flexibility)" the greater the overall chance of success in the domain. New graduates also include aptitude in their highly ranked positive and self-directed skills set.

Professional engineers clearly value the basic skills of engineering, professionalism, and aptitude in their new employees. The traditional engineering capabilities of problem solving, an analytical and investigative mindset, and strong technical skills occupy 35 % of their nominated expectations. At 18 %, professionalism—as evidenced by hard work, quality outcomes, punctuality, and the ability to lead a project or team—is the next most important competence they seek. The emphasis on practical and applied knowledge indicates that preparation for the workplace in the form of experiential learning and work placements is credited by industry.

Implications

"Schools are supposed to be stopovers in life, not ends in themselves. The information, skills, and understandings they offer are knowledge-to-go. Not just to use on site" (Perkins and Salomon 2012, p. 248). Holton and Naquin (2001) highlight that successful higher education and workplace practices are fundamentally different. Hettich (2007) refers to this as the "paradox of preparation", meaning that while the foundational knowledge or skills acquired in college or university are

important to professional success, the workplace processes that utilise this knowledge do not correspond to university success processes. Skills for workplace success include professional skills such as interfacing with clients, working well with project teams, and pitching ideas to senior management. Hays and Clements (2012) observe that, "the period between study and career is understood as a hiatus and appears to be treated by both university and organisations as a no man's land, with neither necessarily having the responsibility, resources, or mechanisms to work in the transition space" (p. 4). According to Wood and Solomonides (2008), transitions between study and work can be conceptualised as "risk management points". These transitions offer opportunities for education and the workplace to embed risk mitigation techniques and activities in curricular and workplace development program design. When combined with the transition model of Bridges (2003) and Taylor et al. (2007), these risk points highlight opportunities for greater curricular and learning design reciprocity between higher education and the workplace. Leveraging these opportunities may help counter theory-practice divide polarity and encourage curricular models that better accommodate learning across the work lifespan.

Implications for Higher Education

University curricular reform is influencing change in support of transitions across the learning and work lifespan—from school to university, to the workplace. One effort that closely aligns with the industry needs demonstrated by experienced professionals' responses to the Tuning civil engineering questionnaire is the CDIO. The CDIO (Conceive, Design, Implement, Operate) Initiative (2004) emerged from industry-diagnosed gaps in graduate capability and Accreditation Board of Engineering and Technology (ABET) expectations. The CDIO syllabus consists of four key areas: (1) disciplinary knowledge and reasoning; (2) personal and professional skills and attributes; (3) interpersonal skills: teamwork and communication; and (4) conceiving, designing, implementing, and operating (CDIO) systems in the enterprise, societal, and environmental context—the innovation process (Crawley et al. 2014, p. 18). Ability to work on a team, awareness of workplace expectations, and the ability to communicate are three key employer dilemmas that Katz (1993) identifies from engineering supervisors. Many of her recommendations are implemented in university group and team activities that focus on problem identification and solutions, internships, work experience and capstone programs, and on presentation and communication skills. Hettich (2007) recommends a selection of strategies to guide student preparedness for entering the workforce. These include: examining their attitudes towards work and peers, critically examining activities and tasks for transferrable skills, reflective practice, and seeking mentorship or job-shadowing opportunities.

In noting the increasing diversity of higher education curricula, Gibbons et al. (1994) signal a need for greater emphasis on industry partnerships and co-creation

of curricula. This can be accomplished through work placements, capstone courses, and encouraging industry specialists to present, lecture, or co-teach university curricula. These efforts help underpin the notion of a "managed transition" from formal education, and integrate with work-lifespan thinking and lifelong learning.

Implications for the Workplace

Candy and Crebert (1991) emphasise that "formal education occupies only a small proportion of the learning continuum, that most people complete their formal education early in their lives in a relatively short period, and that most learning experiences actually take place outside the educational institution" (p. 571). With cost and time-to-competency as organisational drivers, implications for the workplace relate to how new starters are onboarded, integrated into teams, and developed through work activities. The 70:20:10 (70:20:10 Forum 2016) is a popular organisational development training model. It recommends balancing workplace development activities according to a delivery methodology of allocating 70 % to development through experiential learning—work activities and "stretch" tasks; 20 % to social learning—coaching or mentoring; and 10 % to formal classroom, eLearning, or training activities. Tynjälä (2008) reminds us of the contextual nature of workplace learning. She notes that "in order to be a true expert in working life one has to develop situation-specific forms of competence, and this is possible only in authentic situations. On the other hand, situation-specific learning by itself may be very limiting. Something learnt in one situation is not easily transferred to another type of situation" (Tynjälä 2008, p. 133). Hettich (2010) asks: "What particular academic and non-academic activities contribute most to a successful transition and in what types of work environments?" (p. 107) Eraut (2007) offers in response a taxonomy of workplace learning processes: (1) work processes with learning as a by-product, such as working in teams, tackling stretch tasks, and solving problems; (2) learning located within the workplace through asking

Table 14.6 Workplace learning processes (Eraut 2007)

Work processes with learning as a by-product	Learning actions located within work or learning processes	Learning experiences at or near the workplace
Participating in group processes Working alongside others Consultation Tackling challenging tasks and roles Solving problems Trying things out Consolidating, extending, and refining skill	Asking questions Listening Observing Getting information Learning from mistakes Reflecting Locating resource people Giving and receiving feedback	Being supervised Being coached Being mentored Shadowing Visiting other sites Studying based on individual needs/planning Going to conferences Taking courses

questions, observing, reflecting, or learning from errors; and (3) learning experiences at the workplace, for example being supervised or coached. Table 14.6 shows these workplace learning activities.

These processes contribute to a transition curriculum model to accommodate the roles and needs of students and the workplace. The model is presented in Fig. 14.6. It acknowledges the different forms of knowledge used in educational settings and in workplace settings, and suggests a number of work readiness and early career activities to improve successful beginning and ending transition points from higher education to work.

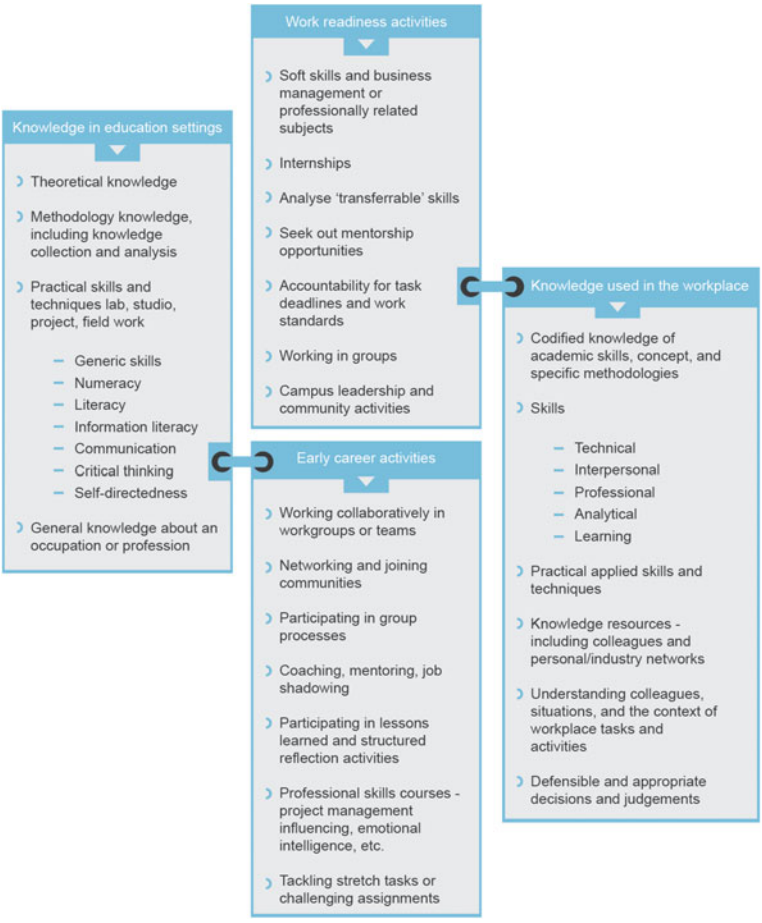


Fig. 14.6 Knowledge used in academia and the workplace (adapted from Eraut 2009; Taylor et al. 2007; Hettich 2007; Landrum et al. 2010)

Although presented as a model, Fig. 14.6 serves more as a heuristic for transitioning graduates to the workplace and for developing career starters. It acknowledges that formal education settings have a preparatory function in developing the theoretical and methodological foundation for students' nominated career paths, and in providing general knowledge about these professions. Formal education also plays a significant foundational role in preparing students for their chosen professions through providing basic practical skills and techniques such as laboratory, project, and field work, and via activities that develop individual and interpersonal dimensions. Work-readiness activities specifically designed to support the transition to the workplace might combine internships and work-based learning (WBL) undertaken in partnership with organisations; courses co-created and delivered with industry; and subjects delivered using workplace paradigms of project management, reports, and presentations. These techniques are already being implemented in higher education through guest speakers, work placements, and work-oriented forms of assessment. For the workplace, participating in internship programs and engagement with educational settings creates industry presence and supports talent pipelines.

Bariletti (2015) writes that the technology giant Google's onboarding processes include "practice-based learning and cognitive apprenticeships, to foster long-term connections between employees". This indicates that organisations are implementing workplace parallels of the university First Year Experience (FYE) programs that typically provide a week-long orientation to university life, and academic awareness and support activities across the first academic year. For the workplace, onboarding and these "professional" year programs provide opportunities to support the transition into the workplace, and encourage employee retention.

Conclusion

Theoretical models of transition points across the developmental and career lifespan provide greater awareness of the continuity of learning experiences. They also help identify boundaries of knowledge transfer to extend a richer understanding of lifelong learning and how these transitions affect ongoing personal development. This has positive implications for curricular and developmental thinking that span higher education and the transition to the work phase of careers. From the viewpoint of lifelong learning, this may also mean we need to better understand how the concept of "apprentices" changes across school, university, and stages of the career and professional journey. Educational work-readiness programs, internships or "professional year" programs, and workplace onboarding suggest this is already under way. While these activities emulate the workplace and provide authentic activities and tasks, much remains to be done on creating more effective university and workplace education and development models that more fully leverage these transitions across the learning and work lifespan. Ideally, the outcome of these efforts will progress an integrative and connective pedagogy between educational

institutions and organisations (Tynjälä 2008). It is also likely that "increasing co-operation between education and work, and new forms of work based learning (WBL) will change the nature of learning in both contexts and may create entirely new kinds of learning opportunities" Tynjälä (2008, p. 133).

Appendix 1: Tuning Questionnaire for Civil Engineering Graduates

Note: The civil engineering specific questions in Part II and Part III of this questionnaire have been adapted for the purposes of this research from a report developed by Manoliu (2005), and summarised in Gonzélez and Wagenaar (2003).

Background Information

1. Age in years:
2. Gender:

   (1) Male
   (2) Female

3. Year in which you graduated:
4. Title of your first degree (in the national language):
5. Present employment situation:

   (1) Working in a position related to your degree
   (2) Working in a position not related to your degree
   (3) Further study
   (4) Looking for your first job
   (5) Unemployed, but have previously been employed
   (6) Neither employed nor looking for employment
   (7) Other (please specify):

6. Do you feel that the education you have received at the university has been adequate?

   (1) Very much
   (2) Much
   (3) Some
   (4) Little
   (5) Very little

7. How would you rate the employment potential of your degree?

   (1) Very poor
   (2) Poor
   (3) Fair
   (4) Good
   (5) Very Good

Generic Skills

For each of the skills listed below, please estimate:

- the level to which each skill or capability is important to an engineering degree programme at your university;
- the importance of the skill or capability, in your opinion, for work in the engineering profession.

The blank spaces may be used to indicate any other skills that you consider important but which do not appear on the list.

Please use the following scale:
1 = none; 2 = weak; 3 = considerable; 4 = strong.

Skill/capability	Level to which developed by University degree	Importance for work
	1 2 3 4	1 2 3 4

1. Capacity for analysis and synthesis
2. Capacity for applying knowledge in practice
3. Planning and time management
4. Basic general knowledge in the field of study
5. Grounding in basic knowledge of the profession in practice
6. Oral and written communication in your native language
7. Knowledge of a second language
8. Elementary computing skills
9. Research skills
10. Capacity to learn

11. Information management skills (ability to retrieve and analyse information from different sources)
12. Critical and self-critical abilities
13. Capacity to adapt to new situations
14. Capacity for generating new ideas (creativity)
15. Problem solving
16. Decision-making
17. Teamwork
18. Interpersonal skills
19. Leadership
20. Ability to work in an interdisciplinary team
21. Ability to communicate with non-experts (in the field)
22. Appreciation of diversity and multiculturality
23. Ability to work in an international context
24. Understanding of cultures and customs of other countries
25. Ability to work autonomously
26. Project design and management
27. Initiative and entrepreneurial spirit
28. Ethical commitment
29. Concern for quality
30. Will to succeed
31. <free text>
32. <free text>
33. <free text>

In your opinion, what are the three to five (3–5) most important general capabilities required for engineering? Please enter your choices below.

1. .....
2. .....
3. .....
4. .....
5. .....

Specific Skills

For each of the skills listed below, please estimate:

- the level to which each skill or capability is important to an engineering degree programme at your university;
- the importance of the skill or capability, in your opinion, for work in the engineering profession.

The blank spaces may be used to indicate any other skills that you consider important but which do not appear on the list.

Please use the following scale:
1 = none; 2 = weak; 3 = considerable; 4 = strong.

Skill/capability	Level to which developed by University degree				Importance for work			
	1	2	3	4	1	2	3	4

1. An ability to apply knowledge of mathematics and other basic subjects
2. An ability to use knowledge of mechanics, applied mechanics and of other core subjects relevant to civil engineering
3. An ability to design a system or a component to meet desired needs
4. An ability to identify, formulate and solve common civil engineering problems
5. An ability to identify, formulate and solve complex civil engineering problems
6. An understanding of the interaction between technical and environmental issues and ability to design and construct environmentally friendly civil engineering works
7. An ability to design and conduct experiments, as well as analyse and interpret data
8. An ability to identify research needs and necessary resource
9. An ability to use the techniques, skills and modern engineering tools, including IT, necessary for engineering practice
10. An ability to apply knowledge in a specialized area related to civil engineering
11. An understanding of the elements of project and construction management of common civil engineering works
12. An understanding of the elements of project and construction management of complex civil engineering works
13. An understanding of professional and ethical responsibility of civil engineers
14. An understanding of the impact of solutions for civil engineering works in a global and societal context
15. An ability to communicate effectively

16. An understanding of the role of the leader and leadership principles and attitudes
17. A recognition of the need for, and the ability to engage in, life-long learning
18. An ability to function in multi-disciplinary teams
19. <free text>
20. <free text>
21. <free text>

In your opinion, what are the three to five (3–5) most important technical or specific skills required for engineering? Please enter your choices below.

1. .....
2. .....
3. .....
4. .....
5. .....

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Part IV
The Whole Journey

Chapter 15
Success at University: The Student Perspective

Oliver Hannon, Lisa Roisin Smith and Giang Lã

Abstract Most of the chapters in this book are written by academics and university administrators—even a Vice-Chancellor. This chapter is different—it is written by students based on interviews with fellow students and presents our analysis of their ideas about what success means to them. From a personal point of view, in the authors' households it was expected that we attend university after completing high school, ideally without a gap year. Coming from families of educated parents, study was discussed as "a given". We agree that this manifested as a form of both pressure as well as support during different times of the decision, application, and enrolment processes. However, that is not to say we did not feel our own desire to attend university. Despite very different events throughout our high school education and upbringing, very similar motivating forces emerged that would drive us to eventually end up in business-related degrees with comparable ambitions for the future. Success is something that, as a concept, remains universal in its appeal and motivation for attainment, whilst seeming consistently to lack definition. Depending on background, subject matter, and level of previous achievement or personal benchmark for performance of an individual, one person's definition and perception of success can greatly differ from another's. It is this nature that makes the concept both difficult to write about, and yet, intriguing and appealing to analyse theoretically. We have thought deeply about what success means to us and we describe our reflections later in this chapter. We start with the opinions of our fellow students.

Keywords Student perspective · Undergraduate research

O. Hannon · L.R. Smith (✉) · G. Lã
Macquarie University, Sydney, Australia
e-mail: lisa.smith4@students.mq.edu.au

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Background

We designed questions based on our ideas of success as well as extensive discussions among ourselves and with peers. We wanted to ensure that we covered all aspects of success that a student may have at university. Faculty members assisted us to write an ethics application so that we could record and use information from fellow students.

We conducted interviews with both randomly selected and personally known undergraduate students around the Macquarie University campus and its study areas. In total, 57 interviews were conducted with students from first year to final year, including master's. There were students from commerce, arts, education, law, science, and psychology.

After consenting to be interviewed and the necessary exchange of project information, the students were identified by their degree and year of study. The interviews were recorded and they were asked a series of open-ended questions to which they could respond and elaborate as much as they liked. The questions were centred on the respondent's personal achievements, goals, role models, and university experience in order to invoke insight into the concept of success within, as well as outside, a tertiary education context.

1. What is your greatest achievement/success or what is it that you are most proud of?
2. Who is someone that you look up to or constitute as successful and why?
3. What is the greatest signifier of success to you personally?
4. How do you think university/education will help you to achieve success?
5. What does success at university look like to you?
6. Would you say, at this point in time, you are successful?

Following the interviews, the transcripts were analysed by the authors and several themes emerged. Respondents often found it problematic to clearly articulate their ideas, including the concept itself and what it means to be successful, the rationale behind their choice to study at university, as well as what education meant to them. Students are busy with the process of studying and getting on with their lives (sport, family, employment, and travel) and may not have reflected on the outcome. We suspected that the interview itself and thinking about success could change the way the participants think about their studies.

What Is Success to Current Students?

We found that some students struggled to articulate their ideas about success whereas others were able to articulate their motivations and how their conception of success had changed.

I think it's changed in recent years. I grew up in the country and I think I grew up with – my dad was a farmer – and I think with my childhood I often saw success more with money, and I was very good at saving money, and I didn't like spending money. I think that success for me was to save a lot of money and to be able to buy tangible things like a house, or save up for a car, things like that. As I've got older, as I've moved to Sydney, I think I need a lot less than I thought and I would probably consider other experiences as being worthy of things to spend my money on. Like travel, just enjoying things day to day, like going to a café and spending money in that way. So I think in terms of that, I'd probably more see success now as having a happy life. I think previously I probably thought all those things contributed to a happy life, making money, being able to buy tangible things. Now I see you can do that in other ways. (Speaker details not disclosed)

For many students, success was a balance between work and family. Family and friends were a key contributor to success.

I define success as maintaining a good relationship with families and friends, as well as achievements in jobs and careers. I think being successful is a balance between families and careers overall. (Speaker details not disclosed)

But in my opinion … the highest level of success should be the combination of both, so you should have a successful career, a successful personal life, and you should have a happy family that looks after you, supports you in your career life, and to achieve what you really want in life. (Speaker details not disclosed)

I'm most proud of raising three children, who are very different, who have achieved in different ways, but, essentially, are very good people. (Education, 2nd year)

Happiness was a key theme throughout the interviews. Students want to be happy.

My definition of success is – I can enjoy every moment of my life. Every morning when I wake up, I appreciate that today, I have one more day to live, to love. And I hope that my success – when I feel happy, every day when I smile, it's very simple that when people see me feel happy, and they feel happy.

Students were very proud of their achievements at university and even being accepted was seen as a key achievement in their life.

Getting into uni. Because I really struggled at school, and I thought that I wouldn't be able to get high enough marks to get into uni. Somehow, I managed, and I got the degree that I wanted. I'm really proud of myself for that. (Criminology, 2nd year)

My greatest achievement so far is having completed and passed 1st year of university. (Business Administration, 1st year)

My greatest achievement is making it to my final semester. Haven't really been the most diligent student and I can now see a qualification in sight. (Commerce, 4th year)

My greatest achievement is making it this far frankly. I had a severely disrupted year 12 and didn't think I'd really go on to start working again and go to university. (Accounting, 1st year)

I think I'm proud of – I wasn't really very good at English, I didn't think that I wanted to come to Australia to study, I was thinking I'm just going to graduate from high school in Vietnam, get into a university in Vietnam, graduate and find any job. But then my dad, the one who inspired me, he would say, 'Okay, I want you to go to Australia to study.' I would

> say, 'Dad, my English is really sad. How can I do it?' 'You can start right now.' So I started to study, really study, English. (Speaker details not disclosed)

Very few students talked about the love of learning or finding that their degree opened up their minds. The majority were looking for a satisfying job and a work/life balance. Here are quotes from two of the few who raised this, and it is interesting to note that one is a master's student and the other a final year student. Perhaps it is difficult early in your undergraduate degree to appreciate knowledge for its own sake; maybe you need to be in employment or have confidence that you will pass to have that security.

> I do have a job but I am enjoying extending my knowledge in my profession. (Commerce, Master's)

> I find attending and completing university to be an extremely great achievement in my life. Allowing myself to be open to learning about things that I am interested in has contributed positively intellectually towards my future. (Media, 3rd year)

Speaking with less experienced, younger or first year students at an undergraduate level revealed a certain consistency in their views on success. A general sense of humility emerged from most respondents in the interviews, with the majority at least alluding to an appreciation of a certain level of inexperience, as well as admiring other individuals for the examples that they set or acting as role models to others who are still learning.

The honesty in some more self-questioning interviewees was refreshing in the sense that it resembled a personally held and very validating perception of success, academically or otherwise. Whilst it is recognised that students in the later years of undergraduate tertiary study have "runs on the board" that are indicative of at least some forms of success or achievement, we suggest that people may have a tendency to perceive inadequacies far more easily, as well as admire the successes of others more substantially. Perhaps this is commonplace at such a stage in personal development, as the majority of these interviews seem to suggest. Perhaps it may even be characteristic of a lot more people generally than is given credit for, with a majority of the public possessing an unexpected level of humility.

> Given my age at the moment [20], I think I'm quite a successful person because I do have a loving family – my parents really look after me, support me in everything that I want to do, I have a really caring brother that understand me; and also I have quite a good result so far for my studying, which is the more important thing at the moment. And then I have a few friends, like my friendship. Even I go study abroad and then I still have good relationship with my close friend back in my country. I also make a lot of new friends in the new country that I'm studying now, which is Australia. So I guess it should be consider as successful. (Speaker details not disclosed)

Several students considered feats such as sporting and out-of-comfort-zone experiences.

> My greatest achievement so far has been bungee jumping 134 m into a canyon even though I didn't want to at all. (Anthropology, 2nd year, UK exchange student)

From a university point of view, these ideas of success suggest that the university should offer a range of experiences for students to feel successful. Some will find academic success, for others sport or travel, and there will always be a need to create a sense of belonging and support, particularly for those who study far from their homes.

Role Models

Participants were asked who they looked up to or who they considered as successful. There was a wide range of responses including parents, music stars, entrepreneurs (such as Steve Jobs), religious figures, and political figures. There was some evidence that women selected female role models and males chose men, as well as students identifying most with those of a similar cultural background, which suggests that it is important for university lecturers to use a wide range of role examples for their students.

> Joan of Arc is an inspiring figure in history that I've always admired because she was a woman and I can identify with that, but also because she had something she believed in really strongly and she was able to convince a lot of people … to have that drive and success I think was really cool. (Marketing and Media, 3rd Year)

> I look up to my Dad the most because he is the hardest working person I know. He's had some of the most amazing accomplishments in his profession but has given everything to his family. He's the most humble and upstanding person I know and that is worth more than any type of worldly success. (Speech & Hearing Science, 3rd Year)

> Someone I would constitute as successful is my father. He honestly came from nothing and came to Australia to build a life for my family and I and he's done an incredible job. I think he's the best person in my life and I'm always proud to call him my father. (Media, 2nd year)

> My Mum, because she moved out of home and moved to a different country when she was in her early 20 s, and then she's done well with her job, and is always trying harder and going for things even if they're really hard, even if you don't achieve it. (Speaker details not disclosed)

> Julie Bishop. Because I want to be Foreign Minister. Because she's awesome. She's just a female in politics, and I find that very powerful. I just find her really powerful as a woman. (Criminology, 2nd year)

> Highly successful young people in business like the Atlassian guys. [See https://www.atlassian.com] (Business Administration, 1st year)

> Eddie Huang [lawyer, restaurateur, novelist], because he's using his [Taiwanese] culture with American culture and getting American people to connect with the minority that is his culture. (Speaker details not disclosed)

Reason for Study

Participants indicated that university and tertiary education becomes an appealing (not only "sensible") option in the transition from being a high school student to being a young adult who is a productive member of society. Data from the interviews were corroborated by our own personal experience with friends and family.

> I'm not really sure if university or an extended education will mean that I will necessarily be successful but I'm not sure what I would be doing otherwise. Plus, my parents really encouraged me to go to university if I didn't have any other ideas. (Commerce, 1st Year)

> I wasn't really sure about what I wanted to do with my career, so that's partly why I took a double degree. (Arts/Law, 3rd Year).

It is expected that you go to university and your parents support this decision. Even though one third of students at our university are the first in their family to go to university, our respondents all said that it was expected that they would go if they could gain a place.

How Do You Think University/Education Will Help You to Achieve Success?

All respondents agreed that university will help them achieve success. Obviously these are students who are currently studying, so therefore are choosing to stay because they believe that study will lead to rewards. The majority felt that university was a requirement for a better job and a more secure future. A few students commented on the knowledge and personal growth that university afforded them.

> I think it will help me become a more focused individual, and allow me to find what I am passionate about, and figure out the best way to pursue and grow in that passion. I think it will allow me to consider viewpoints and angles on certain topics that I would otherwise not have thought of. (Psychology, 1st year)

What Does Success at University Look Like to You?

To this group of respondents, success at university was passing the subjects, completing the program, and graduating.

> I am happy I just finish third year. English is a second language so I find some subjects difficult to understand. (Marketing, 3rd year)

As Table 15.1 shows, the vast majority saw university success as a necessary prerequisite to a "dream job", a stepping stone to a secure future. The respondents were looking to improve their life and their family outcomes. Many students are

Table 15.1 Student survey, Question 5

Q5. What does success at university look like to you?	# of responses	Example quote
Career/dream job/security	20	I need qualifications to follow my dream job
Stepping stone/open opportunities	11	Massive stepping stone
Knowledge/growth as a person	10	Learn new things, achieve a higher level of personal success
Family/happiness/social	8	Coming to uni, socialising, meeting different people
Live in Australia	2	Having a better life in Australia in a great university

from migrant backgrounds, or studying in Australia in order to migrate to this country. The responses demonstrate the need to succeed for the majority of students. Their families have made sacrifices to send them to university and the expectation is a more secure and fulfilled future for themselves and their families.

Are You Successful Now?

Students were asked if they felt that they were successful at this point in time. Around 20 (one third of respondents) stated that they were not successful and one student said "not happy, stressed, not satisfied"; however, two thirds of the students were happy with their progress and felt that their university results had helped them feel successful.

> Yes I guess for me, I am successful so far in a way that I'm happy with what I've done. But it's been a struggle. (Commerce, 4th year)

> I feel very successful right now – I have enjoyed my course and am excited for the future. I feel fulfilled if anything. (Psychology, 2nd year)

> I am pleased with my success at this time – I have received a good GPA and I've been able to take advantage of awesome opportunities like exchange. (Commerce, 3rd year)

Of those who did not feel successful, the majority stated that they were too young to be successful, that they needed the experience that comes with age. A few questioned their choice of university study.

> I would say that I am not really that successful because I am not sure what I want to do with myself. I'm thinking maybe I should take a gap year next year to be honest. (Commerce, 1st year)

Comments from students are important for universities as we need to be aware of the different responses of students to their environment and themselves. If one third of students do not feel successful, what can we do to improve their outcomes and

their perceptions of self? Gigliotti (Chap. 6) and Farrell (Chap. 8) discuss interventions for students with this perception.

We now discuss our own personal ideas of success. These have become deeper after talking to all the respondents.

What Success Means to the Authors

Oliver

I feel that a sense of success comes about with a sense of ownership—the possession of some property, record, or result, perhaps intellectual or creative, that required a significant level of effort to attain and in which one takes pride. There is no necessity for external recognition from others, only the very intimate feeling of fulfilment that comes with placing importance on something and dedicating valuable time to bringing it to fruition. Based on this thinking, university or some course in education as a whole could fall under such a criterion—for me. However, the decision to take part in tertiary education should ideally indicate some level of desire for learning in the student, meaning that it is their intention to "succeed" to the best of their ability—that is to say, that they intend to put in a level of sufficient effort or attain a level of achievement that reflects their feelings towards completion and they ultimately see that as an objective.

Comparing my attitude to my peers, a lot of respondents seemed to feel somewhat indifferent to their education and other past or present academic pursuits at the time of interviewing. Such an inclination could be interpreted (as young adolescents with similarly questionable feelings towards the future and potential professional careers) as being that many undergraduate students are unsure of what is ahead and of what they truly value in such a pivotal point in their development. This then suggests that "success" is indeed very relative, as well as constantly reviewed by many individuals at such a time—that is to say, that it is not clear or easily solidified before or even during a time of formal tertiary education for some. For this reason, success as a measure becomes very hard to quantify or evaluate, and the best procedure for its attainment becomes impossible to simply state. Around one third of students at my university are the first in their family to go to university and perhaps my supportive and knowledgeable family background has allowed me to be clearer about success as I have seen it in my family.

As a student of business with a lifelong love for the creative arts, I have always been conflicted about how I am to generate and measure my success—especially moving into adolescence and the lead-up to tertiary study. On the one hand, having

a keen interest in commerce and the law led to an expectation in myself to innovate in an area such as technology, or even make significant societal change through some form of political leadership. However, my passion for performance, storytelling, and visual art has only fed a desire to pursue a diverse body of work that challenges individuals across the world to think and consider some of the abstract ideas I am so interested in exploring.

By my aforementioned framework for success, the latter option becomes the more obviously quantifiable measure within one's individual accomplishments. Simply a name on a range of achievements or creations would allow a straightforward measure that is, in some ways, more superficial than one that results in less obvious credit to be given to a small piece working behind the scenes. This may even include significant achievements or successes within tertiary study to some degree, as explored by the respondents—by accumulating accreditations, honours, and even grades from institutionalised education, success can easily be seen on paper.

> Success at university looks different to everyone, I think. To me, right now, it may be consistently high grades and entry into Honours, as I've been so anxious about for three years. (Psychology Hons, 4th Year).

However, in some sense, this is something I have felt cynical towards in the past—the fact that in some areas and certain situations, the record of some act or achievement is more important than the act itself. This line of thinking, again, draws parallels to my rationale that success remains relative and innately hard to standardise into a definition. To some, simply getting through the day or completing minute, even seemingly meaningless tasks in the grand scheme of things, could be considered a great success. Even with no evident reward or accolades to show for it.

Lisa

I personally believe that happiness and success go hand in hand. Happiness is an overall enjoyment of living, being confident in your body, and believing in your own ideas and values. I believe it takes a matter of time and commitment to achieve success and that it is a personal thing to accomplish, no person's success is the same. While people might believe that success is to do with wealth or looking at a monetary approach, in my opinion this is not wrong; however, I believe there are a few other factors to consider in order to become successful. Wealth to me is not being rich and famous, but more a financial figure that allows an individual to spend their disposable income on goods and services that enable happiness. In order to achieve such wealth, I believe that a tertiary education is needed, whether it is at university, college, or other training institution. For certain careers it is a

requirement; so to be successful, people who wish to be in these careers will need to engage in some level of tertiary education.

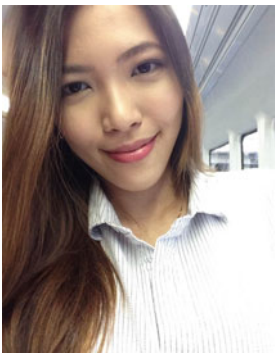
Other factors that contribute to success other than a financial gain are relationships, health, and achieving personal goals. I believe health is a definite factor of a person's happiness, which will in turn lead to their success. Health to me is eating a balanced diet, keeping active, and maintaining mental health through positive relationships. This will not only minimise the burden of health issues such as cardiovascular disease, obesity, or even depression, but allow you to be happy and confident in your body. This is not to say that if an individual were to have such health issues they are not successful, but rather these individuals will need to develop a different approach, as not everyone's path to success is the same.

In terms of mental health, relationships I believe are a necessity to people's happiness. People have relationships with their parents, partners, children, friends, and work colleagues. Stress in the home, work, and other environments needs to be managed and minimised, which will lead to enhanced relationships and a more enjoyable environment for everyone. Relationships are not always going to be positive all the time, they will fluctuate; but it is how the people in the relationship manage a situation that enables the relationship to either cease or flourish.

I also believe that to become successful it is important to set realistic goals for yourself and work to achieve them. Individuals set different goals that suit their lifestyle and aspirations. It might be getting up earlier in the morning or becoming a CEO in a company. As long as the individual believes that they have achieved their goals to the best of their ability, and are content with the level they have achieved, then this to me is being successful.

Lastly success to me is not dependent on age. You could be 10, 100, or anything in between and still be successful. Also if you are successful now this does not automatically mean that you will be successful forever. Situations can change and it's the way that individuals respond to these changed situations that will determine whether or not an individual will continue to be successful.

Giang



I believe that the perception of success does not always stay the same forever. The older we get the more personal and intuitive our definition of success will become. As we grow up and have clearer ideas of what we want in life day by day, we may view success today differently from yesterday.

As for me, my perspective toward what is seen as successful has constantly altered as I have grown older and encountered more life-changing events.

Being born into a family which has traditionally always valued education, I used to believe that success

was being able to reach the highest level of education which I possibly could and receive the highest marks in all the tests. However, after I came to Australia to study at the age of 16 without family or friends, I did not see success solely as such anymore. During that earlier time in Australia, I was lost and lonely. I could not feel a sense of belonging in a school where the majority of the students were non-Asians and had already formed their own group of friends for years. At that time, I was frequently getting the top marks, but did not feel successful. I wanted more than just good grades. I wanted to stop being a nerd whose "best friends" were mathematics homework and textbooks. I wanted to fit in. My perspective towards success was reshaped as not only achieving academic excellence but also having a fulfilling social life.

Now when I have finally assimilated myself within Australian culture, made lots of amazing friends, and have a degree, I redefine what is called success to me once again. I have been thinking a lot lately about a stable life with an enjoyable job and a small family of my own. I find it essential, as well as exciting, to build up a family with someone in whom I can entirely place my trust, who will laugh with me, cry for me, and be loyal and supportive to me. Since my lifetime goals seem to have changed, the meaning of success has therefore evolved into another form in my mind.

Perhaps I can say that finishing my master's degree well, getting a decent job, and most importantly having a happy family of my own, are what it takes for me to see myself as "successful" now.

Conclusion

Happiness was the strongest theme through the interviews. Students saw success as happiness—friends, family, dream jobs, financial security—all of these contributed to their idea of success. Only one of us as authors talked about health as an important factor in success and the necessity to work at this to maintain it. As we acknowledged at the beginning, conducting the interviews may have influenced the interviewee's responses, and also our own.

Having heard the reflections of other students, Lisa reflected on the importance of mental health and its contribution to success, confidence, and happiness. Perhaps this is what the respondents were referring to when they talked about friends and supportive families and that, to them, success was happiness.

> I think success is something that allows you to do whatever you want in life, so it can be a successful career or a successful personal life. But in my opinion, if it's the highest level of success it should be the combination of both, so you should have a successful career, a successful personal life, and you should have a happy family that looks after you, supports you in your career life, and to achieve what you really want in life. (Speaker details not disclosed)

What should universities' response be to the perceptions of success of students? All entities in the university environment, student respondents and academics alike, seem to acknowledge the importance of happiness and a sense of life balance and, thus, fulfilment. It was uncommon to find someone who prioritised monetary wealth or material success over human connection and personal achievement; a very positive outcome to find in what is a results-driven and very professional environment such as business and education. However, as participants in such a system, we all feel a pull in the direction of success—and rightly so. It feels good to achieve, and a goal-setting attitude is a healthy driving force within the human condition. However, interestingly, there is still a very innate pressure underlying a lot of participants' responses regarding their motivations for study—all authors included.

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Chapter 16
Academic Literacy Support: Teaching Along the Continuum

Tessa Green, Joshua Dymock and Carol Floyd

Abstract The widening participation agenda and the growing numbers of international students has led to a growing need for centralised academic language and learning (ALL) support for students in Australian universities. One of the challenges that these units face is providing equitable and sustainable models of academic literacy assistance across the university. Support situated within the disciplines is widely espoused in the literature but can lead to inequities, with some students receiving extensive support and others receiving very little. One relatively small ALL unit has addressed this challenge by working within the generic-to-embedded support continuum. On the generic end are academic skills workshops and generic online access materials, while activities at the embedded-literacy end include collaborations with departmental staff to offer targeted activities to improve students' academic literacy skills. In between, discipline-specific online materials and individual consultations bridge the gap by addressing the concerns of specific disciplines and specific assignments. This strategy aims to provide support that is both effective and equitable, allowing students to access a range of support throughout their academic journey.

Keywords Academic literacy · Program implementation

Background

Australian universities have traditionally attracted a relatively small pool of students, most of whom were likely to have grown up in households that privileged literacy, and they were thus assumed to be commencing their studies with a high level of competence in the required academic skills. Over recent decades, higher education policy has deliberately targeted an increased proportion of students from backgrounds that previously would have made them unlikely to attend university.

T. Green · J. Dymock · C. Floyd (✉)
Macquarie University, Sydney, Australia
e-mail: carol.floyd@mq.edu.au

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These groups include students from low socio-economic backgrounds, those who are the first in their family to attend university, Indigenous students, students from regional and remote areas, and those from non-English speaking backgrounds. Such students are likely to have less social and cultural capital than traditional cohorts and are therefore less likely to be familiar with the norms, practices, and expectations of the academy (Devlin and McKay 2014).

Over the same period, per-student government funding of Australian universities has significantly declined (Sharrock 2016), with the expectation that the shortfall would be made up through recruitment of full-fee paying international students. As a result, the number of international students at Australian universities has increased considerably over the past two decades (Russell et al. 2009). At Macquarie University, international students currently comprise just under 30 % of the student cohort (Macquarie University 2015). Many of these international students have learnt English as a second or third language, and even those for whom English is their native language often come from cultures where the norms and expectations of tertiary study differ markedly from the Australian context (Andrade 2006; Biggs and Watkins 2001; Russell et al. 2010).

The inevitable result of accommodating more students without equivalent increases in per-student funding has been an overall increase in class sizes (ABC News Fact Check 2013). Teaching staff, therefore, have less time to devote to individual students at precisely the same time as their classrooms have seen increased numbers of students who are likely to need such individual assistance. To address this imbalance, the majority of Australian universities now offer some form of extracurricular learning support, commonly through centralised academic language and learning (ALL) units (Zeegers 2004). Too often seen as some form of a quick fix for students with low levels of academic literacy or English language proficiency, these ALL units find themselves pressured by competing demands and agendas, as higher education institutions regularly restructure and reprioritise to best position themselves within a rapidly changing sector.

One of the biggest challenges facing ALL units in such an environment is to find sustainable ways of using limited resources to support effective academic outcomes for all students. Some ALL units have also been required to expand their traditional area of expertise to create new resources in the areas of digital literacy and professional communication. There has also been the most recent distraction for some universities of finding suitable responses to significant media attention on issues of plagiarism and claims of widespread cheating among students. For a small centralised ALL unit, responding meaningfully to this multitude of intersecting agendas requires a strategy that is based on efficient use of resources while also allowing for sufficient flexibility.

The authors will describe in this chapter how a relatively small ALL unit has managed to achieve this by working within a continuum of generic to embedded support for the development of students' academic literacy. After reviewing some of the theoretical and practical issues associated with different models of language and literacy support, we will examine the strategies that have allowed this small ALL unit to contribute to student success across the University. Specifically, we will focus on how our decision making has been based on a twofold strategy of

working directly with students where relevant and collaborating closely with staff where possible, at all times ensuring that our resources and communications reach the widest possible number of students.

Models of Support

In the past decade, the trend in academic language and learning development has been away from generic teaching and towards a model where instruction is discipline specific and embedded within curricula. The most influential theoretical framework underpinning this approach was outlined by Lea and Street (1998), who described three different models for supporting the development of students' academic language proficiency: study skills, academic socialisation, and academic literacies. Lea and Street argue that the study-skills approach to literacy instruction is based on an assumption that writing is a basic set of generic skills which, once learnt, can be transferred to any discipline and applied equally effectively within any context. The academic socialisation approach, on the other hand, assumes that each discipline has its own, generally stable, ways of communicating and that students must be taught the conventions and expectations of writing within their particular academic discipline. The approach promoted by Lea and Street, which they called academic literacies, is also based on the premise that each discipline has its own specific discourse. They expanded on this idea, however, by arguing that each discourse is shaped by the epistemological approach (or approaches) favoured by that discipline, which is not always stable. Thus, becoming an effective writer means not just being a member of the community of a given discipline, but also understanding the processes and power dynamics that underpin the construction and communication of knowledge within that discipline.

Lea and Street were writing from a UK context, where the academic literacies approach to literacy instruction has since become so popular that it has been described as "the only way of developing students' understanding of subject-specific writing requirements" (Wingate 2007, p. 464). The academic literacies model has also dominated the ALL literature in Australia in the past decade, with a consensus that it is the most effective model for developing students' academic language and literacy (e.g. Benzie 2010; Chanock et al. 2012; Hammer and Green 2011; Thies 2012; Wingate and Dreiss 2009). In this field as in many others, however, the theory tends to be clear-cut in a way that reality rarely is.

The main criticism of the academic literacies model has been that it fails to offer effective alternatives to the models it professes to replace, and thus has no firm pedagogical approach to learning and teaching (Wingate and Tribble 2012). To the extent that any form of pedagogical consensus has emerged, it has focused on the importance of embedding the development of students' academic literacy within the curriculum of each discipline (e.g. Arkoudis et al. 2012; Briguglio and Watson 2014; McWilliams and Allan 2014; Thies 2012). In Australia, notions of effective embedding have been heavily influenced by Jones et al. (2001), who conceive of

language and literacy development as being implemented across a continuum consisting of four main elements: adjunct (weak), adjunct (strong), integrated, and embedded. Others have since tweaked this original taxonomy (Dunworth 2013; Harris and Ashton 2011), while maintaining the idea of a continuum which ranges from support that is outside the curriculum and not specific to any discipline to language and literacy development which is discipline specific, fully integrated within curricula, and supported by broader university policies or strategies.

A continuum approach also reflects the academic journey that students make themselves. First-year students are not expected to be fully fledged practitioners of all the disciplinary conventions and epistemological approaches of a discipline. Rather, they are expected to develop these skills as they read and write in their discipline. Along this continuum of learning, a continuum of teaching must respond to present needs. Sometimes these needs, especially for students who have had less exposure to academic ways of writing and thinking, relate to the underlying basics or generic properties of academic discourse. To argue that generic introductions to academic culture cannot be useful is tantamount to denying that there are any commonalities between academic cultures across the disciplines, and that the academy itself has no underlying or distinguishing values. A continuum is, therefore, a valuable way to conceptualise the student journey and to plan provision of support within tertiary institutions.

The mix of different types and levels of support differs significantly across the higher education sector. The Association for Academic Language and Learning (AALL) regularly surveys all Australian universities to compare the levels of resourcing and types of activities offered to support the development of students' academic language and learning. The most recent data suggest that although most universities have implemented some form of embedded support within their institution, all 39 Australian universities continue to offer generic learning workshops outside of the formal curriculum. Thirty-eight of them continue to offer their students opportunities for individual consultations with an academic language and learning adviser (Barthel 2013). This suggests that although the literature increasingly encourages a focus on fully embedded models, in practice most Australian universities are still offering support across the continuum, and still see value in offering "generic" forms of learning support.

One of the main issues that can obstruct effective embedding is that it requires ALL staff to form deep collaborations with disciplinary academic staff who are already working to myriad, often contradictory, agendas (Fanghanel 2012). For effective collaborations to occur, disciplinary academics must be aware that such opportunities exist, and have sufficient time and incentive to avail themselves of these opportunities. Thus, the responsibility for promoting the integration of language and literacy development within the curriculum lies largely with ALL staff, whose position within the institution often makes it difficult for them to have a significant influence on policy or strategy development (Peach 2005). At the same time, some academic staff express a lack of willingness or necessary expertise with regard to developing students' language proficiency. Thus learning advisers are

often required to work at changing mindsets among academic staff towards their role in learning and teaching (Clughen and Connell 2012).

There is evidence that ALL staff have identified willing and engaged disciplinary academic staff to collaborate with. In doing so, they have successfully embedded language development within units or across programs (Chanock 2013; Drury and Jones 2010; Kokkinn and Mahar 2011; Stappenbelt and Barrett-Lennard 2008; Thies 2012).

These examples, although effective, suggest a well-intentioned yet inequitable approach. In some units, the convenor may embed academic literacy development activities, while in others the students, through no fault of their own, have no such opportunities. On the other hand, extracurricular workshops, although sometimes criticised on the grounds that those students who are mostly likely to need assistance are often the least likely to attend (Arkoudis et al. 2012; Harris and Ashton 2011), at least empower the students to make such decisions for themselves, rather than leaving the decision in the hands of individual unit convenors or program directors.

There has been criticism of the narrow focus of a purely discipline-specific approach. Canagarajah (2002) argues that to teach writing solely within a discipline context means that the "pedagogical orientation is narrowed down to such an extent that, in the name of specificity, students are not encouraged to go beyond the immediate context and discourses of the disciplines" (p. 131). For university students, who, unlike professional academics, may be required to write in other disciplines, and who will probably not spend their lives within a single discipline, a generic approach may be more useful and give them more transferable skills (Canagarajah 2002) and can lead to "rhetorical consciousness-raising" (Swales and Feak 2012, p. xi). In addition, ALL staff are aware of disciplinary differences and, in fact, as Peach (2005) argues:

> the skills taught by learning advisers outside a discipline or program of study do not necessarily lack contextualisation. Learning advisers help students to find out about the nature of the broader university learning environment and assist students to develop strategies to negotiate the meaning of signs and symbols within the university context (p. 7).

Another problem with relying solely on the embedded approach is that knowledge of disciplinary writing requirements is often acquired by long-term exposure to the conventions and epistemological expectations of a discipline. Therefore, as some argue (Etherington 2008; Itua et al. 2012), subject specialists are often not explicitly aware of disciplinary discourse practices and may not have the expertise to teach academic writing. While some academics carefully scaffold writing requirements and explain expectations clearly, others see these activities as taking time away from content instruction (Bailey 2010). Indeed, some teaching staff view writing and other academic literacy issues as problems to be "fixed" by academic skills advisers in a forum completely independent of disciplinary teaching (Chanock 2007). These issues have led to a situation in which true collaboration is rarely seen, and where resourcing continues to be an important issue (Bailey 2010).

It is not surprising that some of the most effective examples of large-scale embedding have occurred in institutions which have developed a formal policy or

strategy around academic language and literacy (Dunworth 2013), and thus have committed top-down support to complement the work being done by ALL staff. For those institutions which do not yet have a policy or official strategy to guide the work being done in this area, learning advisers need to be persistent in promoting to management and teaching staff the importance of integrative approaches, while continuing to ensure that all students are able to access learning support regardless of their discipline. This has to be done in an environment where continued funding for support areas cannot be guaranteed, and changes in government policy often require prompt and significant changes in institutional strategic direction. It is within this context that we now describe the strategic approach that the Learning Skills Unit (LSU) at Macquarie University has taken over the last 5 years.

Case Study: Academic Language and Learning Support at Macquarie University

The LSU at Macquarie University consists of five full-time professional staff. Recently relocated from the Learning and Teaching Centre to the University Library, the LSU has previously been positioned within the First Year Experience Unit, and before that within the Office of the Dean of Students. With four restructures in 5 years, learning advisers have had first-hand experience of the ways in which changing priorities across the sector can strongly affect the way they work. Regardless of location and reporting lines, our approach has always been to offer language and learning development across a continuum of support strategies, ensuring that all students have access to various forms of learning support. At the same time, we are continually promoting to teaching staff the importance of scaffolding within the curriculum the language conventions of their discipline, and offering professional development and support for how best to do this. The diagram in Fig. 16.1 shows the full continuum of the resources that we offer, ranging from the most generic to the most discipline specific.

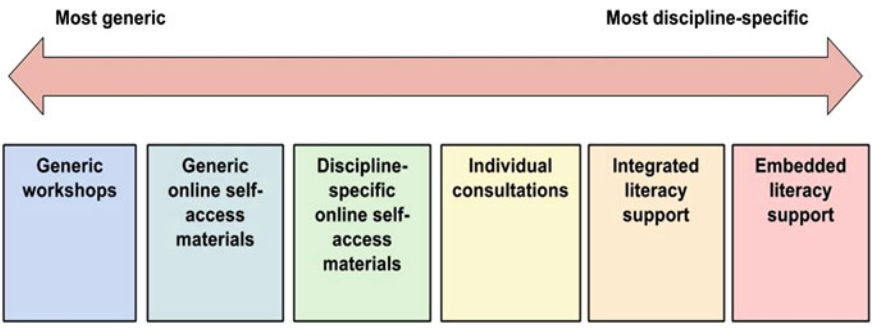

Fig. 16.1 Academic language and learning across the curriculum

Each element in this continuum offers different benefits and presents different challenges, and each element is driven by and responds to different needs and demands.

Generic Workshops

Extracurricular workshops, which aim to develop students' understanding of broad academic writing conventions and learning strategies, have received considerable negative attention in recent times (Dunworth 2013; Wingate 2007). However, in seeking to abolish such workshops altogether in favour of fully embedded approaches, there is a real danger of "throwing the baby out with the bathwater". As discussed previously, most examples of embedding have been done at the level of individual units or programs, so that only certain cohorts are targeted. As Swales and Feak (2012) point out, even large research universities find it logistically impossible to offer discipline-based writing assistance. Harris and Ashton (2011) also note that voluntary workshops may be the most viable option in institutions with large class sizes and relatively few learning advisers.

Our response has been to continue to offer a full range of generic workshops as part of our continuum of support strategies. Examples of the types of topics offered in these workshops include:

- strategies for academic reading,
- writing critically,
- paraphrasing effectively,
- essay structure,
- constructing effective paragraphs,
- referencing and citation, and
- writing clear sentences.

We continue to offer these workshops for several reasons. Firstly, they respond to direct demand from both students and staff. This is especially important when many students have very little face-to-face interaction with teaching staff.

Secondly, while it may be true that important disciplinary differences cannot be covered in such a forum, these workshops are particularly useful for building confidence and self-efficacy among students, especially those from non-traditional academic backgrounds. Generic workshops are also useful for demonstrating effective assignment processes, and for encouraging effective learning strategies in areas such as critical reading, effective note-taking, active learning, and time management. Such strategies tend not to be specific to a particular discipline and, for a minimal investment of time, students can learn strategies to be applied throughout the length and breadth of their studies. These workshops also provide students with an understanding of the values and practices common to all disciplines. These include critical approaches to knowledge, evidence-based

development of arguments, and deductive structures of argumentation. In all our Learning Skills workshops, we emphasise that there are differences in writing style and structure between disciplines, and encourage students to explore the expectations of their own disciplinary context, asking their teachers to clarify these conventions where possible.

The statistics support the value of this approach. In student surveys conducted in semesters one and two in 2014 and 2015, over 30 % of all surveyed students agreed that attending Learning Skills workshops influenced their decision to continue studying when they otherwise may have discontinued their studies or failed. In addition, 76 % of students reported that they felt better prepared for their studies after attending workshops. The overall satisfaction level averaged over four student surveys from 2013 to 2015 was 84 %.

Generic Online Self-access Resources

Generic online resources suffer from the same image problem as generic workshops; namely, that they depend on students' awareness that they exist and on individual motivation to use them effectively. However, these resources can also offer many of the same benefits as workshops, especially in helping students to build confidence through developing effective strategies and processes for learning. Even more so than workshops, online resources offer flexibility for students to develop their skills and knowledge in a risk-free environment, without fear of losing marks or any form of social embarrassment.

At Macquarie, students access these generic resources in large numbers every year. The LSU has created two online resources within the Moodle learning management system (LMS) used across the University. "StudyWISE" is an academic literacy resource which offers strategies and practice activities on all aspects of academic language and learning. More than 27,000 students have access to this module. The most accessed resource in 2015 was the quiz on "Academic language conventions", with over 6000 hits. Other popular resources include:

- essay writing,
- getting off to a good start at university,
- the assignment process,
- referencing, and
- taking notes.

These generic resources respond to areas in which students feel ill-prepared. Indeed, the ability to track usage of each resource allows us to pinpoint the areas of highest student demand and then feed this information back to teaching staff as a means of encouraging them to better assist students' transition into the academy.

The other generic online resource created by the LSU is the Academic Integrity Module (AIM), which aims to increase students' awareness of what is considered

acceptable academic practice at Macquarie. The module commences with a diagnostic quiz which tests how well students understand Macquarie's Academic Honesty Policy and ends with a mastery quiz, which allows them to demonstrate their comprehension. The quizzes, like much of the content, are based around practical scenarios relating to plagiarism and other forms of academic misconduct. The AIM currently has 21,000 students enrolled and is designed as a tool for learning rather than a disciplinary measure, with the clear aim of taking the fear out of this important issue. Feedback from staff across various disciplines suggests that they are heavily promoting the AIM to students, and such buy-in from teaching staff is an important step in legitimising the resource as a fundamental part of developing and understanding academic integrity.

Discipline-Specific Online Resources

The StudyWISE online resource does include one section which offers students discipline-specific support. The "Types of assignment" section does this in two ways: through the presentation of genres common to different disciplines (e.g. business reports, case analyses, critical reviews) and through exemplars. Our online corpus of marked student assignments, across various disciplines, offers real examples of student writing, providing important opportunities for self-reflection and self-assessment. Each exemplar is annotated to draw attention to important stylistic or structural features. When supplemented by annotations made by learning advisers, the feedback given by teachers, and subject rubrics indicating the standards that are valued, students can see what the particular textual and linguistic expectations of different genres are, as well as what their teachers expect of them. Examples of the types of exemplars currently available to students include:

- a first year anthropology essay,
- a critical review for postgraduate accounting,
- a physics laboratory report,
- a political science case study,
- a literature review for postgraduate applied linguistics,
- an oral presentation for psychology,
- a lesson plan and teaching evaluation for education, and
- a research proposal for biological sciences.

As Handley and Williams (2011) point out, exemplars provide students with concrete descriptions of standards, but also allow students to see how assignment expectations are developed into authentic student texts. In one study exploring student use of exemplars, 87 % of students who had used exemplars said that they had given them the confidence to produce good quality work (Hendry et al. 2011). Our experience demonstrates the significant student demand for such a resource, with the "Types of assignments" section currently the second-most accessed section

within StudyWISE. The Handley and Williams study (2011) reporting students' positive perceptions of the usefulness of exemplars also highlighted the value of classroom discussion of these texts. With this in mind, the LSU has used local teaching and learning fora and blogs to promote to teaching staff the benefits of using exemplars in the classroom to improve student writing.

Individual Consultations

Individual consultations provide an opportunity for students to discuss aspects of specific assignments they are working on. They are perhaps the most specific form of support available to students since they deal with not only discipline-specific but unit-specific and individual-specific requirements. As such, they are highly resource intensive. In 2011, our small adviser team of four staff provided 715 × 50-min consultations but saw only 95 individual students with an average of 7.5 return visits. This was neither a sustainable nor effective model. Without increasing our resourcing, we introduced a new triage model in 2012 to provide maximum impact for the benefit of the majority of students. In this model, advisers make themselves available 2 h every day for short consultations (15–20 min) that do not require students to register. Longer consultations are available for students deemed by the learning adviser to be in need of more intensive help. The same staff also provide an online consultation service with a 24-h turnaround in the provision of a response to student requests.

Under the triage approach, in 2015 the LSU provided 945 students with individual consultations, and 80 % of surveyed students agreed that they felt more prepared for their studies after a consultation. The average satisfaction level, calculated over the previous four semesters, was 81 %. Our experience supports similar findings in the literature. In one recent report focusing on international students (Ashton-Hay et al. 2016, pp. A-8), 61 % of respondents identified individual learning consultations as the most helpful form of support and as providing "great help in complex writing". Interestingly, after "Feedback from lecturers" (52 %), the third most helpful form of support was academic-skills workshops (48 %).

Requests for help with specific assignments are the most common type of consultation, especially with regard to writing, referencing, and research. This is perhaps predictable, given that students tend to focus far more attention on assessments than on other aspects of their learning experience. Many students (45 % average over four semesters) use the consultation service more than once. As one student said:

> I have always found Learning Skills service at the Info Desk to be very helpful, they understood my needs, they clearly explained information to me and guided me in the right direction… I have always trusted the guidance and directions that they have given me through this year because it has always been very helpful with my studies. (Learning Skills Unit 2015)

Individual consultations can also provide a safe environment to express feelings of dejection, frustration, or fear of failure. In our evaluation surveys, one of the major reasons selected for seeking a consultation with us is: "I was feeling overwhelmed by my studies and I wanted someone to talk to about this." Not only is learning scaffolded in individual consultations, but self-confidence is also built in an environment that is often emotionally safer than the lecture or tutorial context (Huijser et al. 2008). Survey responses about Learning Skills consultations reflect this sentiment:

> They are open and kind… There is no pressure or risk of feeling embarrassment. Again I felt secure. (Learning Skills Unit 2015)Learning Skills advisers are passionate about what they do and this clearly comes across which is motivating as a student. I was helped out of a rabbit hole of overwhelm [sic] in a professional and supportive manner. And reassured that my overwhelm was common which was validating. (Learning Skills Unit 2015)

The sensitivity brought to consultations applies in a special way to international students, whose language needs are often more acute. The learning adviser can thus help to interpret instructions and clear up misunderstandings which owe as much to differences of culture as to language (Woodward-Kron 2007). As Briguglio (2009) suggests, behind every request for help with English there may be a myriad of issues, such as referencing practices, structuring a text, or critical writing. Furthermore, learner advisers develop familiarity with disciplinary conventions and texts through the process of individual consultations. As Chanock (2004) argues, in the process of engaging with students "through the forms and language they are expected to produce," we generate "a metacognitive analysis of the culture of each discipline they write in" (p. 49).

Activities Integrated Within Faculties

Integrated literacy support describes workshops or lectures conducted by learning advisers within the formal curriculum space of a particular unit (Jones et al. 2001). Activities can be considered to be integrated within the curriculum in that they are specific to a particular discipline, are conducted within scheduled class hours for the relevant unit, and are most commonly directly related to an upcoming assessment task. Such an approach usually requires the learning adviser to be available every semester to revise content and deliver lectures or activities for every relevant unit, making this approach extremely resource intensive. However, the needs-based, just-in-time nature of this model offers valuable and targeted support to students. The inclusion of such activities within the formal curriculum also demonstrates to students the importance of developing their academic language proficiency and increases their awareness of the support options available to them. Examples of such collaboration at Macquarie have included:

- in-class presentations on the structure and language of business reports (human resources, accounting);
- in-class workshops on time management in response to a need identified by the unit convenor (statistics);
- in-class lectures and tutorials on managing group work effectively (media, law, statistics);
- in-class lectures on the structure and language of essays (ancient history);
- in-class workshops on evaluating and synthesising sources (early childhood); and
- targeted, extracurricular disciplinary workshops on specific areas of difficulty (human sciences, arts).

These types of interventions are difficult to evaluate. Because they are conducted within the curriculum of the relevant unit, they are not evaluated through the surveys conducted by the LSU. Learning advisers can request the relevant unit convenor to include a specific question when they conduct their surveys at the end of the semester. However, response rates for these surveys are often very low, and one question within a much larger survey does not provide sufficient feedback on which to base decisions or make improvements. Nonetheless, unit convenors appear to value these collaborations, as evidenced by requests for the repeated involvement of learning advisers, and by collaborations brought about by word of mouth between unit convenors across different disciplines.

Embedded Literacy Support

Most commonly in the literature, the term "embedded" has been used to describe projects in which ALL staff have collaborated with disciplinary academics in the creation, but not necessarily the delivery, of assessment tasks or related in-class activities (e.g. Harris and Ashton 2011; Kennelly et al. 2010; Thies 2012). Whereas an integrated approach relies on a learning adviser for the design and usually also the delivery of the activity, in a truly embedded approach the activity is collaboratively designed by a learning adviser and the unit convenor and/or other staff teaching within the relevant unit or across a program. All parties, therefore, have direct input into the type and format of the activity, usually an assessment task, which is delivered and marked by the disciplinary academic. Embedded support thus becomes more sustainable for ALL staff than integrated support, because it does not require the learning adviser to be involved in every iteration of the unit.

The LSU advisers have been involved in a number of embedded projects at Macquarie, the most recent of which was a collaboration with the Department of Engineering. This collaboration involved the unit convenor of a core first-year engineering subject, the learning adviser aligned with the Faculty of Science and Engineering, and a research librarian. This group, along with some of the tutors involved in teaching the unit, met several times to discuss the biggest areas of need

among first-year engineering students and to plan relevant responses. The research librarian and the learning adviser were each given space within the curriculum to deliver lectures on the topics of "searching for sources" and "writing engineering reports" respectively. As well as this, the learning adviser created an English grammar quiz, an academic style quiz, a report-writing activity, and a rubric for assessing language and style. These activities were assessable, ensuring that all students had the incentive to devote sufficient time and effort to each task. These assessment tasks are now permanently embedded within the curriculum and will run in every iteration of this unit, without the need for any further input from the learning adviser. Subject-specific adaptations of these resources will also shortly be embedded in a large first-year biology unit.

The main strength of this embedded approach is that its collaborative nature dispenses with the false dichotomy between disciplinary content and the language used to express it (Dunworth 2013). This acknowledges the inevitable link between the way that language is used in a given discipline and the ideologies and epistemologies that underpin that discipline (Hyland 2004).

However, even this approach to the development of students' academic language and literacy has significant drawbacks. Much like the integrated approach, embedding still tends to rely on ALL staff being the ones to sell its benefits to disciplinary academic staff, or special effort being made by the unit convenor or program director. This presents the problem that the very success of these embedding projects creates a form of inequality, whereby those units or programs which have embedded literacy within their curricula provide students with opportunities that their peers in other disciplines may not have, through no fault of the students themselves.

Seamless Academic Literacy Development

The ideal situation is one in which there is a whole-of-institution approach to academic literacies, or a seamless rather than merely embedded approach (Dunworth 2013). Although the seamless approach still advocates curricula-based collaborations between ALL staff and disciplinary academics, it acknowledges the need for such collaborations to occur across every program, a situation which can only realistically occur if the institution has implemented policies or strategies which require the development of students' academic literacy to be embedded within all curricula. Such an approach obviously has resourcing implications. It would require academic staff to be given the time and incentive to review their curricula to see how effectively students' language and literacy are being developed across their program. It would also necessitate professional development opportunities to allow teaching staff to develop the competence and confidence to redesign their curricula where relevant and change their teaching practice where necessary.

To encourage such an approach the LSU—along with other champions of academic literacy at Macquarie—has been involved in institutional change by participating in such initiatives as the Academic Literacy Reference Group (ALRG) in 2012, with membership from the various faculties and other key stakeholders. The ALRG formally recommended that an English language proficiency policy be drafted, and an English Language Policy Working Group has since been established by the Pro Vice-Chancellor, Learning and Teaching, and is chaired by the Associate Dean Learning and Teaching, from the Faculty of Business and Economics. Encouragingly, one of the three key objectives put forward in the recently launched *Learning and Teaching Strategic Framework 2015–2020* (Macquarie University 2016) is ensuring deep, broad, graduate capabilities through a connected curriculum. Although the implementation framework for this strategy is still forthcoming, one of the goals by which this will be achieved is through a program-based approach to curriculum, which will involve the embedding of key literacies. This indicates that the necessary impetus and top-down support required for an academic literacies model is set to become a key aspect of learning and teaching at Macquarie.

Further, each faculty has for some years supported an alignment arrangement with the LSU for each learning adviser to have membership of the respective Learning and Teaching Committees. Within the Faculty of Business and Economics, for example, the Associate Dean, Learning and Teaching, has encouraged opportunities for collaboration between academic staff and the learning adviser that have resulted in online literacy resources and language rubrics. Within their committees, each learning adviser has also had a regular forum to promote to academic staff across disciplines the importance of embedding and assessing academic literacy development. Along with regular posts on learning and teaching, as well as presentations at learning and teaching events, the LSU staff continue to be involved in committees that allow us to promote the importance of this issue, especially in the area of student progression, retention, and success.

The LSU also produced a staff professional development guide: *Developing Your Students' English Language Proficiency: The Academic Literacies Approach (*Learning Skills Unit 2014). This guide was developed in consultation with academic staff, and begins by discussing why students often commence their studies with lower levels of language proficiency and academic literacy than many teaching staff may expect. It then explains why embedding is both an equitable and effective pedagogical practice, before outlining a variety of different strategies for:

- mapping existing units for academic literacy development,
- clarifying language expectations and conventions within a particular discipline,
- developing activities and assessment tasks that will promote language and literacy development, and
- providing effective feedback to assist students to improve their language proficiency.

Conclusion

The challenges facing a small ALL unit in a large and diverse institution like Macquarie University are similar to the challenges facing the sector as a whole: how best to respond to many different, often conflicting, agendas and still provide student support which is both meaningful and equitable. Based on what the literature at the time was describing as best practice within the sector, our original approach was to focus our energies on collaborative projects aimed at embedding language and literacy development within the curricula of selected disciplines. Over time, however, we have developed a more nuanced approach which recognises that the needs and demands of students and staff alike vary considerably. Providing support across a continuum of different strategies is the most effective and sustainable way of ensuring that as many students as possible have the opportunity to develop their academic language and literacy. Despite the changes in our overall approach over the years, the LSU's consistent goal has been to work within our means to ensure that all students are empowered to take control of their learning. We recognise that academic literacy support along the continuum is in turn part of a larger continuum of support that includes academic advising, cultural activities, and friendship networks. Our approach will almost certainly continue to evolve in response to changing circumstances, resources, and agendas both locally and across the sector, but we will continue to focus on providing a student experience that is about helping them achieve success, and is not based on assumptions about who our students are or should be.

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Chapter 17
Program Curriculum Alignment: Designing for Success

Susan Hoadley and Joanna Sabri

Abstract For students, success is completing their degree, graduating and getting a job! In this chapter, we discuss the role of program curriculum alignment in ensuring students achieve success in these terms. We describe the increasing expectations of higher education programs to develop graduate outcomes that are valued in the workplace, as well as how these expectations manifest at different institutional levels. In doing so, we argue that programs should be the focus of our (learning and) teaching efforts and demonstrate that program curriculum design needs to incorporate two dimensions of alignment: vertical as well as horizontal. As such, program curriculum alignment and management involve collaboration within and beyond universities, and we describe the program curriculum management process as a cycle consisting of four stages.

Keywords Curriculum alignment · Graduate outcomes · Employability skills

Introduction

As discussed in the introductory chapter, students see success as degree completion and graduation leading to occupational attainment. From this broad perspective student success means completing a program, as opposed to doing individual subjects, that will enable them to gain (better) employment, in the broadest sense on the word. This perspective is also evident in the extent of the research that has been undertaken into employer/industry expectations of university graduates and surveys on the employment outcomes of new graduates. It is further reinforced more broadly in our society where tertiary qualifications are a key component of individual identity, such that they are commonly provided as post-nominals on business cards, highlighted in professional biographies and so on.

S. Hoadley (✉) · J. Sabri
University of Technology, Sydney, Australia
e-mail: susan.hoadley@uts.edu.au

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The idea that completing higher education leads to occupational attainment is not new. The connection between degree completion and occupation has long been made explicit in accredited vocational degree programs for occupations such as accountants, actuaries, engineers, nurses, and teachers. Other accreditation frameworks that make this link explicit are increasingly being adopted, for example the American Association of Colleges and Business Schools and the US-based Chartered Financial Analyst Institute. In addition, tertiary qualifications are now commonly subject to national accreditation requirements, such as the Australian Qualifications Framework (AQF 2013) and the Quality Assurance Agency for Higher Education finance benchmark in the UK (QAA 2007) that prescribe graduate outcomes with an emphasis on preparation for professional practice.

All in all, there is increasing pressure from students, industry and the broader community alike on universities to deliver programs that explicitly develop graduate outcomes that are valued in the workplace. To achieve this, universities must adopt a program-level approach (Treleaven and Voola 2008), which involves:

- articulating appropriate program-level learning outcomes,
- designing and delivering programs that explicitly and demonstrably enable students to achieve these outcomes, and
- collecting and analysing evidence to ensure that students are achieving these outcomes.

In other words, to ensure student success in terms of completing a degree and getting a (better) job, universities have to apply the principle of constructive alignment (Biggs 1996) at a program level.

Academics may feel and express discomfort at the idea that education should focus on the needs of employers, seeing it as potentially limiting in terms of the scope of education and academic freedom. Notwithstanding this, whilst rejecting increasing human capital as a role of higher education, Kalfa and Taksa (2013) argue that developing transferrable graduate attributes contributes to graduate employability, in that these attributes are a form of social competence identified by Bourdieu as an aspect of cultural capital. In other words, universities need to focus on delivering programs that develop graduate outcomes as a means to enabling students' social inclusion in the workforce, rather than increasing their human capital value to employers.

Challenges

Biggs (2014) states that whilst curriculum alignment has become incorporated into institutional teaching policy as a means to achieve quality teaching, factors such as decreased public funding, increased staff workload, emphasis on research, and staff resistance to change are challenges to its implementation. All of these challenges also apply to, and indeed are often magnified by, implementing constructive alignment at a program level. In addition, constructive alignment at a program level is a paradigm shift for academics who are focused on the individual subject(s) they

are responsible for, and may have limited visibility of, or interest in, the overall program. Further, university workload models that are based on individual subjects are not conducive to a program approach.

Universities are conceptualised and organised by disciplines. Students come to university expecting to study disciplines, and academics teach and research disciplines. Not surprisingly then, both students and academics tend to focus on the discipline-specific knowledge and skills that are developed at university (Freeman et al. 2008). This is a challenge when both students and academics consider the development of generic skills as secondary to the development of disciplinary knowledge; and skills such as critical thinking, problem solving, and communication have an epistemology of their own. The consequence of this is severe, as the graduate outcomes valued in the workplace and articulated in many accreditation frameworks and graduate recruitment practices are underpinned by generic skills (Sin and McGuigan 2013) (For examples refer to Table 17.1).

The challenge then is for universities to deliver on these essential generic skills, which are not always sufficiently developed when staff teach in isolation and with an assumption that generic skills will emerge by themselves. Thus aspects of graduate outcomes that are highly valued by employers and society more broadly are not always recognised or valued by students and academics. Indeed, as detailed by Rigby et al. (2010), it is frequently reported that universities are not adequately developing students' generic skills (e.g. Cleary et al. 2007; Freeman et al. 2008; Treleaven and Voola 2008), although more recent research reports a lack of solid data in this area (Oliver et al. 2014). In fact, neither discipline-specific nor generic skills can be developed in isolation from one another. For example, Sloan and Porter (2009) and Jones (2009) found that for students to successfully acquire

Table 17.1 Generic skills from three different perspectives

Employers[a]	National accreditation[b]	Institutional[c]
Communication	Communication	Written and oral communication
Teamwork	Working with others	Learning and working collaboratively
Problem solving	Problem solving	Problem solving (incl. Generating ideas and innovative solutions)
Initiative and enterprise	Decision making	Critical and analytical (and sometimes creative and reflective) thinking
Planning and organising		
Learning	Learning to learn	Learning and working independently
Self-management	Self-direction	
Technology		Information literacy, often associated with technology
	Acting with integrity	Ethical and inclusive engagement with communities, cultures and nations

[a]Employability skills for the future (DEST, ACCI, & BCA 2002)
[b]Generic learning outcomes (AQF Council 2013)
[c]Australian University Graduate Attributes (Oliver 2011)

generic skills, these skills must be integrated within disciplinary content and contexts and, therefore, are best conceptualised as different perspectives of the same curriculum (Knewstubb and Ruth 2015).

Success

For students, the aim of program curriculum alignment is to ensure they achieve program learning outcomes that will enable them to realise success in terms of occupational attainment. Such learning outcomes involve both discipline-specific skills and knowledge as well as generic skills. Importantly, students should be able to conceptualise, articulate, and demonstrate these outcomes, particularly in terms of their application and transfer in and across the workplace (Treleaven and Voola 2008) and beyond. This will enable students to identify appropriate occupational opportunities as well as equip them to gain access to and maximise these opportunities.

For universities, just as subject-level curriculum alignment is seen as a means to achieve quality teaching, program curriculum alignment is a means to deliver quality programs that better meet the needs of students, industry, and the community.

For academics, program curriculum alignment also offers opportunities to streamline the curriculum; focus on assuring standards of program outcomes; reduce duplication, extraneous content and idiosyncratic change; and so, arguably, reduce academic workload.

See Fig. 17.1 for an example of how assessments may be designed to facilitate a sustained, progressive, and incremental development of program learning outcomes. In taking such a program approach, universities and academics are better able to ensure the success of students because they are given the continual opportunity to learn, practise, and sharpen their skills—an important factor in assuring a student's success, as observed by Graham et al. (2009) in relation to written communication.

A program approach is also essential to articulating how subjects and subject outcomes contribute to the program learning outcomes that equip students for the workplace; or, seen from the other direction, how to embed the development of program learning outcomes in individual subjects in a structured, stable and sustainable way. Program curriculum alignment provides the impetus for universities and academics to step back from their subjects and think about what constitutes success for the students and how they can contribute to student success.

Program Curriculum Alignment in Practice

To ensure programs deliver graduate outcomes that are valued by students, industry, and the broader community, universities need to mandate processes which make program curriculum alignment of central importance. Biggs (1993) described

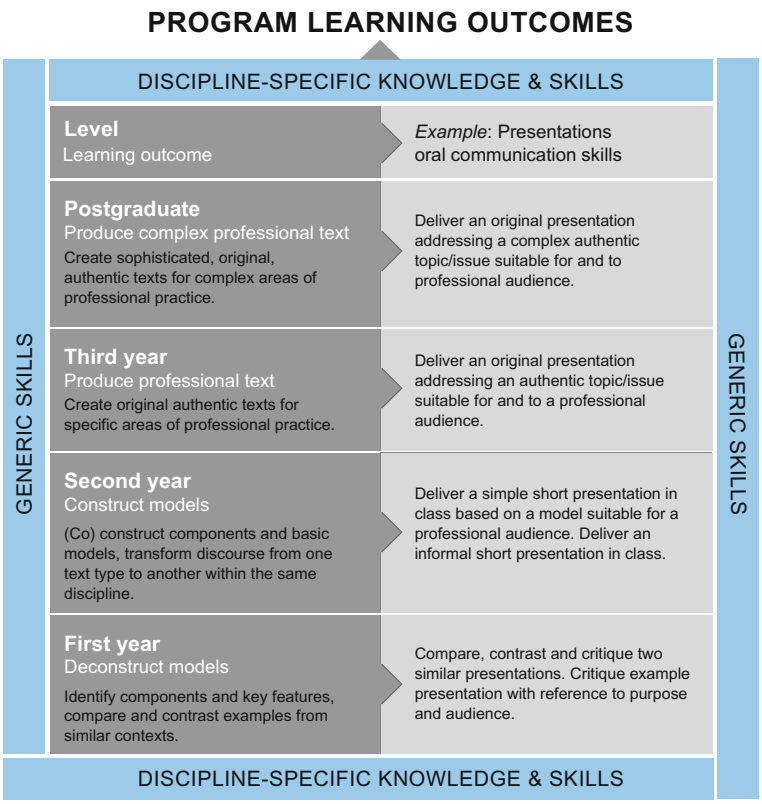

Fig. 17.1 Program approach to assessment task design, informed by genre-based literacy pedagogy (Martin 1999)

higher education as consisting of a series of nested systems. This conceptualisation can be used to model a program approach to alignment (Wood 2012) as well as to understanding how to embed specific outcomes, such as communication, throughout a program (Hoadley and Wood 2013). For the purposes of our discussion, it is helpful to identify three levels of systems as shown in Fig. 17.2. Each system must align vertically with the system above. Therefore, subjects must align with and (in combination) deliver the program outcomes, which in turn must meet the needs of the relevant accreditation frameworks. The same program may be subject to multiple accreditation requirements, in some cases institutional, industry/professional as well as national. In Fig. 17.2, internal accreditation requirements, such as the need to deliver graduate capabilities identified by the university, are shown at the same level as external accreditation requirements, such as professional accreditation by industry bodies and government requirements. These frameworks can be separated out into different levels if they have a hierarchical relationship, or they may sit alongside one another. The potential complexity of the multiple accreditation frameworks makes it even more essential to focus on

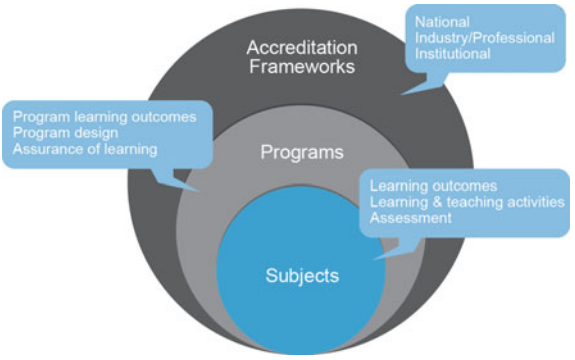

Fig. 17.2 Vertical alignment

programs and the delivery of program learning outcomes that can be mapped to various accreditation frameworks.

As suggested in Fig. 17.2, there are parallels between the three elements of subjects level and the three elements of the programs level. According to Biggs (1996), curriculum alignment is where learning objectives are identified as learning outcomes, and learning and teaching activities and assessment tasks are designed to develop and assess students' abilities in relation to these outcomes. Applied at a program level, this means:

- identifying program learning outcomes;
- designing a program by specifying a combination of specifically designed compulsory subjects that progressively develop these outcomes (i.e. introduction to capstone subjects); and
- using assurance of learning to measure the extent to which the program achieves the program learning outcomes.

From this perspective, program curriculum alignment can be understood as the horizontal alignment of the three elements: program learning outcomes, program design, and assurance of learning. However, given the need for vertical alignment between programs and subjects highlighted above, the elements of curriculum alignment in programs and subjects are interrelated and interact in complex and dynamic ways, as shown in Fig. 17.3.

Program outcomes (1) articulate what the student will be able to do on completion of the degree in terms of both discipline-specific knowledge and skills and generic skills. The program learning outcomes (1) and the subject learning outcomes (a) must align with one another (Treleaven and Voola 2008). In developing subject learning outcomes, it is common to use a taxonomy such as Bloom's (Bloom et al. 1956) to indicate different levels of learning, that is, from lower order to higher order. The implications of this for program design in terms of progression through a series of sequential subjects (e.g. first year, second year to third year) is that earlier subjects are likely to have more lower order outcomes, whereas later subjects should primarily have higher order outcomes. A popular design strategy that makes this transition explicit is the use of capstone subjects (refer to Fig. 17.4).

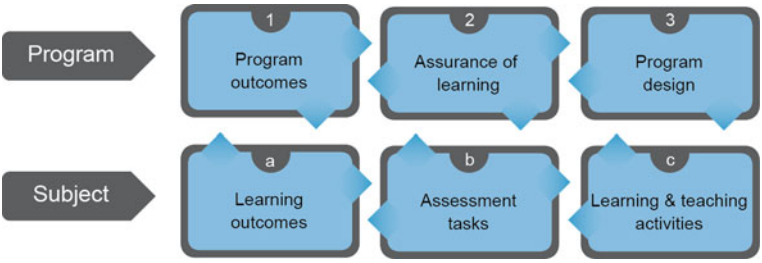

Fig. 17.3 Program and subject alignment

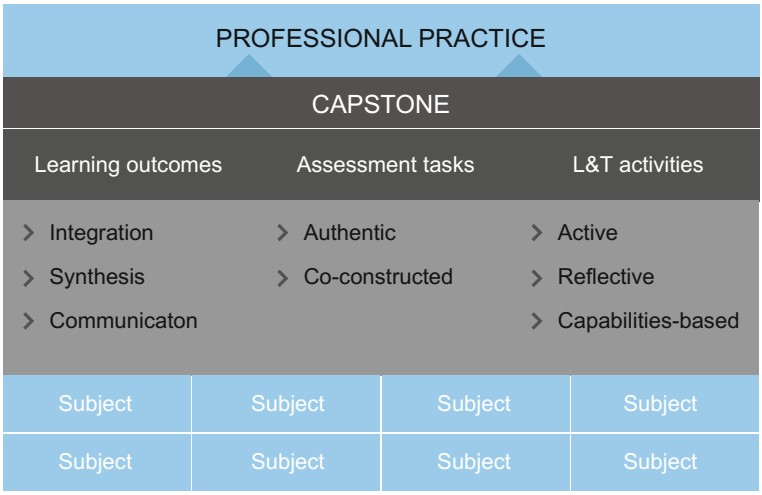

Fig. 17.4 Capstone subjects (informed by Bailey et al. 2012)

Capstone subjects focus on the integration and synthesis of existing theory and knowledge, thus making strong links to application in professional settings to achieve subject and program learning outcomes, particularly in relation to generic skills (Bailey et al. 2012). Hence, the learning outcomes for capstone subjects are closer to program learning outcomes in that they are both higher order outcomes. However, the scope of the content and context of program outcomes may be at a greater level of abstraction or generality than subject learning outcomes, being that they encompass the whole program.

In their work on curriculum design, Wiggins and McTighe (2005) emphasise the importance of moving from the desired learning outcomes to determining acceptable evidence that the outcomes have been achieved. This applies at the subject level where assessments tasks (b) are designed to allow students to demonstrate that they have achieved the subject learning outcomes (a) and to provide feedback to students. Similarly, at a program level, an assurance of learning process (2) is used

to provide feedback to determine the extent to which a program is achieving its program outcomes (1). This assurance of learning process involves determining and gathering direct evidence of students' performance in relation to the program learning outcomes and analysing and interpreting this evidence to report to internal and external stakeholders (i.e. program management staff, learning and teaching staff, and accreditation bodies). The evidence used for assurance of learning (2) is often the subject-level assessment tasks (b), and hence this process involves identifying subject-level assessment tasks which are best aligned with the program learning outcomes.

At a subject level, students are assessed individually in relation to the subject learning outcomes (a). Having completed all the required subjects in a program, and therefore having achieved all the subject learning outcomes (a), students are deemed to have achieved the program outcomes (1). This relies on the quality and extent of the alignment between the assessment tasks (b) and the subject (a) and program outcomes (1), discussed previously (Treleaven and Voola 2008). Assurance of learning (2) is a way of checking this alignment in that it provides a direct link between the subject-level assessment tasks (b) and the program learning outcomes (1), which ensures alignment between the program outcomes (1), the subject learning outcomes (a), and the assessment tasks (b).

The remaining element of curriculum alignment at the subject level, as shown in Fig. 17.3, is the learning and teaching activities (c) that allow students to develop and practise the subject learning outcomes (a). Following Wiggins and McTighe (2005), we have shown these as aligning with the learning outcomes (a) through the assessment tasks (b), on the basis that the learning and teaching activities should develop the knowledge and skills students require to successfully complete the assessment tasks and thus demonstrate they have achieved the learning outcomes. At the program level, the program design (3) is roughly parallel to the subject learning and teaching activities (c). Similar to the subject level, we show the program design (3) as aligning with the program learning outcomes (1) via assurance of learning (2). In doing so, we highlight the role of being able to measure achievement of the program learning outcomes in informing program (and by extension subject) design and of the results of this measurement acting as a driver of changes to program design.

The implications of these two dimensions of alignment, vertical as well as horizontal, are twofold. Firstly, academics need to understand their role in the teaching and assessing of generic skills, as well as have a shared understanding of these generic skills, and then work together to plan, design, and implement strategies to successfully develop these skills within their disciplinary context. Secondly, students need to understand the program learning outcomes and their relevance to employment, in that, as well as discipline-specific knowledge and skills, they incorporate the generic skills valued by employers (Treleaven and Voola 2008). In addition, students need to be confident of their own abilities in relation to these outcomes as evidenced by their performance in assessment tasks that align with the program learning outcomes via the subject learning outcomes (Treleaven and Voola 2008).

In sum, the program learning outcomes need to be made explicit to and understood by students, and the alignment between program learning outcomes, subject learning outcomes, and assessment tasks should be constantly reinforced in the delivery of the subjects that constitute the programs (Treleaven and Voola 2008).

Managing Program Curriculum Alignment

In order to design and manage programs (and subjects as the component of programs) to achieve program learning outcomes, curriculum management needs to be embedded in the management systems of the institution. This is shown in Fig. 17.5 as a series of nested systems, again following Biggs (1993).

Whereas previously, curriculum design and management were primarily done at subject level by individual academics, increasingly the need for program curriculum alignment means that curriculum management is a process that is undertaken at all levels and across various areas of universities. As such, the curriculum management processes in turn need to be embedded in and supported by the broader management systems of the university, such as management and reporting structures, human resource policies, and information systems. As shown in Fig. 17.6, this process consists of a cycle of four key stages: design, develop, deliver, and detect (Khan 2015).

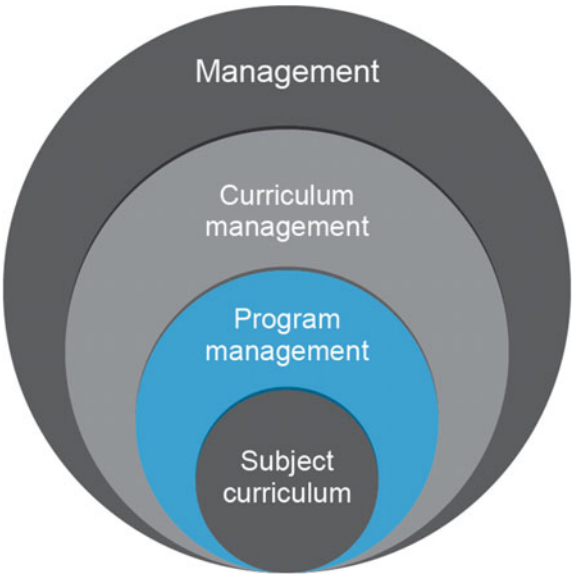

Fig. 17.5 Curriculum management systems

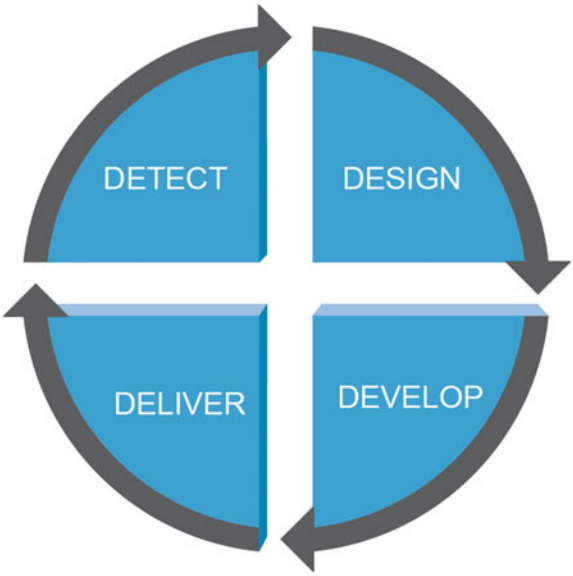

Fig. 17.6 Curriculum management cycle

Design

At the design stage the focus is on what the program is going to do in terms of what learning outcomes it is going to deliver and what accreditation requirements it is going to meet. The drivers are likely to be senior departmental, faculty, or university academic staff who believe there is a need for the program. Design does not only apply to new programs, but is also essential in ratifying and improving existing programs. Inputs are data from internal and external sources as well as the requirements of internal and external stakeholders and accreditation bodies. Incorporated in this stage will be an approval process, most likely involving faculty and university committees, to double-check the need for and design of the program before resources are committed to its development and delivery. Professional staff with expertise in program design and accreditation processes may support and facilitate this stage of the process. The ideal output is a design package that is sufficiently detailed to inform the development stage.

Develop

This stage involves developing the program design in terms of the subjects that, in combination, are going to develop the program learning outcomes. As discussed above, this means explicitly aligning the subject learning outcomes with the program learning outcomes, as well as ensuring that the assessment tasks and learning and teaching activities in the subject develop and measure the subject learning

outcomes. Drivers of this stage are likely to be senior department and faculty academic staff who are responsible for the implementation of the program. Inputs are the program design package and resources in relation to existing subjects included in the program. New subjects and significant changes to existing subjects will generally require faculty committee (if not university committee) approval, and professional staff with expertise in curriculum management may support and facilitate the process. The bulk of the development work is done by learning and teaching staff in collaboration with academics as teaching experts in their discipline. The output of this stage is a learning and teaching package including program-to-subject mapping of learning outcomes and assessment tasks, subject specifications, and learning and teaching resources such as assessment designs and guidelines for marking/grading subjects.

Deliver

This stage refers to the delivery of the subject to students. The responsibility lies with the academic appointed to the subject, albeit with support from administrative staff and in accordance with the administrative processes of the university. The input is the learning and teaching package from the development stage. Whilst the academic may be able to vary the delivery of the subject, they are constrained by the requirement of the subject to contribute to the program learning outcomes as specified in the mapping from the development stage. There may also be constraints in relation to the detect stage as discussed below. Overall, a consideration of program curriculum alignment is that change, particularly in relation to learning outcomes and assessment tasks, needs to go through (stages of) the management process. The upside of this is that subjects become more considered and stable, and ideally academic staff spend less time on learning and teaching (re)development activities. In this context, the catalyst for change is the output from this stage being a teaching team report that is one of the inputs into the detect stage.

Detect

This refers to all the activities around measuring the effectiveness of the program (and the subjects within the program). The drivers of this stage will be senior department and faculty academic staff who are responsible for the "performance" of the faculty. As well as the reports from the teaching team, typical inputs are subject results, student/graduate evaluations/surveys, assurance of learning results, and internal and external curriculum review reports. Given the variety and volume of data, professional staff are involved in the collection and analysis of data to provide input to the (re)design stage, or the development and/or delivery stage as most appropriate.

For universities and university staff, developing a curriculum management process as described above is essential to the design and delivery of quality programs, whilst using resources as efficiently and effectively as possible. For example, separating the design stage from the development stage prevents the expenditure of resources on developing learning and teaching resources before a program has been fully specified and approved by the institution. Understanding what is required at each stage allows the expertise of staff to be used to best advantage, such as the development of learning and teaching resources being primarily undertaken by qualified education specialists. Specifying inputs and outputs for each stage means that staff have a clear structure to work within and a better understanding of what they need to deliver. Just as such a process allows for greater clarity in relation to different areas of responsibility, it also specifies points at which different areas need to work together and hand over to one another, and thus encourages collaboration.

Conclusion

In this chapter, we emphasise the role of constructive alignment of programs as a factor in student success. We argue that higher education programs must explicitly deliver outcomes for students that enable their social inclusion in terms of employment, not least because this is what students come to university for. Although our focus is success for students, it is clear that program curriculum alignment has benefits for universities, employers, and society more broadly, although it does present some challenges for universities and university staff.

In practice, program curriculum alignment not only adds another layer of alignment; it also adds another dimension. In addition to horizontal alignment within subjects and programs, we have to take into account the need for vertical alignment between subjects, programs, and accreditation frameworks—both internal to universities and external. We have concentrated on alignment within and between subjects and programs as the main focus of program curriculum alignment, noting the role of capstone subjects as an explicit and effective curriculum design strategy. Program curriculum alignment increases the scope of curriculum management beyond individual subjects, and needs to be undertaken collectively, collaboratively, and collegially by different individuals/groups within universities, supported by processes and systems at all (operational) levels.

Program curriculum alignment implies a holistic approach to meeting the expectations of students in terms of what they come to university to achieve. The main challenges to program curriculum alignment are caused by the atomistic structures of universities, such as subjects, departments, and disciplines and, arguably, it is just such atomistic structures that have, in part, driven the need for program curriculum alignment. As described in this chapter, program curriculum alignment is positioned within and in relation to these structures. An interesting question for the future is the extent to which program curriculum alignment will make existing structures obsolete and so drive structural change in universities.

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Chapter 18
Academic Choices and Perceptions of Success by Students in Mumbai: An Analysis of Socio-Cultural Factors

Mohan B. Rao and Minu Mehta

Abstract We undertook a study at our College in Mumbai, India, to analyse the decision-making mechanisms behind the academic choices of students in undergraduate and postgraduate programs. Our main aim was to explore the term "success", as understood by the students. We further wanted to examine if the students perceived "success" to be connected to their academic choices. We sought clarity on certain important issues. Are the academic choices of students in Indian society their independent decisions based on personal assessment of their competencies and preferences? Are the students influenced by factors like the expectations of parents, employment opportunities, and cultural biases? We also compared the response of undergraduate and postgraduate students to investigate if there is a discernible difference between the two. Another area of enquiry was the impact of gender in undergraduate and postgraduate course choices. The study is based on a questionnaire-style survey, with random convenience sampling of 180 students enrolled in undergraduate programs and 168 students in postgraduate programs in Mumbai and suburbs. An initial pilot study was conducted on 50 undergraduate and 35 postgraduate students.

Keywords Business education · India · Academic choices

Background

Students play a vital role in India as the country's future human capital. India is currently undergoing a period of demographic dividend (Aiyar and Mody 2011) and, as a result, the largest number of students in India's history are set to enrol in

M.B. Rao · M. Mehta (✉)
IES Management College and Research Centre, Mumbai, India
e-mail: minu.mehta@ies.edu

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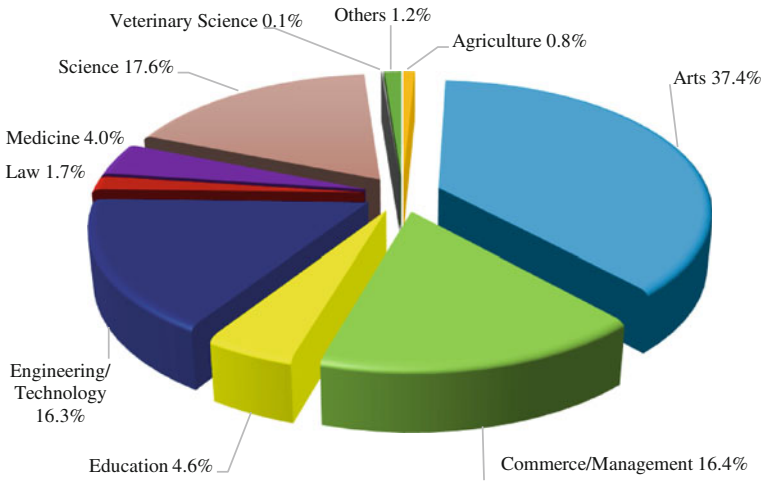

Fig. 18.1 Student enrolment by stream, adapted from UGC (2015, p. 57)

higher education institutions. In 1947, the year of India's independence from the United Kingdom, the country had 20 universities and 500 colleges with 2.1 lakhs[1] students enrolled in higher education (University Grants Commission 2015). Developments since that time have led to a staggering growth in the higher education sector in India as is documented in the University Grants Commission's *Annual Report 2014–2015*:

> The numbers now have increased 40 times in the case of the Universities, 82 times in the case of Colleges and the students enrolment has gone up to over 127 times in the formal system of higher education in comparison to the figures at the time of independence … the total enrolment in all courses and levels in regular stream was 265.85 lakhs including 124.76 lakhs women students, constituting 46.93 %. (University Grants Commission 2015, pp. 7–8)

The student enrolment in 2014–2015 at various levels stood at undergraduate (88.26 %), postgraduate (11.09 %), research (0.67 %), diploma/certificate (1.57 %), and integrated (0.41 %). The report also shows that just over 70 % of a total of 26,585,437 enrolments were spread over only three faculties: Arts, Science and Commerce/Management. As Fig. 18.1 illustrates, less than a third of the enrolments were in professional faculties.

As teachers employed at IES Management College and Research Centre, Mumbai, and closely linked to the admission process, we are interested in the academic choices of students. The nationwide statistics quoted above highlight the importance of developing a system that aligns aptitude with admission, so as to

[1]A lakh is a unit in the Indian numbering system equal to one hundred thousand (100,000).

ensure the best fit. The current practice of granting admission based only on the marks earned by the applicants in the qualifying exams offers almost no scope for factors like aptitude, personality, and interest of the students. At our College, we run an autonomous course, the Postgraduate Diploma in Management, for which we are empowered to design our own admission criteria. For this, apart from the government-determined marks criteria, applicants are personally interviewed by a faculty panel which helps us to gauge the suitability of the student for the course and minimise the cases of students who stray into courses they are ill suited for. However, the painful reality is that these practices are rare and almost non-existent at undergraduate levels. Students apply for courses which are open to them based on their marks and, if rejected, pick up whatever else is available. Thus, student choice being limited, revealing the factors that influence it is the focus of this study.

For the sample under study, 348 respondents representing various colleges and universities in Mumbai and suburbs were interviewed. The student enrolment by stream for this sample, as shown in Fig. 18.2, differed from the national distribution as shown in Fig. 18.1. This is perhaps due to the fact that the study was Mumbai-centric, and as it is the financial capital of the country the opportunities available in the business sector are greater.

As the gender and level breakdown of the sample in Fig. 18.3 show, streams like law and education attracted smaller numbers of students than commerce and management. In addition, postgraduate enrolment fell for engineering, with more students diverting to courses like an MBA, which is perceived as more job-oriented. Education as a stream, shows an under-enrolment of male students indicating feminisation of teaching as a profession; more so at the school level. The men who opt to teach at undergraduate and postgraduate levels do not require a degree in education and so are not represented here. Even research attracts a low number of male students.

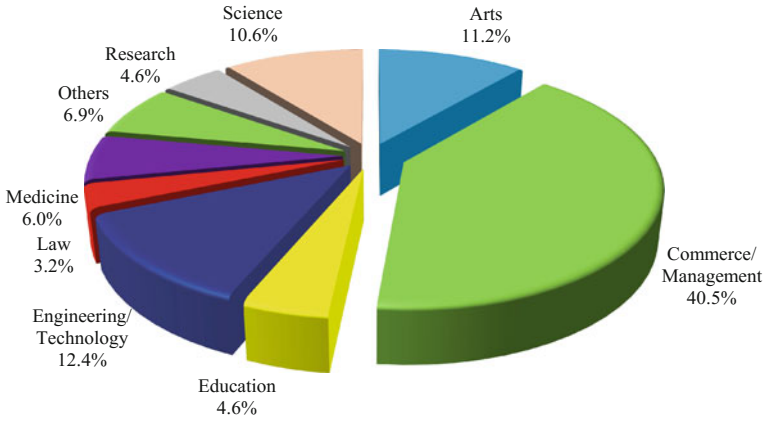

Fig. 18.2 Stream wise student enrolment for the sample, Mumbai

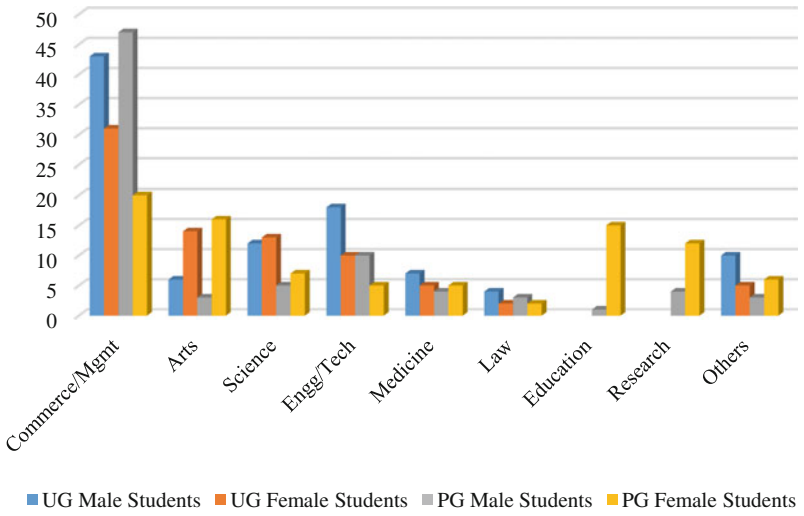

Fig. 18.3 Gender and level breakdown of student enrolments, IESMCRC, Mumbai

Our study advances the understanding of the reasons that encourage students to crowd in certain streams and reject others. It offers an interpretation of the perception of success by the students, and highlights their ideas about making the process of course choice more scientific and less arbitrary. The role of parents, teachers, and peers is also examined, along with factors like affordability of the course and employment potential. We endeavour to understand if the students feel that their academic choices were giving them an experience of fulfilment and enrichment, and were the best selections from the available choices. Where the students reported not being happy or were dissatisfied with their choices, the reasons for this inappropriate choice are probed. Did they enrol for the current course because of parental pressure or cultural biases? Were they feeling stuck in their courses? Was a course correction available to them? Most importantly, the study seeks answers to the young students' judgement of their ability to shape their future lives through their choices. The responses are used to map the changes, subtle and obvious, in Indian society, in particular with respect to the cultural prejudices associated with gender.

Factors Influencing Academic and Career Decisions

A typical Indian family is characterised by parents offering support to children way beyond the support received by children in many other parts of the world, which effectively translates into an increased dependence on parents and consequent loss

of independent decision making by children (Gupta 1987; Simhadri 1989; Madan 1990; Shukla 1994; Ahuja 2002; Adya 2008). The determinants of field and subject choice are classified as intrinsic, extrinsic, and interpersonal, as classified by Carpenter and Foster (1977). As supported by numerous studies (Ahuja 2002; Chang 2005; Adya 2008; Margolis 2008; Sugahara et al. 2009; Wong and Liu 2010), career choice is an interplay of these three factors. Ahuja (2002) and Adya (2008) found social and structural factors to be more important for career choice, for example, the critical role played by parents, peer groups, media, and availability of successful role models, teachers, and counsellors. Dryler (1998) suggests that role models influencing career choice among students are mainly picked up from within the settings of family or education. Sreekanth (2010) reported a positive correlation between parental involvement and educational performance of their children, which facilitated a better quality of life for the children. Similar studies by Steinberg et al. (1992), Hill et al. (2004), Winters (1993), Choi (2003), Greene and Tichenor (2003), and Tillman (2003) have found parental influence to be critical to positive educational outcomes for their children.

Smith (2000) found that mothers with 4-year degree qualifications influence the career choices of their children more decisively than other mothers. The education of parents, employment of mothers, and success being a core family value were found to have significant impact on the career choice of children, especially for girls who entered science-based courses (Jackson et al. 1993). A father's role in persuading daughters to opt for non-traditional careers is well documented in a number of studies (Scandura and Ragins 1993; Leslie et al. 1998; Gates 2002; Trauth 2002). Agarwala's (2008) sample, drawn from a management college in India, reported that the respondents' fathers exerted the maximum influence on the career choice of male as well as female respondents. The author attributes this to the strongly collectivist culture of India, as outlined by Hofstede (1980).

Banks et al. (1995) found that the gender and choices of siblings often influence academic and career choices of students. Kram and Isabella (1985) found adolescents and post–adolescents to be somewhat influenced by their peers; while Smith (2000) found male peers to be significantly responsible for the choice of mathematics-science-technology among women. Negative peer group influence that made students not opt for physics in college was reported by Brekke (1997). Several studies have shown how the prominence of gender stereotypes in the media affects the choice of subjects and careers, especially for women students (McArthur and Resco 1975; Culley 1988; Furnham and Voli 1989; Signorielli et al. 1994; Milkie 1999; Furnham and Mak 1999; Nelson and Paek 2003). Biases emanating from teachers are also documented as encouraging or discouraging students from pursuing courses like IT (Lipinsky et al. 1986; Lockheed 1986; Sanders and Stone 1986; Culley 1988; Volman and van Eck 2001). Gates (2002) and Turner et al. (2002) noted how the personal prejudice of teachers and counsellors pushed girls towards traditional subjects and, consequently, away from non-traditional career options, while they did the opposite with boys. However, Canes and Rosen (1995)

vouch for the positive role played by male professors in encouraging women students to take up computer and IT-related subjects. In either case, the role of teachers and counsellors as influencers cannot be underestimated. While a few studies do exist of the choice of professions in areas like accountancy, engineering, management, teaching, healthcare, and tourism (Carpenter and Strawser 1970; Paolillo and Estes 1982; Choo et al. 2012; Bundy and Norris 1992; Auyeung and Sands 1997; Moy and Lee 2002; Morrison 2004; Simmering and Wilcox 1995; Ozbilgin et al. 2005; Malach-Pines and Baruch 2007; Davis 2009), these studies do not shed light on the decision-making processes of students in India.

For the purposes of our study, the determinants of field and subject choice are classified as intrinsic, extrinsic, and interpersonal, as classified by Carpenter and Foster (1977). Intrinsic factors refer to the inherent interests and skills of the respondent and their own plans for their future; the extrinsic factors are attributes of the external environment, like government policy, remuneration, and high demand for a certain type of skills; and interpersonal factors refer to the pressure exerted by parents, siblings, peers, teachers, and others. We study the factors that prompt undergraduate and postgraduate students in India to accept or reject courses, and explore whether the relative importance of these factors changes as the students transit from undergraduate programs to postgraduate programs. Further, we probe whether students connect success in life with their academic paths and see a causal relationship therein; and whether the perception of success differs at undergraduate and postgraduate levels. Another area of enquiry is the impact of gender, first in the choice of course, and second, in understanding the relationship between success and academic choice.

Methodology

The study was conducted using a structured questionnaire administered to 348 respondents, of whom 180 students were enrolled in undergraduate courses and 168 were postgraduate students. There were 100 male and 80 female respondents at the undergraduate level, and 80 male and 88 female respondents at the postgraduate level. The respondents were drawn from Mumbai and suburbs and represented general as well as professional courses leading to undergraduate and postgraduate degrees in arts, commerce, science, engineering, medicine, law, architecture, pharmacy, and management, and also postgraduate courses like MPhil and PhD. The factors influencing academic choices were broadly categorised into extrinsic (environment determined), intrinsic (self-determined), and interpersonal (determined by family, peers and role models). Each of these categories was further refined and examined. The main findings are summarised below.

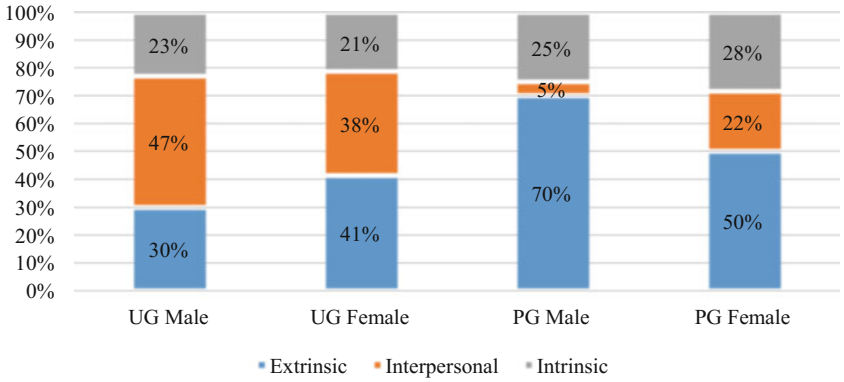

Fig. 18.4 Factors impacting decision making

Findings

As shown in Fig. 18.4, at the undergraduate level the impact of interpersonal factors, representing parents, peers, and role models, was highest for male students; while extrinsic factors, specifically, affordability of the course and the distance of the college from home, were the dominant factors for female respondents. Coming to the postgraduate level, extrinsic factors gain predominance for both the genders. Even though the importance of interpersonal factor-based decision making shrinks for both postgraduate male and female students, the change is more dramatic for men compared to women students. Thus, external environmental factors like the availability of employment opportunities gain more significance for men as they prepare themselves for their future role as the primary breadwinner, in keeping with the pressure of traditional gender roles in the Indian society. Male students at the postgraduate level learn to rely more on their understanding of the economic environment and experience a loosening of parental control. For women students, though parental influence shrinks, it is much more than that for their male peers.

Interpersonal Factors

When interpersonal factors are examined further, for postgraduate male and female students, successful role models become more influential compared to peers. In contrast, at the undergraduate level, nearly half of all the male and female respondents said that they opted for a course knowing that their friends were joining it too. This was found to be applicable for professional courses like medicine and engineering as well as general courses like commerce. On further probing, it was found that somewhere in their high school years, children tend to get into friendship

circles with fellow students of similar academic calibre and professional ambitions. They spend extended periods of time in close proximity as they prepare for board exams and entrance exams (wherever required; for example, medicine and engineering). The bonds thus formed play a crucial role in their choice of course and, to an extent, the choice of college too. It is presumed, by parents as well as students, that in the unfamiliar and highly competitive world of college education, the presence of a friend is reassuring and comforting, not only for managing studies and assignments but also for practical concerns like carpooling. It would be interesting to focus exclusively on the role of friends and peers in a future study.

Extrinsic Factors

When it comes to extrinsic factors, affordability of the course is of maximum importance at undergraduate level, for males and females, while at the postgraduate level, it is employment opportunities. It was heartening to note the willingness of families to invest in postgraduate education of girls as it shows a change in attitude; a generation ago marriage expenses took precedence over education for girls. As a 23-year-old student pursuing her MBA, said, "I requested my parents to support me for my education and promised them that I would fund my own marriage expenses, and they readily agreed." Another student said, "Both me and my sister worked for 2 years after our engineering degree and saved up for our master's. Dad made good the gap between our saving and the actual expenditure." When asked if this dependence on parents resulted in any subtle or overt pressure to pursue a particular course, a 22-year-old pursuing an MBA was forthright in saying:

> Yes. I actually wanted to pursue music, but since the field is so uncertain, it would mean additional dependence on parents for anything from five to eight years. They were willing to sponsor my MBA and advised me to keep music as a part-time profession. I saw merit in that. I sing in a club in the evenings on weekends and will take a call to go full time or not, by the time I finish my MBA.

When quizzed if getting employed might make him extremely busy with little time for his passion, he shrugged it off and said, "I might enjoy my job as much as I enjoy music." Most of the students in the sample reported making conscious and informed choices when it came to picking their streams for postgraduate courses. They viewed postgraduate qualification as their last chance to enhance their possibility of landing a lucrative job and their parents seemed to be in agreement with them. For the students desiring a track change, postgraduate studies assumed critical importance and the students were acutely aware of this. For instance, a twenty 22-year-old male student, with an undergraduate degree in English Literature, said that after receiving the degree he was totally dejected by the limited employment opportunities open to him. "I wish I had majored in economics. With English, what am I good for?" he rued. He decided to study law as he felt it would open more doors for him.

Intrinsic Factors

The study threw up interesting insights on the intrinsic factors guiding the academic choices of the respondents. In fact, the gender differences indicated by them are pointers to the perception of success of the youth in India.

The young men were guided more by their personal plans for the future than by what they identified as their heart's desire, which would stand for their personal happiness. At undergraduate as well as postgraduate levels, the men showed much more willingness to sacrifice their happiness for what they felt were practical factors. Even the importance of one's aptitude came down from 23 % at undergraduate level to a mere 5 % at the postgraduate level.

As many as six students pursuing chartered accountancy parallel to their undergraduate commerce degree said that their decision was guided by the value of a qualification which would enable them to lead comfortable future lives. One of these respondents, a 20-year-old male, categorically stated:

> I am pursuing CA as it is the least expensive of all professional courses and so the onus is on my hard work and is not a financial burden on my parents. I am not enjoying the course but I know it is good for me. Left to myself, I would have enjoyed a research career in physics. But I wouldn't have been able to do much for my family. I want to change my family's circumstances quickly.

This readiness to trade personal preferences for a better future was found to be enhanced at the postgraduate level for male students. Perhaps the pressures of patriarchy coupled with a slow growth in employment opportunities has made the men willing to overlook their own desires and likings. One respondent pursuing an MBA after completing his undergraduate medical degree, said, "I chose MBA over MD as a corporate career scores over private practice, more so since there are few doctors in pharmaceutical companies." When complimented on the sound plan he had outlined for himself, he said:

> To be honest, I would have preferred practising as a general physician, but the cost of setting up a decent clinic and the prospect of waiting for at least five to seven years to build a loyal patient base is too unattractive. Alternatively, with an MBA, my starting package would be more than what I could make in the next few years as a private physician.

Another interesting case was that of a computer engineer who was enrolled in a law degree. He felt that his background would open more opportunities for him in cases related to cyber-crime.

In sharp contrast, women students across all levels were much more conscious of their personal likings and attempted to align their personal preferences with career prospects. One student majoring in undergraduate political science said she loved the subject and that was the only thing that mattered to her. Asked about what sort of employment opportunities the degree would prepare her for, she said she could work as a journalist or as a civil servant. Another student said she had enrolled for an MA in mass communication since she fancied a career in media and advertising. Asked if she was aware of the job market and the remuneration packages, she said,

"Eventually everyone gets absorbed." A respondent pursuing a Bed, after having completed her BSc in chemistry, said she had an aptitude for teaching and was of a nurturing disposition, and so would make a good school teacher.

Even when the women were found to be changing tack, they attributed it to a recent discovery of their actual aptitude. One student said that she decided to pursue an MBA after a B.Sc. in biotechnology and not an M.Sc., as she found herself to be a people person and so was convinced that she would become a successful human resource professional. Coming to the women who were guided by their plans for the future, the biggest difference between them and the men who were similarly guided was the contents of the plan. While most of the women had factored in the demands of marriage and motherhood, the men reported career opportunities, remuneration, and social status to be prominent features of their future plans. Thus women were cognizant of the fact that marriage and maternity could lead to disruptions in their careers and were preparing themselves accordingly. The women aspiring to academic careers in schools or colleges readily admitted that they chose these careers as they were more accommodating for marriage and motherhood than corporate careers. The women pursuing an MBA and so, ostensibly, on a corporate career track, said they were hopeful of marrying liberal men who would support them in their professional choices. There were also some women who had planned to reject marriage or motherhood or even both, and concentrate totally on building their professional lives. The future plans of men, on the other hand, were unencumbered by such domestic concerns.

Definitions of Success

Finally, when asked pointedly what defined success for them, the male students at undergraduate and postgraduate levels overwhelmingly identified well-paid jobs and a high social status as the benchmarks of success. They felt that education was a tool towards this end and that education per se does not lead to success. Success is achieved when education leads to upward social mobility and material prosperity. At both the undergraduate and postgraduate levels, male students felt that postgraduate degrees were more concrete in shaping their careers and that undergraduate degrees had, more or less, become a necessity, like an extended school education. Women respondents, on the other hand, felt that doing what they enjoyed was an indicator of success. By this definition, getting enrolled in a course of their choice was also an indicator of success for them. While most of them aspired to lucrative jobs and it was a prominent parameter of success, it was not the only definer. For women, enjoying the job was as important as earning money; and integrating career with marriage and maternity was of critical importance. They tended to agree with their male peers that postgraduate courses were the real differentiators and that undergraduate degrees did not actually define them or their

lives. Perhaps this explains the big importance placed on affordability at undergraduate levels, whereby decisions are taken on the premise that it is better to save now and spend more at the postgraduate level.

Conclusions and Implications

Our study led to some positive—and some disturbing—realisations. As stakeholders in the massively expanding higher education sector in India, we happily noted the narrowing gender differentials in the importance given to postgraduate education. It was heartening to see the easy readiness of parents to sponsor postgraduate education for sons and daughters alike. However, we were pained by the casual and arbitrary marks-based enrolment strategies adopted by colleges and universities in India. It was evident that not all students are making wise academic choices and the sheer magnitude of numbers suggests the existence of a huge pool of students who are not suited for the courses they are enrolled in. For a country undergoing a period of demographic dividend, the implications are worrisome. Unhappy students are unlikely to transform themselves into happy professionals and caring adults.

We observed with interest the perceptual differences regarding success for men and women pursuing undergraduate and postgraduate studies. Similarly, the factors impacting choice of a specific course by men and women at undergraduate and postgraduate studies showed the subtle and obvious pressures experienced by the respondents. It was found that at undergraduate levels, the interpersonal factors impact the decision to join a particular course much more for male respondents compared to female respondents. Parents tend to have greater aspirations and expectations from their sons, but tend to take pragmatic decisions based on affordability and distance for their daughters. The responses underscored the need for a transformational change in the enrolment strategies of colleges and universities, whereby the psycho-graphics of the students become an important entry-level consideration instead of the current practice of only looking at the marks obtained in the qualifying exams. It was found that the near non-availability of counsellors on campuses led to most of the students making arbitrary choices and joining courses for which they fulfilled the marks criteria. Many respondents said that had they been guided about the personality traits required for professionals from this area, they would have made more informed decisions. Another area of concern was the rigid structure of higher education in India, where the undergraduate student has to declare their major right at the entry level for certain professional courses like engineering. This also led to making decisions based on cultural biases and social expectations (for example, "Mechanical engineering is not suitable for girls").

Relative to the undergraduate courses, at postgraduate level the extrinsic factors gained precedence for both genders. When examined in depth, it was found that male respondents perceived success to be a function of their money and material gains and their social status, whereas women gave greater importance to their

personal likings and aptitude. Men studied the job market and joined the courses which helped them to match their skills with those in demand, whereas women tended to opt for courses that enhanced their inherent skills and searched for jobs where those skills were required. Men students thus interpreted success as the end result of their academic choices, whereas women students co-opted the academic choices as well as the jobs as part of their understanding of success. For men, success was a product whereas for women, it was a process.

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Chapter 19
Higher Education in Bangladesh: The East West University Experience

Mohammed Farashuddin

Abstract Higher education has made a quantum leap in Bangladesh. Tertiary enrolment which was 31,000 in 1972 rose to 3.1 million in 2015; that is roughly 2 % of the population and 20 % of the cohort. In 2013, 63 % of the enrolment in universities was in the private universities. East West University (EWU), a leading private university, has been able to secure permanent approval in less than twenty years since its establishment in October 1996. EWU prides itself in offering excellence in education under efficient management, a highly relevant curriculum, a competent teaching faculty, a zero-tolerance discipline, and innovative cost sharing to attract as well as retain students. Its ability to help graduates to secure jobs contributes to EWU's high retention rates and excellent reputation.

Keywords Higher education management · Bangladesh · Retention

Background

The East West University in Bangladesh was established in 1996 under the *Private University Act 1992* (Act 35) in rented premises measuring 18,000 sq ft or so. At that time, the public sector was the dominant provider of tertiary education. In that context, the advent of private-sector higher education in 1992 marked an auspicious occasion. By 2013, non-government university enrolment had reached an impressive 63 % of all tertiary education students. East West University, one of the 68 private universities permitted to establish and run tertiary education in Bangladesh, accounted for 2.4 % of those private-sector enrolments.

M. Farashuddin (✉)
East West University, Dhaka, Bangladesh
e-mail: farashuddin@mail.ewubd.edu

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Enrolment, Number of Faculty Members, and Per Capita Expenditure of University Students

The demand for tertiary education had expanded greatly, and public universities were unable to meet the increasing desire of the population for university places. Public universities experienced strong competition for seats, and it was not uncommon for session jams to occur. In some public universities, class stoppages occurred as a result of political turmoil, which sometimes resulted in completion of the degree programs 1½–2 years later than the scheduled time. Due to these factors and the undersupply of public university places, many higher education seekers began to enrol in foreign tertiary institutions, without being able to determine the quality of the education offered by those institutions. Some of those institutions proved to be sub-standard. This exerted expenditure pressure on the scarce foreign exchange reserves of the country. Consequently, private universities were permitted to be created in order to supplement, rather than supplant, the overflowing public universities. Establishment of the private universities gradually slowed the excessive loss of students to foreign universities, thus preserving valuable foreign exchange.

Just as the public universities have widely differing quality and standard of tertiary education, the 68 private universities were perceived as having a highly differential standard and quality of the student body. In the 1990s, the handful of private universities which then existed accepted those students who could not attain admission to the public universities in the urban areas, including the high-ranking institutions. However, several private universities, including East West University, have now reached admirable standards, with their graduates capable of competing with graduates of public universities in the corporate-sector job market.

A major shortcoming in the arena of Bangladesh higher education is the conspicuous absence of an institutional mechanism that would provide an indication as to which higher education providers, and which programs, have attained a minimum benchmark of quality and standard.

Another challenge for students in selecting an institution is that most of the private universities are located in the urban areas—approximately 45 of the 68 or so private universities are located in the capital city of Dhaka itself. Infrastructure and nearness to the faculty members in the public universities are cited as the major reasons for such concentration.

University education in Bangladesh is divided into four streams. Of the total tertiary enrolment of 2,290,189 (roughly 2.3 million) in 2013, Islamic universities, with a high proportion of students from the madrasha education system, accepted 187,485 students or 8.1 % of the total. The largest group—1,563,366 or 68.3 %—were registered at colleges affiliated under the National University. The distance-learning type is under the Open University; however, experts have general reservations about the quality of distance learning, which is either devoid of classroom contact or may lack effective monitoring and supervision.

Between the 32 public universities and 68 private universities, a total of 539,338 or 23.6 % of the aggregate students are pursuing higher education. Although there remains a perception that private universities may not offer equivalent tertiary education, private university graduates do compete effectively with public university graduates in the job market and other aspects of national life. In 2013, 32 public universities had:

- 11,323 faculty members,
- 2329 or 21 % female, and
- teacher:student ratio of 1:19.

By contrast, 68 private universities had a teacher:student ratio of 1:25. However, if the extreme cases at private universities with a very unsatisfactory teacher:student ratio are excluded, the proportion becomes comparable with that in the public universities. At East West University, there were 336 faculty members for 7749 students in 2013 at a ratio of 1:23.

According to the annual report of 2013 of the University Grants Commission (UGC) of Bangladesh, the highest per capita student expenditure in a public university was recorded to be taka 231,423 (USD 2967) at the Bangabandhu Sheikh Mujib Medical University. Looking at the general-education public universities of the country, Khulna University had the highest per capita student expenditure at taka 149,007 (USD 1910). It is noteworthy that education in the public universities in Bangladesh is heavily subsidised, sometimes by as much as 90 %. Thus the public universities receive very little tuition revenue from the students, with the primary source of revenue being through government subsidies.

In relation to private universities, the average per capita student expenditure was recorded at taka 81,206 (USD 1041). Outside that average, some private universities might be charging 40–50 % higher fees. Under the *Private University Act 2010*, each private university is required to be a non-profit organisation. There is some criticism that some private universities are operating for profit. Nevertheless, there is no mechanism to assess the quality and standard of education at any of the universities of Bangladesh against the cost of tuition. There are neither forensic nor legal methods by which to assess whether profit has occurred, nor any likelihood of a penalty in the event that a breach of the Act has been identified. As many as 14 private universities were notified to close down operations on charges of serious violation of the provisions of the *Private University Act 2010*. However, the universities successfully obtained stay orders and continued to operate without sanction.

Establishment of the East West University

By 1996, as part of a growing movement, a seminar entitled "Bangladesh towards Twenty-First Century", was held at a modest building at 43 Mohakhali, Dhaka. Professor Nurul Islam, an economist of global fame and the first Deputy Chairman (Minister) of the Bangladesh Planning Commission during 1972–74, presented the keynote address, and also published a compelling paper on Bangladesh's economic development. In the audience, prominent economists, planners, educationists, former finance ministers, former planning ministers, and politicians (including the current Education Minister of Bangladesh since 2009) were present. The seminar was held at the makeshift conference room of rented premises previously housing a Sino-Bangla garment factory. The seminar highlighted the critical catalytic role that higher education can play in contributing to a prosperous Bangladesh in the twenty-first century.

A group of 15 education champions,[1] under the stewardship of Dr. Mohammed Farashuddin, elected Syed Manzur Elahi to be the first Chair of the *Progoti Foundation for Education and Development* (PFED). PFED decided to establish East West University, EWU, as the Foundation's first project. Dr. Mohammed Farashuddin, a retiring Resident Representative of the United Nations Development Programme, was nominated to be the Founder Vice Chancellor.

The proposal adopted "excellence in education" as the motto of the University. It committed EWU to a system of education that would ensure a "meaningful synthesis between the eastern values and requirements with the western discipline and rigor". EWU was to be an English-medium, semester-system, non-profit seat of higher learning aiming to offer a globally accepted standard of education at reasonable cost. PFED resolved to redeploy any operating surplus of EWU to the development of EWU itself. It is also worth noting that in practically all major steps, the private universities are subject to government or UGC approval or control.

[1]A group of retired and serving UN officials, one top industrialist cum-former adviser to the 1991 and 1996 caretaker governments, and several eminent personalities, decided to set up the Progoti Foundation for Education and Development (PFED). The group consisted of an ILO official Mr. Jalaluddin Ahmed, a former Secretary to the Government; Mr. S.M. Nousher Ali, former Chief Engineer of Bangladesh Television; Mr. Farooque B. Chaudhury, an industrial entrepreneur; Dr. Rafiqul Huda Chaudury, retired UN adviser, educationist and researcher; Mr. Syed Manzur Elahi, industrial entrepreneur and former adviser to the Caretaker Government of Bangladesh in 1991 and 1996; Dr. Mohmmed Farashuddin, Former Governor, Bangladesh Bank and Visiting Professor at several universities, Mr. Mohammad Zahedul Haque, pharmacist; Dr. Saidur Rahman Lasker, retired UN official and educationist; Dr. Muhammad Abdul Mannan, retired Director of the Asian Development Bank and educationist; Professor Dr. M. Mosleh-Uddin, retired UN official and educationist; Mr. Shelley Abdul Mubdi, pharmacist; Mr. Md. Abdul Mumin, industrial entrepreneur and former Vice President of FBCCI; Dr. Khalilur Rahman, UN official; Mr. H.N. Ashequr Rahman, MP, Chairman of the Parliamentary Standing Committee on Public Administration, Chairman of the Meghna Bank Ltd., and former State Minister; and Mrs. Razia Samad, educationist.

EWU benefited considerably from the pioneering journey of its four predecessor private universities. Although two of these institutions made a major contribution in reconciling the broader community to the idea of tertiary education being provided by the private sector, those institutions primarily catered to the needs of the offspring of the elite class. The universities' sponsors were predominantly from the corporate sector and the tuition fees charged were very high. The founding members of East West University by contrast saw a need to create high standard, good quality, higher education for the children of the middle class. Like most of the other private universities, EWU started with the advantages of being ideology neutral, discipline oriented, and committed to completing all academic programs within the stipulated timeframes.

Interestingly, there are no student politics in the private universities in Bangladesh. EWU like all the others designed a syllabus and course composition in such a way that the graduates can find gainful employment. Although western-oriented, these private universities initially underestimated the importance of general education—mathematics, basic sciences, history, and philosophy in particular—in the curricula. The initial disciplines in which bachelor degrees were mainly offered were in business administration (BBA) and computer science and engineering (CSE), the graduates of which were in demand in the job market.

Two courses each (6 credits out of 123–136) were made compulsory in English and mathematics. A remedial course (non-credit) in both the disciplines was also made compulsory for students with major deficiencies. EWU also introduced general requirements for three credit courses in Bangladesh Studies and in an Introduction to Computers. By purposefully evolving the curriculum in this way, private universities in Bangladesh customised higher education in order to maximise employment opportunity for the children of the middle class. The lofty ideal of creation and dissemination of knowledge took a back seat.

The University Grants Commission prescribed some minimum requirements for establishing and running a private university. Each private university must have at least two Faculties, such as Business Administration and the Science and Engineering faculties, a minimum requirement of full-time faculty members for each department, as well as class size; student:teacher ratio; and space per capita.

EWU started with a major advantage in having the six-storeyed building, 18,000 sq ft space, at reduced rent. The owner of the building, a class friend of a sponsor, benefitted by having EWU in possession of the building and preventing illegal occupation, which had been a risk.

The first semester of EWU in 1996 was, as expected, a very difficult one. It began with 20 students, six of whom dropped out during the semester. The building's internal space was open and therefore conducive to being partitioned as per the requirements of an academic institution. However, there was no lift and the five faculty members, three non-teaching staff, and the students struggled to climb the stairs to the higher floors.

The area around the campus of EWU was not conducive to academic pursuit at all. The road in front was full of water puddles. The three rickshaw garages and a car repair centre opposite the EWU's rented building tended to attract antisocial

elements. Eventually, the Mayor of Dhaka City authorised the repair of the road and the local Member of Parliament assisted with relocation of the garages. These developments helped boost guardians' confidence in the newborn institution. The value of the surrounding land and the rates for property rental of the University surrounds were improved. The general environment of the locality also showed marked improvement in its amenity.

By spring 1997, the university admission test resulted in EWU achieving an enrolment of 148 students. A significant turning point was reached by the end of Fall Semester 1999 when enrolment reached 777, which included 165 female students. The teaching faculty was boosted to 23, including nine female faculty members. Female faculty members were recruited deliberately in order to attract more female students. In the arena of higher education in Bangladesh, scarcity of qualified faculty members has still remained the most formidable obstacle. Nevertheless, gender balance is a matter of priority at EWU.

The physical space and the laboratory facilities were expanded significantly by 1997. A library was established and a medical centre was set up for primary healthcare. EWU declared its highest priority to be creating educational support facilities in terms of book purchase, journal subscription, and adequate laboratory facilities. There was an absence of recreational facilities, such as a playing field, although most educational institutions in Dhaka do not have these either. The solution to this was to lease a nearby outdoor field for limited soccer, cricket, and football practice and competition.

By autumn 1999, a generous financial assistance scheme was also put in place, which comprises both merit scholarships and needs-based stipends.

EWU was quite fortunate in having been financially self-sufficient from the beginning and in raising enough resources from the student tuition revenue to pay for expenses. Efficiency in financial management and academic policy was a positive factor.

Furthermore, EWU maintains an impartial and transparent admission process, the test results of which should be announced by midnight of the same day the examination was held. In the course of time, as the number of admission seekers increased significantly, the result of the written part of the admission test would be announced by the same midnight, leaving an oral part to be announced within the following 2 or 3 days. Running three semesters a year suited the students, the guardians, and the sponsors.

These factors along with well-equipped and comfortable classrooms, optimal class size, competent faculty, appropriate teaching facilities, strict discipline, zero tolerance to sexual harassment, and a congenial atmosphere, created confidence in EWU as an accomplished and desirable provider of tertiary education. The University experienced a steady growth of student enrolment which also boosted tuition revenue.

Additionally, at commencement, the Vice Chancellor (Dr. Mohammed Farashuddin), the Treasurer (Syed Manzur Elahi) and the Registrar (Mr. S.M. Nousher Ali) rendered their services to EWU free of charge. Together with the reduced rental of the newly hired buildings financed under EWU advances and no

remuneration claims by the sponsors on its resources, EWU was enabled to stand independently, reaching a financial break-even point from its commencement.

EWU has always put a very high value on quality education with a strictly administered admission test, with coded anonymity, and an impartial selection of teaching faculty. There is a policy of no-interference by the sponsors in evaluation of the examination scripts by the teaching faculty, according best practice in international universities.

As a major point of departure, the first Academic Council was chaired not by the Vice Chancellor but by an internationally reputed academic, Professor Wahiduddin Mahmud. Amongst the members of the Academic Council were eminent educationists and scientists such as Professor Anupom Sen, Professor Zafar Iqbal, Professor Syed Manzurul Islam and Mr. Habibullah N. Karim.

Table 19.1 shows that EWU has made steady progress in student enrolment, faculty strength, space availability, and the number of classrooms as well as laboratories. It also shows an impressive growth of teaching-faculty strength and an improving gender balance in the student body.

Table 19.1 EWU student enrolments, faculty strength and, facilities

Date	Enrolment			Number of faculty members			Number of classrooms	Area of EWU (in sq ft)	Number (capacity of laboratories)
	Male	Female	Total	Full Time		Adjunct			
				Male	Female				
1996	8	6	14	6	0	0	10	2470	
1997	104	41	145	7	0	1	22	5574	6 (210)
1998	289	92	381	18	6	6	22	5574	6 (210)
1999	550	153	703	23	9		22	5574	6 (210)
2000	756	236	992	26	9		22	5574	6 (210)
2001	998	329	1327	35	12	22	22	5574	6 (210)
2002	1382	430	1812	35	11	17	22	8896	7 (240)
2003	1907	650	2557	50	15	41	27	11,789	7 (240)
2004	2503	861	3364	60	14	53	38	14,729	9 (310)
2005	2967	1043	4010	66	20	73	46	14,729	15 (490)
2006	3279	1244	4523	72	27	79	49	14,729	18 (590)
2007	3187	1304	4491	82	26	79	51	17,426	18 (590)
2008	3469	1503	4972	88	34	90	54	17,426	18 (590)
2009	3643	1633	5276	100	39	81	57	17,426	18 (590)
2010	3959	1841	5800	101	45	114	58	17,426	18 (590)
2011	4375	2330	6705	104	56	124	58	17,426	18 (590)
2012	4632	2532	7164	107	74	145	64	70,230	25 (820)
2013	4939	2810	7749	126	80	130	65	70,230	25 (820)
2014	5463	3223	8686	124	92	134	65	70,230	25 (820)

Tuition Fees

Consistent with its goal to support the higher education aspirations of the offspring of the middle class, the Board of Trustees of EWU set tuition fees at around 35–40 % lower than the private universities of comparable standards. Even so, the tuition fees at EWU are still relatively high, approximately half the price of the real cost of tuition, noting that public universities are subsidised up to 95 %. Tuition fees were, however, set bearing in mind the socio-economic conditions of the community, as exhorted in the *Private University Act 2010*. At the same time, the fees have to be enough to pay for the teaching faculty members (25 %), other education expenses (5 %), administration and management expenses (27 %), tax payments (6 %), and utility charges (5 %). It has also been considered to be prudent to generate surplus to enable a fund to be created for the purpose of improving the campus as well as for any unforeseen expenses.

The tuition covers most fees such as the examination fee, library fee, etc. Only a Student Activity Fee and a laboratory fee for all the students are to be paid in addition to the tuition fee. It is worth mentioning that EWU's only source of income is the tuition revenue, as it does not solicit any support financial or otherwise (like a land grant or land allocation at a concessional price) from any source, whether public or private, home or abroad. There is now minimal surplus revenue generated.

EWU has, as of 2012, insured all its students under a general insurance scheme, and all its staff under an insurance scheme permitting hospitalisation. The academic and non-teaching staff were also brought under a gratuity fund, a provident fund, a festival bonus, leave entitlement and leave encashment in line with the provisions of the UN. Female staff have two periods of 6 months' maternity leave entitlement (after 2 years of service at EWU) during their term of employment. The academic and non-teaching employees have rental accommodation available, reduced to 40 % of the basic pay. Staff are also offered subsidised transport between home and campus.

In order to enable lower-income families to access the quality higher education at EWU, several measures were taken. These measures include:

- full tuition-fee waiver to all those scoring golden GPA 5+ in the Secondary School Certificate (SSC) and Higher Secondary Certificate (HSC) in the immediate past consecutive examinations, or equivalent scores in 'O' level and 'A' level examinations;
- top-position securing candidates with the highest score at the admission test of each faculty;
- admitting 30 students each semester by the directors from amongst those who met the minimum standards set by the University Grants Commission; and
- scholarships of 100 % of the tuition fee, for those students completing 30 credits in the three semesters starting from the semester of entry in the immediate past year, and securing the highest GPA.

These features continue to be available for those recipients who score above a fixed threshold of GPA. However, in recent times the scholarship aspirants also have to qualify at the admission test in order to qualify for one of these measures.

Later on, a scheme called the Medha Lalon Fund (Merit Nurturing Scheme) was created to grant 30 scholarships to the top scorers who were not already catered for by the measures referred to above, to the extent of approximately 50 % of their tuition fees.

A needs-based financial assistance system was also adopted to support those who, in the cycle of three consecutive semesters after admission, complete 30 credits; secure a Cumulative Grade Point Average (CGPA) of at least 2.5 (2.75 now); and experience financial difficulties. This assistance would subsidise approximately 40 % of the tuition fees and would run in cycles of three semesters.

The *Private Universities Act 2010* mandated that private universities support the higher education needs of at least 5 % of the students enrolled in each private university. EWU elected to expend approximately 5 % of the total tuition revenue in financial support of approximately 15 % of enrolled students.

EWU now pays for full tuition of the children of the freedom fighters (who fought in 1971 for the independence of Bangladesh) who also qualify under the admission tests. Some institutions and individuals have made contributions which are used to support some meritorious students by way of partial funding.

EWU has also started a scheme of appointing Graduate Teaching Assistants (GTAs) from amongst the meritorious postgraduate students and undergraduate Teaching Assistants (UTAs) to help disadvantaged meritorious students to pay for their higher education, in exchange for guiding the graduate and undergraduate students respectively. GTAs and UTAs remain attached to the faculty members but are precluded from teaching, setting exam questions, and evaluating exam scripts.

EWU has a reputation for an objective and transparent system of evaluating students by the instructor concerned. There is a policy of no interference by the trustees in the grading of students. The Academic Council, the Syndicate, and the Board of Trustees remain constantly engaged in seeking ways to improve the quality of grades of the below-average students who had low CGPA scores.

Improvement in English proficiency is also a focus.

Despite persistent pressure from the authorities under the influence of the public universities, EWU has avoided the practice of appointing an internal examiner, reiterating full confidence on its teaching faculty members. There are also practical difficulties in using two examiners in a 14-week semester.

In these ways, EWU has endeavoured to attract disadvantaged students, particularly those outside the metropolis of Dhaka, and retain those who demonstrate merit.

Approximately one third of the student body of EWU is from the mofussil (that is, from outside the capital city Dhaka). These students are commonly more disadvantaged. From the standard market-based tuition fee charged to the majority of students, EWU allocates a portion of that revenue to subsidise and support

markedly disadvantaged students. This has the result of enabling some students to obtain valuable education which they would not otherwise have had the means to access.

It is possible that public universities could employ the same policy in order to subsidise the associated living expenses of disadvantaged students. This would mean that instead of charging no or minimal fees (a student at the University of Dhaka in 1960 would pay a tuition of taka 12 per month equivalent to USD 3.00; it was raised to taka 30 in 2010, equivalent to US 40c), the public university might charge a higher fee to standard students in order to subsidise the more disadvantaged, local students.

Attracting and Retaining Students

Tuition cost at the public universities is negligible, especially compared to private universities, with 90–95 % of the costs of higher education being funded by the government from public money. Students from middle- to higher-income families pay the same as those from lower-income families.

Session jam occurs in public universities, where students may take 20–25 % more time than expected to complete their degrees. Compared to students in private universities, who complete their courses on time, it can be argued that the higher private university fees are offset against the gains made by private university students in earlier employment, and that the actual public university fees (subsidised by public funds) are increased by the prolonged period of tuition.

Some of the public universities with good reputations attract up to 80 candidates for every seat available. Initially, private universities received students who could not gain entry to public universities (potentially those who were less meritorious). Nevertheless, those private university students received high-quality education in the right environment, enabling them to complete the degrees they aspired to, and compete in the job market with those from the Bangladesh University of Engineering and Technology (BUET) and the Institute of Business Administration, (IBA), the two standard bearers of quality education in the country. Over time, some of the best students, as judged by the HSC and SSC, also started competing for admission seats in the reputable and well-prepared private universities.

Timely completion of the degrees, a politically neutral environment, availability of merit scholarships, success in the job market, and strict discipline, are encouraging increasing numbers of quality students to seek admission at the private universities.

At EWU, the academics, non-teaching staff, and the trustees make combined and concerted efforts to maintain the congenial atmosphere that had been created at inception. The decision-making process is a transparent matter. The Annual Report

and the Convocation Brochure produced every year meticulously show all items of revenue and expenditure without exception. The accounts of the University are externally audited by a firm (appointed by the government) approved by the Chancellor. The financial support, the merit scholarships, and the opportunity to pay the semester dues in instalments have also helped attract and retain children of the middle class aspiring to advance and prosper. In addition, the more rigorous and objective admission test and a lower acceptance rate are seen as major attractions by admission seekers who opt for EWU (which is rather impressive for a private university).

Over the 18 years of life since its beginnings, by the end of 2014 EWU had admitted a total of 28,680 students from amongst the hopeful prospects. Of these, 10,986 graduated in the 14 annual Convocations (graduation ceremonies). On 31 December, 2014, net cumulative enrolment was 19,672. The dropout rate was 9008 students; approximately 2021 are accounted for by department transfers within the University.

However, the large dropout rate remains a matter of grave concern as the bulk of students reported leaving because of their inability to cope with the rigour of the program of studies at EWU. Others left for higher education abroad. However, some dropouts occur because of financial inability. Transfers to other private universities are rare.

Currently, governance in the education sector in Bangladesh still leaves major scope for improvement. In private-sector tertiary education, the legal apparatus, norms, and optimal practices are still evolving. In the *Private University Act 2010* there are ambiguities as to the span and areas of management control. Since our management Syndicate is chaired by the Vice Chancellor (who is the CEO of the University) and the Board of Trustees is headed by a sponsor of the University, there can be some jurisdictional tension in relation to policy making and implementation. There can be conflict and affiliations amongst sponsors to add to the administrative difficulty. Those conflicts in private universities can present challenges in administration and management.

The governance issue becomes serious in some cases due to the absence of an oversight system for the private universities. The University Grants Commission Ordinance promulgated in 1973 (the private universities came into being after two decades) does not provide legal authority to the UGC to supervise the academic activities of private universities, nor to enforce any penalties. The UGC now exercises its authority through administrative orders, but legislation exerting legal authority over the private universities could be more proscriptive.

In strengthening the UGC, legal, financial, and human resource capacity need to be enhanced significantly. The need for setting up a quality indexing accreditation council is also an urgent one (Table 19.2).

Table 19.2 Retention picture at East West University

Date	Admitted			Graduated			Continuing in 2014			Discontinued	Continued	Retention (%)
	Male	Female	Total	Male	Female	Total	Male	Female	Total			
1996	8	6	14	5	6	11			0	3	11	79
1997	99	35	134	72	29	101			0	33	101	75
1998	190	53	243	116	38	154			0	89	154	63
1999	315	71	386	174	52	226			0	160	226	59
2000	336	111	447	176	79	255			0	192	255	57
2001	448	127	575	304	100	404			0	171	404	70
2002	635	182	817	406	136	542			0	275	542	66
2003	975	318	1293	603	221	824			0	469	824	64
2004	1107	392	1499	669	276	945	1		1	553	946	63
2005	1170	424	1594	723	322	1045	2		2	547	1047	66
2006	1166	465	1631	691	356	1047	4	1	5	579	1052	65
2007	971	432	1403	582	292	874	9		9	520	883	63
2008	1513	634	2147	886	444	1330	29	7	36	781	1366	64
2009	1621	612	2233	882	403	1285	87	29	116	832	1401	63
2010	1668	750	2418	630	374	1004	444	233	677	737	1681	70
2011	1917	1129	3046	271	271	542	921	528	1449	1055	1991	65
2012	1723	922	2645	179	115	294	920	546	1466	885	1760	67
2013	1853	1087	2940	65	35	100	1300	836	2136	704	2236	76
2014	2032	1183	3215	2	1	3	1746	1043	2789	423	2792	87
	19,747	8933	28,680	7436	3550	10,986	5463	3223	8686	9008	19,672	69
											Average	67

Own Campus and Stabilisation

Private universities in Bangladesh are established and run on the basis of temporary permission. That permission is subject to the requirement that the university will construct and move to its own campus—initially within five years but now seven years—from commencement (defined as the first day of classes in rented premises). Only one private university of any significance has been able to meet this requirement. This is due to the cost of construction and skyrocketing land prices in Bangladesh's major cities. The minimum size on which a university is legally permitted to construct its own campus is one acre. Currently, this may cost roughly USD 15 million to purchase.

EWU was fortunate enough to purchase just over two acres of land in 2002, costing just 5 % of the 2015 land price. It has been possible to construct a 459,000 sq ft, nine-storey, state-of-the-art, modern building at a cost of USD 20 million, including the land price, on a plot which is double the size of the minimum required. EWU has just been granted a permanent sanad (permanent approval) by the Ministry of Education for the University, making it the third private university to achieve this; out of 84 private universities, EWU is one of three private universities to have successfully completed all 11 conditions laid down for a permanent sanad.

By 2012 EWU relocated to its own campus building, measuring 459,000 sq ft on a 7.3 ha plot in Aftabnagar. The campus is located in Badda and has very good connections with Uttara, Gulshan, Banani, Dhanondi, and Maghbazar areas. This private university has now become a remarkable seat of higher education with the motto "excellence in education" as a major driving force to emerge as a source of generating human resource for meeting national and international needs.

A major attraction of the campus is a 2500 sq ft open-sky concourse where 2500 plus students can mingle in the open. That space is also used to convene the Convocation every year. Either the President of the People's Republic of Bangladesh chairs the annual Convocation of EWU as its Chancellor, or they send a nominee to chair the Convocation as the Chancellor's representative.

The EWU Board of Trustees takes a lot of pride in its management efficiency. The construction of the campus was in a good location, well connected to several main parts of the metropolis. The construction has been funded from student tuition revenue. It was possible to construct the campus without increasing tuition fees nor imposing a surcharge on students. EWU does not have liabilities to any sectors (including financial institutions).

Incoming students are very impressed by the competent quality of the teaching faculty, air-conditioned classrooms, adequacy of educational and laboratory equipment, ongoing digitisation of the library, and a very congenial atmosphere, all housed within an attractive campus.

EWU also offers a Career Counselling Centre (CCC) which can arrange for placement of EWU graduates in good-quality jobs within various reputable corporate bodies, with whom the CCC maintains meaningful contact. The CCC also

supports prospective graduates in improving their English language and interview skills, by arranging training sessions with the help of external experts. The CCC additionally can also assist with such things as preparation of curriculum vitae. It is intended to develop the CCC's functions to assist externally bound students with admission abroad. The CCC may also be used as a vehicle for strengthening the collaborative arrangements with universities abroad.

Currently, EWU is still developing its alumni group into an effective instrument for fund mobilisation and job placement. However, alumni who work for various corporate entities do help to recruit EWU graduates for positions in these establishments. EWU management also organises large firms to hold recruitment sessions with EWU graduates. In addition, some sponsors liaise with potential employers to lobby for the recruitment of EWU graduates.

With a highly competent teaching staff, humane but strictly discipline-oriented administration and a good reputation for its congenial environment, EWU has been making itself more attractive to potential students and guardians.

Student Accommodation

One major impediment in attracting and retaining students from the mofussil (that is, from outside the capital) is the absence of affordable and convenient accommodation. At EWU, a trial accommodation facility on a small scale was implemented in 1997. However, the Vice Chancellor at the time felt a sense of responsibility when the young students participating in the trial demonstrated their inability to live independently without supervision. The cost of providing a quasi-parental supervisory function was excessive and the trial failed.

As an alternative, it is proposed to assist students to organise private accommodation in groups (popularly known as "Mess"). This has not been made operative yet. Indeed, without the University's assistance, EWU students are already forming groups and many rent private accommodation around the campus and set up their own kitchen.

EWU also applies traditionally conservative social values, such as:

1. preventing the public show of private affection amongst the students;
2. guarding against unfair means in the examinations; and
3. adoption of a policy of zero tolerance for misconduct.

Students breaching these values within the University campus are expelled. EWU has earned a reputation for nurturing Bengali culture, which is rich in substance and sober in conduct. Because of its cultural orientation, and in addition to its academic reputation, many families find EWU to be an attractive tertiary education option. There is a contradiction in the sense that the University's insistence on speaking English on campus is not quite consistent with Bengali culture, that is,

rather than the mother language. This is justifiable in that English language skills contribute greatly to a student's employability, both locally and in the global market.

Staff Amenity

EWU provides a respectful environment for its staff members. For example, in contrast to some other local institutions, it does not require the traditional "punching machine" or "thumb registration" to record entrance and exit times. However, EWU does require specified time to be made available for students to access teaching staff.

EWU is also considering moving to a system of not more than two mandatory semesters in a year with an optional summer semester, so that the faculty members have more time for research and students get time to breathe. Although there is a faculty development fund for the research-minded faculty members to present their research papers to seminars abroad, it has not yet been possible to reduce the teaching load of teachers keen to undertake creative research. Study leave opportunities for young and willing faculty members to study abroad for up to PhD level —retaining their job, salary and seniority at EWU—are very attractive. The matter of funding the higher study is yet to be achieved by East West University.

Security measures are in place, such as CCTV surveillance. EWU is committed to providing a safe workplace, free of criminal activities. There are strong policies of secularism and equal opportunity in place.

Revisiting the Importance of Higher Education

Education in general and tertiary education in particular, is expected to enlighten and emancipate the intellectual capabilities and mental faculties of individuals towards human capital formation. The World Bank has been vigorously appealing for nations to work towards a knowledge-based society as a way to ensure a rapid but stable level of socio-economic development.

It has been observed that the countries who have applied focus and resources to higher education as a priority, with consequent quality graduates, have experienced significantly faster economic growth (e.g. the Republic of Korea) compared to others which have not instituted a positive emphasis on higher education and have fallen behind in economic growth.

A Chinese proverb states: "If you are planning for a year, sow rice. If you are planning for a decade, plant trees. If you are planning for a century, educate people."

This proverb most succinctly describes the foundation on which a modern paradigm of development, in particular sustainable human development, rests. Beyond the laudable goal of liberating the soul to become an excellent human being, education may ensure effective governance. Education creates human capital which is inexhaustible, unlike material capital which is finite.

Higher Education: Socio-Economic Impact on Bangladesh

In Bangladesh, there has been an impressive track record of annual growth in the Gross Domestic Product (GDP). For a developing country to achieve a consistently high GDP growth rate of 6.5 % for seven years or so in a row is regarded as a remarkable achievement—even a miracle. The World Bank, based on its own definition and computations, has declared Bangladesh to have graduated out of the low-income category status to the low medium-income level. The journey from low medium income to medium income will be a very challenging one requiring amongst other factors, higher rates of literacy both in quantity and quality.

Bangladesh had been stalled at the 5.5–6.5 annual GDP growth rate (although quite high by most standards) for the last 25 years, since the restoration of democracy in the country in 1991. Of the three factors of production influencing growth rates, Bangladesh seemed to be mired with low productivity of its labour force.

A reason for this stasis is the less-than-optimal quality of higher education and the lower technological intensity of education compared to the other fast-growing Asian countries, such as the Republic of Korea, Singapore, Taiwan, China, India, and Vietnam. There is thus an imperative to enhance the quality of higher education for ensuring conversion of a very large number of people into human capital for more rapid and sustainable development. Bangladesh has roughly half its population of 160 million below the age of 30, and one estimate suggests there are 100 million people between 15 and 59 years of working age. To realise the demographic dividend, the country needs to improve the quality of higher education and widen vocational education.

Incremental Capital Output Ratio (ICOR) in Bangladesh—that is, the ratio of the quantity of capital needed to produce an additional unit of output at the margin—has increased from 4 in 2000 to 4.5 in 2015. As a result, although the investment: GDP ratio of 22 in the year 2000–2001 produced a GDP growth rate of 5.5 %, the investment: GDP ratio of 29 in 2014–2015 has not produced the 7.25 % GDP growth rate it should have. The GDP growth rate in 2014–2015 has been estimated to be 6.5 %. This indicates a need to increase the quality of higher education as it has ramifications for the quality of human resources. This is because the standard of higher education directly impacts on the quality of the teachers, whose quality enhancement is a sine qua non for increasing labour productivity for a higher GDP growth from an identical level of investment.

Accreditation and Beyond

In Bangladesh, the absence of any indicator to judge the standard of tertiary education provided by a particular university means there is no signal for the employers on the one hand and the guardians on the other to determine the quality of a higher seat of learning. Bangladesh is the only Asian country, other than Myanmar, that does not have an accreditation apparatus to assess which of the universities and which of the specific programs of a university meet minimum standards or quality of education.

Usually an accreditation council would compile a set of indices on various aspects of higher education; for example, the admission process, the requirements of laboratory and other facilities, the tuition fee, the qualification of the faculty members, teacher:student ratio, research, and the manner of evaluating the students. The overall score based on the determination of the objective scores would then indicate which of the universities or programs meet the predetermined threshold for accreditation. The process of accreditation, starting from a determination of the indices to an evaluation of self-assessment by each university or a specific program, by a high-powered, neutral and autonomous body would enable the accredited universities or the specific programs to be more prominent. The failure to set up an accreditation mechanism despite all the efforts in the last decade harms the cause of better equipped universities. There is no empirical evidence to counter perceptions about the commercialisation or commoditising of education at the profit-seeking private universities.

Still on the quality of education, Bangladesh is not immune from the global scepticism engulfing the attitude of university students. Professor Michael G. William Deresiewicz of Yale University in his epoch-making book *Excellent Sheep* (2015, Free Press, New York, London, Toronto, Sydney, New Delhi) has analysed at length the state of miseducation of American college students. Professor Deresiewicz's findings about college and university students in the USA are as summarised in *The New York Times Book Review*: thinking critically and creatively and finding a sense of purpose. *Excellent Sheep* takes a sharp look at the high-pressure conveyor belt that culminates in the skewed applications that Deresiewicz saw first-hand.

This phenomenon of brilliant minds getting confused and stagnant in creativity as observed by Professor Deresiewicz in the USA is also applicable, to a somewhat lesser extent, in Bangladesh. The students are under constant pressure to excel in scoring high grades even without conceptualising the contents of education. Present-day university students, in many instances, remain oblivious of matters beyond and around their immediate syllabus. EWU has not been able to find a mechanism to deal with this impediment for transforming its graduates into human beings sensitive to their surroundings.

This private university has now become a remarkable seat of higher education with the motto "excellence in education" as a major driving force to emerge as a source of generating human capital for meeting national and international needs.

Students are very successful in finding employment. The university is meeting the needs of Bangladesh, students and their families. East West University is committed to supporting disadvantaged students who show potential and have significant measures to improve the lives of these students.

This case study of private education in Bangladesh, demonstrates that there are many ways for higher education to improve outcomes for students and that there are many ways to respond to the demand for quality higher education.

Chapter 20
A Curriculum Design Decision as the Starting Point for a Multidisciplinary Research Group

Victor Martinez-Luaces

Abstract I report on the development of a research group that evolved out of a curriculum initiative, which had the aim to increase the applied components in science and engineering courses. The curriculum development itself did not continue due to a change in economic circumstances in Uruguay; however, a successful research group emerged from the students who had been through the curriculum renewal, the Electrochemistry Interdisciplinary Research Group. Successful research outcomes are leading to more students taking courses through this research group.

Keywords Curriculum development · Multi-disciplinarity · STEM · Research

Background

Uruguay is situated in South America between Brazil and Argentina. It is a small nation with an area of 176,215 km^2—about the size of the state of Florida in the USA, or 3.5 times smaller than France. Uruguay has a population of 3.5 million, half of whom live in the capital city of Montevideo. People of European ancestry comprise about 91 % of Uruguay's population. Early Uruguayans came from Spain and Portugal during the colonial period prior to 1810. More recent immigrants, largely from Italy and France, arrived in the nineteenth century and early twentieth century. Today, Uruguay's culture is strongly influenced by its European roots and Spanish is the official language. There is no official religion, with church and state being separate, so that religious freedom is guaranteed.

V. Martinez-Luaces (✉)
UdelaR, Montevideo, Uruguay
e-mail: victorml@fing.edu.uy

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Education in Uruguay is compulsory and free, and is organised into different levels:

- pre-school education
- primary education (6 years)
- middle school education: basic cycle (3 years) then
- second cycle or baccalaureate (3 years) and finally,
- tertiary or higher education

Higher university education is comprised of one public university, the Universidad de la República (University of the Republic, referred to as UdelaR) and some private universities. Non-university higher education is comprised of teacher training institutes and the military academy.

UdelaR was founded in 1849, and most of the buildings and facilities are located in Montevideo, including the law school, and departments of veterinary medicine, medicine, engineering, chemistry, and the humanities. Tuition is free for Uruguayan citizens.

However, the fact that the only public university is located in Montevideo limits the ability of those in the interior of Uruguay to attend university unless their families are relatively well-off financially. Despite that challenge, the number of university students has grown rapidly, tripling between 1970 and 1988. At present, it has a student body of almost 110,000 across a number of schools and institutes. About 58 % of students are women, who are exhibiting a strong preference for the disciplines and professions that are deemed to be prestigious, such as law, social science, engineering, medicine, economics, and administration.

Observers have commented on the discrepancy between university training and job opportunities, particularly in the prestigious fields. This gap has contributed to the substantial level of emigration of some of the best-educated young Uruguayan professionals.

Overview: A Multidisciplinary Project

This chapter examines the effect of curriculum change and a top-down initiative to develop new interdisciplinary research and teaching groups at the Universidad de la República. It started as a curriculum initiative, followed by a research initiative, and has become a success for the staff and students through the development of an interdisciplinary research group, the Electrochemistry Interdisciplinary Research Group (EIRG). A discussion of the difficulties in sustaining curriculum development with changing economic conditions is described. There has also been an interesting interplay between research and curriculum. The earlier changes in curriculum led to the conditions where a successful research group had the skills, expertise, and personal connections to coalesce (Fig. 20.1).

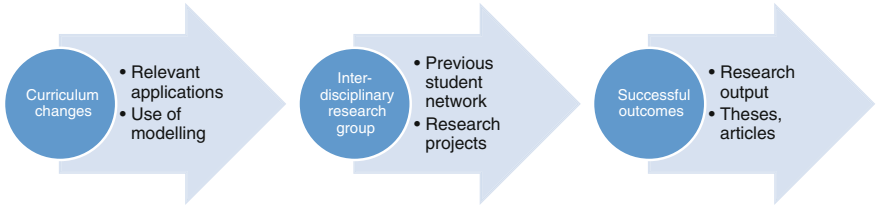

Fig. 20.1 Evolution of the successful research outcome

Often breakthroughs come in the areas between disciplines and in the development of new disciplines. There is a need to push the discipline structure both in teaching and research to be able to find new areas and new ways of teaching. Several recent advances in the learning of threshold concepts (Karunaratne et al. 2016) have emphasised the need to reorder topics for clarity of learning. A similar development occurred at UdelaR. In an attempt to address the narrow discipline approach, new multidisciplinary groups have been developed since 2008.

The authorities of the UdelaR initiated a call for researchers interested in the development of interdisciplinary activities. These activities included publications, master's and doctorate programs, and other multidisciplinary work. This initiative asked for original proposals whose purpose was to help the creation of new collaborative groups to be incorporated in the "UdelaR Interdisciplinary Space".

Eight months later, it was decided to give support to an established group—the elderly and the effects of ageing—and to create four new groups. One of these groups was in the branch of electrochemical systems, which later turned out to be a new structure that has become the very successful Electrochemistry Interdisciplinary Research Group (EIRG).

As a first approach, the electrochemical systems group could be regarded as a joint venture involving researchers from two faculties—the Faculty of Engineering and the Faculty of Sciences—within UdelaR. On further reading the UdelaR authorities' resolution, it becomes clear that the purpose of this new venture was to gather a team of researchers in electrochemistry who previously worked separately within their respective faculties. This group could be divided into two subgroups: the first one with a more scientific approach (researchers coming from the Faculty of Sciences), and the second one with a more technological focus (those working in the Faculty of Engineering) and consequently more involved in corrosion science than in electrochemistry itself. However, the group not only consisted of engineers and science masters and doctorates as expected, but there were also mathematicians, chemists, and IT experts participating in the venture.

A second conclusion—perhaps even more surprising—is that all of them were former students from a third institution at UdelaR, namely the Chemistry Faculty. Moreover, an important part of the whole group (around 50 % of its members) worked in this third faculty before they shifted their research careers to other departments (Faculty of Engineering and Faculty of Sciences), where they found

better conditions to develop their work in this area. From the mathematical education viewpoint—the main focus of this article—it is important to analyse the roots for this particular structure that put together two research units from two different faculties, many of them independent researchers and new members who were ex-students of a third department, meeting for the first time and sharing common experiences. Mathematics and particularly three of its branches—probability and statistics, numerical methods, and differential equations—had an important role in their preliminary experiences with mathematical models for scientific problems. At the same time, these experiences allowed them to work together and all this process finally developed into the EIRG.

For all these reasons, the following questions are relevant in order to understand the development of the multidisciplinary group:

(a) Why did a group of researchers (engineers, science masters and doctorates, mathematicians, chemists, and IT experts), coming from different departments, decide to join and create a new structure around electrochemical systems?
(b) What was the genesis of such an unusual—at least for Uruguay—multidisciplinary research group?
(c) What was the role of mathematics throughout all this process?

The answers to these questions will be developed in the following sections. Its connections with curriculum design will be analysed. I will discuss the successful legacy of this project but also point out the fragility of such projects to extraneous events. Although the project as originally conceived could be deemed to be a "failure" it nevertheless precipitated a very successful multidisciplinary group, the EIRG. The message here is that success may come in unexpected ways.

A Curriculum Design and a Teaching Experiment

Introduction

In the year 2000, the Chemistry Faculty launched a new curriculum which made changes to the majority of the Faculty courses, including mathematics, for different University degrees.

Several traditional mathematics subjects—such as analysis and algebra—were rearranged, with new topics included in the syllabus to form new courses. These subjects used more modern tools, such as MathCad and Scilab, as well as applications relevant to Uruguay. There were other applied courses like Optimization, specially recommended to students interested in gaining a greater degree of mathematical skill, independently of the minimal number of credits required for their degrees.

Development

In the first semester when the new curriculum started, three new first year mathematics courses were taught. After informal talks with the students who were involved in the old curriculum and changed to the new one, it was clear that the students did not perceive any improvement. In fact, they commented that they had "the same boring mathematics courses, just arranged in a different way"; that is, their perception was that the innovations were just cosmetic changes, beautifully presented with new course codes. In this context, second year courses were seen by the Mathematics Department as a great opportunity to change this first impression. This is a note for all curriculum designers: students will see through cosmetic changes. If you change curriculum you need to do it well.

When the new-curriculum students commenced their second year, there was a dramatic decrease in numbers; there were more than 600 students in first year and only 120 in second year. Part of this decline was due to the typical decrease seen in Uruguay between the first and the second years at university, and the other part can be explained by the effect of the different career programs, since pharmacy and biochemistry only had compulsory mathematics courses in their first year.

A first element to be considered is the student population fall, which is also one of the factors that allowed the teaching team to plan more dramatic changes for these courses, since the student:staff ratio was significantly better than in first year courses. A second element to take into account is that for several students—as was mentioned above—the new curriculum did not satisfy their expectations, so changes in second year were crucial in order to modify their opinions and encourage a more positive attitude towards mathematics. Thirdly, last but not least, in second year courses the great majority of the student population (more than 90 %) were chemical engineering and food technology students. Both groups are aware of the importance of mathematical models in their future professions.

These three elements—the student population decrease, the need for changes in second year courses, and the students' previous knowledge about the mathematical models' relevance—suggested that a different orientation should be given towards modelling and applications for the new courses. If positive results were obtained, then this teaching experience would be expanded to first year courses (and other mathematics courses) in the following years. Taking into account all these facts, a curriculum design was made dividing these courses into three modules: the first one for theory, the second one for routine exercises, and the third one devoted to modelling and applications problems. The first two modules could be considered traditional and thus self-explanatory. The theory module was delivered via 90-min lectures twice a week, and the exercises module was planned as a single tutorial—2 h per week—where the students solved routine exercises, facilitated by teachers. The most important change was the new module known as "applications module" or simply "applications", taught in two classes per week, of 90 min' duration each.

End of the Experience at the Chemistry Faculty

At the end of 2001 an economic and political crisis affected Argentina and 7 months later that situation had strong repercussions in Uruguay. By July 2002 the worst economic crisis in Uruguay's history struck, and endured for several years. At that time the working conditions at the Chemistry Faculty were not the best, at least in the opinion of the Mathematics Department members, who decided to move to other institutions. As a result, 3 years later, only two members of this staff remained at the Chemistry Faculty. All the department researchers and almost all the "applied teachers" (those who were able to teach applications) left to work at other places, including private institutions, industry, and even neighbouring countries. Gradually, the remaining staff did not maintain the applied approach of the courses.

Three years later, in 2005, a new rearrangement of mathematics courses was made. Only two of these new courses (ODE and statistics) had a few application problems in their tutorials and the applications module hours were distributed among theory and exercises classes. The new curriculum was abandoned due to lack of staff and willpower. It is difficult to break the traditional model of teaching and curriculum.

As a consequence of this history, it can be considered that the modelling and applications teaching experience, based on direct and inverse problems, only lasted a few years and in 2005 was "officially" finished. Nevertheless, this experience had another chapter outside the Chemistry Faculty, particularly in other UdelaR faculties such as Engineering and Sciences. Consequently, rather than an ending, it was a metamorphosis that took place as a continuation of the process. There is an important lesson here—sometimes failure can be productive.

A Collaborative Work Period

During the period 2003–2008, some former students made contact with the previous Mathematics Department teachers and lecturers in order to get mathematical support for their projects. In those years some of the students were reaching the final part of their university degrees and a few of them had already finished and were involved in master's studies. Then, they came to their former instructors—the "applied teachers"—and asked them to work on this collaborative experience as mathematics and statistics consultants.

In that 5-year period, those former students were involved in master's theses and research projects that needed help with statistical tools and treatment of data, and in several cases their former mathematics teachers also collaborated on the mathematical modelling for their subjects of study.

An important group of those students were involved in research projects about corrosion and/or electrochemistry. In particular, one of each in those areas became a master's thesis; the first one about atmospheric corrosion and the second about electrochemical noise.

The atmospheric corrosion project involved researchers from two faculties (Engineering and Sciences) and, among them, a couple of former students. They started asking about statistics topics (linear and non-linear regression, hypothesis tests, lack of fit and pure error in linear models, and so on) and then gradually they shifted to more innovative techniques like the use of artificial neural networks and non-parametric methods in their studies of corrosion on metallic surfaces. The experimental data came from different environments, from sub-tropical latitudes to Antarctic islands (the Uruguayan Antarctic Base is located there) and this introduced more mathematical richness to the problem itself. Moreover, factors that were shown to be relevant in Antarctic environments almost disappear in sub-tropical locations; and the same situation happened with several factors which were important in marine environments, but not in inland cities and towns. As a consequence of all these facts, the discussion gradually shifted from statistics and data treatment to mathematical models and the modelling process itself. An important result of this collaborative work about atmospheric corrosion was the publication of four journal papers (for example, Díaz et al. 2003, Ohanian et al. 2005).

A second research line, more challenging from the mathematical viewpoint, was devoted to electrochemical noise. A former student asked for help with the data treatment of his research project about this relatively new technique applied to the study of corrosion. After a few months of collaborative work it was clear that the main problem was how to get an effective trend removal, in order to have electrochemical noise data with reasonable relative errors. The production of papers in this project was even greater than in the previous one, including three journal papers and seven publications from conference proceedings in Argentina, Spain, and Uruguay (for example, Ohanián et al. 2004; Martinez-Luaces et al. 2006; Ohanián et al. 2010).

Other results include three master's and one PhD theses. Finally—last but not least—almost all those former students who asked for mathematical support are now working as researchers in electrochemistry and/or corrosion science at the Chemical Engineering Institute (Faculty of Engineering, UdelaR) or at the Experimental Electrochemistry Laboratory (Faculty of Sciences, UdelaR).

Those former students and now researchers were preparing another metamorphic change for this project, which will be commented in the next section.

Creation and Development of the EIRG

The creation of the EIRG and its subsequent successes can be directly attributed to the curriculum initiatives described above. The EIRG has resulted in the publication of books, journal papers, and conference proceedings and has attracted master's and doctoral students.

At the end of the period described in the previous section, a group of electrochemistry and corrosion science researchers—all of them former students of the Chemistry Faculty—were working with electrochemical systems in the Faculty of Sciences and/or Faculty of Engineering. In 2008 they came together in an innovative project, forming a new transversal structure launched by the UdelaR authorities in August 2009. This new structure was created as an interdisciplinary group named "Electrochemical Systems" and now is called the Electrochemistry Interdisciplinary Research Group (EIRG).

From the beginning, this multidisciplinary group included among its members engineers, sciences masters and doctors, chemists, and mathematicians. More recently, the needs of the group in information and technology (IT) led to the creation of a service unit where IT experts could support the research activities of the EIRG. In order to optimise the resources, this service unit is shared with other research groups. It is important to note that except for these IT experts, all the researchers involved in the EIRG activities were former students of the Chemistry Faculty.

As an example of these research activities, a particular case will be examined: it is especially interesting because it was a project that integrated industry, research, and teaching and learning activities. The project started with an agreement between UTE (the Uruguayan electric supply company) and the J. Ricaldoni Foundation (an institution related to the Faculty of Engineering for developing industrial projects and research), with the aim of solving the problem of corrosion in the heat exchangers of electrical plants. It is important to mention that heat exchangers' corrosion in a steam cycle of an electric generating plant represents an important problem for maintenance. The morphology of attack is both generalised and localised; the latter involves drilling shutdowns for the exchange surface and contamination of the circulating fluids. Usually, the problem is solved by stopping the operation and sealing the punctured tube, which causes a decrease in heat-exchange efficiency.

The problem was attacked with three different approaches:

- The potential distribution in tubes of a heat exchanger was simulated when applying cathodic polarisation to its extremes.
- A numeric solution based on boundary elements carried out with the commercial software Beasy ®-GID ® was obtained.
- A semi-analytical method was developed by the researchers.

Since the last two approaches used polarisation curves as a boundary condition, the experimental polarisation curves (voltage versus current density) were determined in the laboratory, under flow conditions and cylindrical cell geometry.

The mathematical modelling of this problem, the different approaches considered, and the comparison of the results were published in two journals (Ohanian and Martinez-Luaces 2012, 2014), six proceedings papers, and many oral presentations. The same EIRG research subgroup is now working on two new projects; an academic one about anomalous diffusion and an industrial one about corrosion in

petrol tanks. For the first one an eclectic approach will be used, combining analytical techniques with finite elements numerical methods. The second project originated from another agreement between ANCAP (the Uruguayan petroleum refinery company) and the J. Ricaldoni Foundation.

From an educational viewpoint, many undergraduate students have been attracted by the interdisciplinary applied approach of the EIRG courses. For this reason, many students have obtained credits for their university studies from those courses. Also, some graduate students are now doing their master's or doctorate programs tutored by EIRG researchers, among other important outcomes.

Final Considerations

Looking back, this project was worthwhile and the long-term benefits are evident, especially after the creation of the Interdisciplinary Group. However, from the Faculty of Chemistry's point of view, despite the good results, the curriculum renewal experience did not last long. It appears that the main reason for the discontinuity of this project was with the human resources related to the project. Despite the fact that many professors were involved in the activity, the core of the project depended on only three of them. Undoubtedly, there is something important we can reflect upon when assessing this project: the lack of training people who could have ensured generational continuity for it.

In view of their professional education or their focus on the mathematics application, the three primary professors were in charge of the mathematical modelling and applications activities, whereas the others within the group restricted themselves to traditional academic tasks. Later, for many reasons, at different times, each of them left the country—and therefore the institution. Consequently, there were not the human resources to replace them, nor continuity of corporate knowledge within the group. For this kind of project, apart from the disciplinary knowledge of mathematics it is also necessary to know how to apply this mathematical knowledge to the core subject of the professions involved. This requires a genuine interest in mathematical modelling, applications, and good teaching practice, both in the transmission of knowledge and in good rapport with the students.

In light of the above, thinking about future plans, human resources should be trained and efforts made to transfer skills between generations, to prevent having to depend exclusively on a team that is in charge of a project in a specific period of time. Due to lack of resources and the traditional employment instability in Uruguay and in the majority of countries in South America, it is not easy for a project like this to continue over time. Hence, institutions play a significant role in creating qualified human resources when a project of this nature is proposed, in order to assure its generational continuity.

Beyond the limitations and difficulties exposed above, it should be noted that even though the curriculum design project in the Chemistry Faculty is over, its consequences persist and in some sense they may be considered as the roots of the EIRG project, which is still alive and healthy.

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Chapter 21
Doctoral Student Success: McGill University's Holistic Support Model

David Syncox, Lina Di Genova, Alison Crump and Laura Winer

Abstract This chapter is a retrospective account of our observations and reflections of McGill University's cultural shift in supporting graduate student success. We are administrators at McGill University, in Montreal, Canada, who have adapted our thinking about doctoral student success to take into account student needs and experiences, and to facilitate skills development. Our approach is to look at the whole student, consistent with the World Health Organization's definition of health and Laverick's (Health promotion practice: Power and empowerment, Sage, Thousand Oaks 2004) "Wellness Wheel", which we have adapted for the doctoral student context.

Keywords Student health · Doctoral students · Graduate support

Introduction

In the last decade, there has been a significant shift from measuring PhD program success in terms of time to completion towards an integrated and systemic model of success that values multiple outcomes and the whole student. The broadened and integrated perspective on success that we share in this chapter has also been informed by an increasing amount of attention given to understanding the career pathways of PhD graduates, and how programs are preparing graduates for the labour market (Allum et al. 2014; Else 2015; Maldonado et al. 2013; Sekuler et al. 2013). We no longer think of the PhD degree as a discrete period, but rather, locate it in the context of a career trajectory that extends well beyond graduation.

D. Syncox (✉) · L. Di Genova · A. Crump · L. Winer
McGill University, Montreal, QC, Canada
e-mail: david.syncox@mcgill.ca

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This shift in perspectives on success has brought with it a need for some re-envisioning of McGill's institutional model of success. PhD students can experience an overwhelming number of challenges during their program. On the academic front, developing an identity as a scholarly communicator and learning how to navigate their relationship with their thesis supervisor are common concerns among doctoral students. The relationship with their thesis supervisor can be as important for doctoral students as their research results in terms of feelings of success. Higher education reports (Maldonado et al. 2013; Tamburri 2013) increasingly call for universities to offer more training to supervisors. We maintain that supervisees also need to better understand their role in the supervisory relationship. The academic challenges of doctoral studies often occur at a time of life when other major life changes are taking place that include increased independence and financial autonomy, developing and managing interpersonal relationships, and career planning.

In this chapter, we begin with an overview of the higher education landscape in Canada and at McGill University. We then describe the emergence of a holistic and integrated model at McGill to support doctoral academic success, including continuing development of supervision initiatives and programming for PhD students related to skills development and wellness. This is followed by an overview of how McGill is supporting this vision of success. Finally, we consider where we intend to go in terms of future developments. This chapter is written for university administrators looking for an inclusive doctoral education model; researchers interested in doctoral education; and academics who seek a model to guide their supervision of doctoral students.

PhD Programs at McGill University

Founded in 1821, in Montreal, Quebec, McGill University is a research-intensive, student-centred university with an international reputation for excellence. The University consistently ranks in the top 25 QS World University Rankings. One quarter of the 40,000 total student population are international students, and a similar number (23 %) are master's and PhD students. In this chapter, we focus specifically on support structures for our almost 4000 doctoral students.

It is important to note that doctoral programs in Canada are structured in such a way that the average time to completion is longer than 3 years, which is common in peer universities internationally. In Canada, doctoral students pass through several stages of their program, beginning with coursework in the first year or two of the program. Doctoral students at McGill, and across Canada, must pass a comprehensive examination at the end of the second year of studies of their program and defend a research proposal or protocol. After this stage, students begin the research and writing for their thesis. There is an oral defence of the thesis in the last stage of

the program. In all, this makes the average registered time to completion for doctoral programs in Canada 5 years. However, the total time to degree is longer, as this mean figure does not take into account temporary leaves of absence from study into account (Elgar 2003). While there is considerable variation across disciplines with respect to times to completion, the average at McGill is consistent with the national average.

With 40,000 students and just under 4000 studying at the doctoral level (Dyens and Massey 2016; McGill University's Enrolment Services 2015), as a research-intensive university McGill has a high ratio of graduate students, especially doctoral students, to academic staff. At present, the ratio of full-time degree-seeking graduate students to tenure-track academic staff is 4:3. Most tenure-track academic staff are engaged in doctoral student thesis supervision. Support services for students at McGill University are found within student affairs offices in faculties or schools as well as centrally located in offices that are part of the Student Life and Learning division, which employs approximately 500 staff. Although the exact number of professional staff engaged in support services directly for doctoral students has not been officially documented, based on our knowledge of institutional programming, the ratio is lower than that for academic staff. McGill has committed to increasing academic staff hires and professionals to provide direct services for students, particularly for career skills development and wellness programming (Manfredi and Di Grappa 2016). There are currently full-time equivalent professional staff who offer direct and indirect support to PhD students in wellness and career planning in units, such as the Teaching and Learning Services, Career Planning Service, Counselling Service, McGill Writing Centre, International Student Services, and the Scholarships and Student Aid Office.

Towards a Broadened Definition of Success

In the early 2000s, the Canadian Association for Graduate Studies (CAGS) engaged the national academic community in a discourse about the future of doctoral education in the twentyfirst century, by publishing a series of papers that outlined national time-to-completion rates for PhD students and recommendations for successful strategies for improving these rates (CAGS 2003). In 2005, McGill began systematically benchmarking doctoral education performance with other Canadian research-intensive universities in the areas of time to completion, student experience, and financial support. What emerged from these benchmarking exercises was a deeper understanding of the multi-faceted experiences of PhD students and the need to develop better supports for them at McGill University.

The model of success that we present in this chapter has been informed by the McGill Principal's commitment to "ensure excellence in supervision, and provide opportunities for developing career-enhancing professional skills" (McGill

Fig. 21.1 McGill's integrated model of graduate student success

Principal's Commitment 2015), data from recent Canadian and McGill surveys on graduate education, as well as institutional resources for support. It is inspired by the "Okanagan Charter: An International Charter for Health Promoting Universities and Colleges" (Okanagan Charter 2015) and Laverick's (2004) holistic and culturally sensitive model of well-being, which comprises eight parts: academic, career, culture, emotional, financial, physical, social, and spiritual. This aligns with McGill Student Services' working definition of health, which includes:

- feeling vital and full of energy,
- having a sense of purpose in life,
- experiencing connectedness to community,
- being able to do things one enjoys,
- having good social relationships, and
- experiencing a sense of control over one's life and one's living conditions (Tellier and Di Genova 2014).

Grounded in these definitions of wellness and health, we have developed an integrated three-part model of success for graduate education at McGill, as shown in Fig. 21.1.

We expect this model to evolve over time as we continue to refine our understanding of the intersections of Academics, Wellbeing and Student Success, and Career and Professional Development; and as our programming and student services continue to develop. We have created an ongoing monitoring and evaluation framework for our service programs to respond to emerging student needs. In the remainder of the chapter, we address each of the parts of the model in turn, expanding on the services and programming provided at the University to support students through their degrees and beyond.

The Timeline for McGill's Integrated Model of Graduate Student Success Is Outlined in Table 21.1.

Table 21.1 Timeline for McGill's integrated model of graduate student success

Year	Component of model	Milestone
2003	Academic	Launch of the Graduate Research Progress Tracking
2006	Wellbeing	PhD support group established
2007	Academics	Launch of the Canadian Graduate and Professional Student Survey
2009	Career	Launch of the SKILLSETS program
	Academic and career	Launch of the graduate outcomes study of alumni
2010	Academic and career	Joint Board/Senate meeting on graduate and postdoctoral studies
2012	Wellbeing	Launch of the Student Psychological Wellbeing Study
2013	Academic	Launch of the Health Scan of perceptions of faculty and staff regarding graduate supervision
		Graduate Writing Initiative, Graphos, launched
	Career	Changes to graduate student, career preparation workshops
	Wellbeing	Joint Board/Senate meeting on mental health
2014	Academic	Streamlined Graduate Research Progress Tracking released
		Senate approved mandatory graduate supervision training
	Wellbeing	Launch of the National College Health Assessment
		Peer Support Network launched
		Mental Health First Aid Training launched for faculty, staff, and students
2015	Academic and wellbeing	Launch of Graduate Life Orientation—Online mandatory training
	Academic	Supervision Basics Orientation sessions

Part 1: Academics

Since 2007, McGill University, along with other Canadian research-intensive universities, has participated in the Canadian Graduate and Professional Student Survey (CGPSS). The purpose of the survey is to measure topics related to key indicators of the doctoral student experience, including graduate supervision, finances, and student life. At McGill, findings related to graduate supervision, financial support, career preparation, and overall support are the most striking. For instance, the results from both 2007 and 2013 show that students want more feedback on their academic progress and research (see Table 21.2). The mean scores (out of 5) show a statistically significant but small improvement over time in the feedback on research progress as well as in the quality of academic advising and guidance received.

The results from the McGill CGPSS data spurred discussion about what other measures could be taken to improve the doctoral student experience with respect to academic guidance and supervision. A mechanism for giving feedback on research

Table 21.2 CGPSS mean-score ratings comparison for 2007 versus 2013 (mean score out of 5)

	2007 (n = 1005)		2013 (n = 622)		
	M	SD	M	SD	
Received feedback on research	3.17	0.10	3.22	0.14	***
Quality of academic advising and guidance received	3.11	0.10	3.22	0.13	***

***$p < 0.001$

to doctoral students has been in place since 2003, when annual Graduate Research Progress Tracking was made mandatory. Initially, the practice was supported by three separate forms; however, feedback from the community showed that the three forms were too complicated to use. In 2013, Graduate and Postdoctoral Studies consulted with professors in various departments, and in 2014 developed a single form to streamline the process of tracking progress. At progress-tracking meetings, students and their supervisory committees establish objectives for the coming year and report on the progress made in the previous year. This is more than an informal check-in, however, as receiving an unsatisfactory rating on two progress reports can be grounds for withdrawal from the University.

To better understand the experiences with supervision at McGill, we recently evaluated the student experience with a supervision Health Scan, described below.

Supervision Pedagogy

The supervisory relationship is the central aspect of a doctoral experience and universities across the country are developing policy and programming to foster good supervision practice. In 2013, the Canadian magazine, *University Affairs*, published an article that noted, "The relationship between grad student and supervisor is so critical to the student's success that universities are becoming more proactive to ensure the union lasts (Galt 2013)." The national focus on improving supervision emerged from a 2003 report by CAGS, which made recommendations for improving completion rates by assessing programs, collecting data from students, and evaluating supervision experiences. Despite increasing attention being given to the need to improve graduate student supervision, supervisors still receive little training to do their jobs and need more support to put the pedagogy of supervision into practice (Kamler and Thomson 2006).

Perceptions of Supervisory Support at McGill

As a follow-up to the feedback from the CGPSS survey and consultations with the Dean of Graduate and Postdoctoral Studies, faculty members, and graduate student groups in 2013, McGill undertook a University-wide Health Scan to measure

perceptions of support within the supervisory relationship. The results were telling. Table 21.2 compares graduate student and supervisor opinions regarding supervisors' time and availability, research task agreement, and progress tracking. It is notable that although Graduate Research Progress Tracking is mandatory for doctoral students, there remains a disparity between student and professor reports of the regularity of this practice.

On every indicator, supervisees reported that they received less support from their supervisor than their supervisors perceived they were giving. As shown in Table 21.3, 87 % of the supervisors indicated that they had completed the Research Objectives Report form, while only 67 % of supervisees reported that their supervisor had completed the same form. This shows that there is a significant difference between what supervisors think they are doing and what students think their supervisors are doing. The discrepancy is even more marked (i.e. a difference of over 30 %) when it comes to discussions regarding the Research Progress Report form.

Table 21.3 2013 graduate supervision health scan

	Supervisee (n = 1379) (%)	Supervisor (n = 386) (%)	% Difference (%)
Time and availability			
Level of agreement with respect to ease of contact/scheduling (e.g. drop by during office hours, by email)	89	98	−9
Typically spend enough time interacting with your supervisor/supervisee	67	79	−12
Task			
Both supervisor and supervisee agree on action points and/or directions for the next stages of research at the end of each meeting	85	90	−5
Progress tracking			
Completed the Graduate Student Research Objectives Report form or Graduate Student Research Progress Record as a formal record of progress in the degree. (N.B.: Progress tracking forms were integrated into a single form in 2014)	67	87	−20
Supervisor or a member of supervisory committee discussed the Graduate Student Research Progress Report form with student	51	84	−33

How These Data Informed Our Practices

The University has used these data, as well as data from the CAGS and CGPSS reports, to inform policy and programming for supervisors and supervisees. It is important to reiterate that McGill is a research-intensive, student-centred university, as this has direct implications for graduate supervision. This aspect of professors' academic duties falls under their teaching, not research, dossier; thus, we promote and support supervision as a pedagogical practice, rather than as an employee model more common to a research institute.

In 2014, the University Senate approved changes to the Graduate Supervision regulations to reflect current practices and programs put in place to improve the supervision experience. In addition to mandatory annual progress tracking meetings, McGill now requires that doctoral students have at least one committee member appointed in addition to their supervisor, to provide students with more opportunities for support and feedback; and that both new faculty members and incoming graduate students participate in mandatory supervision orientation. The implementation of this orientation is particularly significant as it is the only mandatory action for McGill's professoriate in relation to their teaching responsibilities. The programming that is being developed in response to this policy focuses on roles and responsibilities of supervisors and supervisees, and strategies for fostering a positive supervisory relationship (e.g. by clarifying expectations).

These policy changes respond not only to students' desire for more support on their academic progress, but also a growing recognition of the need to support supervision, both from the supervisors' and supervisees' perspectives. It is still too early to be able to report on the impact of the 2014 changes to supervision policy and the increased programming to support supervisory practices. We will run another supervision Health Scan in a few years and will be able to report then on the impact of these institutional efforts on the experiences of individual graduate students and their supervisors. In addition, we plan to consult both students and faculty on an ongoing basis to ensure that the programming is meeting the intended outcomes and to make necessary adjustments along the way. We have an assessment plan for the new mandatory orientation offerings (for both PhD students and new faculty members), which includes post-session surveys and focus groups.

In the next section we turn our discussion to the second part of the success model: well-being and student life.

Part 2: Well-Being and Student Life

As a University, we are moving towards an inclusive support structure where we focus on the whole person, not just on academic development. Facets of this support are discussed below and include financial support, wellness, and inclusivity.

Student Financial Support

In the Canadian context, the CAGS (2001) publication served as a call to action for research agencies and the higher education community to address insufficient financial support for graduate students. In particular, doctoral student financial support has drawn the attention of the Canadian federal Tri-Council Agencies (made up of the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada, and the Social Sciences and Humanities Research Council). In the early 2000s the financing of graduate education was considered a significant barrier to retention and a source of stress, particularly for doctoral students. Universities are now encouraged to communicate with successful applicants about the details of their financial support during their studies. This support typically includes fellowships, teaching assistantships, research assistantships, and other awards. In a recent study at McGill University, 30 % of graduate student respondents reported the highest levels of financial distress among the student body (Di Genova and Romano 2014). Financial uncertainty has been linked to psychological distress, including increased symptoms of depression (Eisenberg et al. 2013). Core commitments to doctoral student funding is an ongoing discussion on how we can best support the needs of our students through their degree.

In the discussion of financial well-being, it is important to recognise that federal funding for PhD students in Canada covers <4 years of full-time study. Students in science, technology, engineering, and medical disciplines are typically guaranteed a 3-year funding package, while students in social sciences and humanities disciplines are provided with much less secure funding, and often rely solely on their own ability to secure external funding for their studies.

Because of the particular funding structure for public universities in Canada, PhD students who go past their fourth year of study—and this is common since the average is roughly 5 years—sometimes need to take a leave of absence from their research program, and instead focus on finding money to pay the bills and care for their families. Alternatively, in addition to their doctoral work, they often take on part-time work as a research assistant or off campus in roles that are not related to their educational pursuits.

Looking again at the CGPSS data, although advice on the availability of financial support ratings is trending in a positive direction, the results shown in Table 21.4 are under 3.0 or "good".

In order to be successful, universities in Canada are responsible for identifying solutions and working to address the needs. This funding structure is part of the reason why times to completion average longer than 5 years: students are supporting themselves, and in some cases their families, with employment income that is often not related to the doctoral degree, or not valued by their thesis supervisor (Elgar 2003). The additional employment responsibilities not only delay time to completion of their PhD; they can often create additional stressors, such as a strained relationship with the thesis supervisor.

Table 21.4 CGPSS mean-score ratings comparison for 2007 versus 2013 (mean score out of 5)

	2007 (n = 1005)		2013 (n = 622)		
	M	SD	M	SD	
Advice on the availability of financial support	2.78	0.09	2.84	0.11	***

***$p < 0.001$

How These Data Informed Our Practices

Since 2004, McGill University has been exploring issues related to student concerns about financial support and funding levels. Our data have shown discrepancies in financial levels between departments and faculties. Over time, internal policies to significantly reduce the "have and have not" funding model for doctoral students have led to a more equitable approach to financial support. Funding levels are communicated to accepted graduate students in their offer of admission. In addition, internal funding awards are being created to supplement financial support for these students. One example is the philosophy department, which offers a minimum guaranteed stipend for all students admitted to the doctoral program. To achieve this financial goal, the department limits the number of students admitted to their program.

Enhanced Wellness Support for Doctoral Students Across Canada

The well-being of graduate students studying at Canadian universities is of prime importance to CAGS. At the 2015 annual conference for graduate deans and administrators, the 2015 CAGS Award for Excellence and Innovation in Enhancing the Graduate Student Experience was awarded to Queen's University, whose comprehensive approach to supporting the wellness and balance challenges faced by its graduate students was recognised (CAGS 2015). This demonstrates an effort to raise awareness across Canadian universities of the importance of supporting graduate student wellness on campuses.

The increasing attention given to well-being in higher education has also been supported by the private sector. Bell Canada, a Canadian telecommunications and media company, for example, recently introduced a national mental health campaign called Bell Let's Talk (http://letstalk.bell.ca/en/our-initiatives/). The campaign is aimed at debunking myths and reducing stigma about mental health, by inviting celebrities and athletes to speak about their own mental health challenges. With an overall national commitment of CDN$100 million, Bell Canada is also providing financial support to mental health initiatives at McGill, such as an online wellness portal for students.

Nationally, the trend among higher education institutions is the development of pan-university wellness strategies, with an emphasis on mental health. A seminal document that provided a framework for campuses is the *Post-Secondary Student Mental Health: Guide to a Systemic Approach*, launched in 2013 by the Canadian Mental Health Association in collaboration with the Canadian Association of College and University Student Services (Canadian Mental Health Association 2013). Canadian campuses are starting to implement mental health literacy programs for students and staff, such as the Canadian Government Mental Health First Aid program. Additional programs and resources promoted on Canadian campuses include: healthy habits and psycho-educational websites with content specific for university-aged populations, as well as offering skills and resiliency-based workshops.

In a recent article comparing mental health issues of undergraduate and graduate students as measured by the National College Health Assessment, graduate students were found to be more likely to seek support of on-campus mental health services (Wyatt and Oswalt 2013) and this is consistent with trends in Canada. Inherent in the Canadian doctoral student experience are particular academic circumstances and pressures related to undergoing comprehensive examinations and completing research under often uncertain funding realities; these warrant specific supports. Most commonly, students seek support for depression, anxiety, and isolation. From a university community perspective, we need to be aware of the issues and be able to identify triggers, respond when needed, and provide support to students at certain critical times of their graduate trajectories.

McGill's Efforts to Improve Doctoral Student Wellness

In addition to McGill University's efforts to promote wellness initiatives for all students, a number of supports were implemented specifically for doctoral students. McGill is a diverse, multicultural community and we have a multi-faceted and integrated approach to supporting doctoral student wellness and promoting inclusivity. This includes, for example, the inclusion of pre-arrival webinars for incoming international students from over 150 countries; and elders at McGill's First Peoples' House provide traditional healing practices for Indigenous students, to help them feel connected and supported. Below, we outline our campus-wide initiatives to foster a healthy and inclusive campus community and reduce stigma around wellness issues.

Starting Early: Orientation

At McGill, we have been working to break down the stigma around mental health by providing more opportunities for open discussion. In addition to the initiatives supported by Bell, we are focusing on providing information during orientation programs and implementing early integration programs. During graduate student

orientation, University-wide and departmental activities focus on the importance of avoiding isolation and connecting with other members of the community. Service professionals and academic staff offer a series of workshops and sessions on academic expectations that address topics such as: workload expectations, dealing with stress, managing anxiety, and supervision basics. At the department level, graduate student ambassadors welcome new students, introduce services, and share ideas for ways to connect. New students are encouraged to network, get involved in departmental or student-run activities within the first 6 weeks, connect with a peer to avoid loneliness, and learn about the variety of services available at McGill.

Another way we are promoting wellness is by presenting the importance of the supervisory relationship early in the doctoral student journey. Some students come to their graduate program with unclear expectations about how to work with their graduate supervisor. Given that McGill has the highest percentage of international students in Canada, and that many students come from cultures and contexts where communicating with professors who are authority figures is challenging, clarifying supervisor-supervisee expectations is paramount to doctoral student success. McGill provides online resources and in-person workshops, and encourages partnerships to support all incoming doctoral students. As mentioned earlier, the University now requires that students, before registration, complete a mandatory online orientation called GLO (Grad Life Orientation), which includes sections on supervisee responsibilities. In addition, the Grad Supervision website (www.mcgill.ca/gradsupervision) has sections for both supervisors and supervisees, which amount to 40 pages of evidence-based advice and information. During graduate orientation, the Dean of Graduate and Postdoctoral Studies gives Supervision Basics sessions that present an overview of the supervisory relationship, including reasonable versus unreasonable expectations, well-being, and communication strategies.

Faculty development is also a key component of doctoral success, especially with respect to supervision. McGill has created a suite of supervision training workshops for faculty supervisors to help them be better prepared to support the students. The first in the series is “The Supervisory Alliance”, which details a model for creating a strong foundation for supervision through common bonds, goals, and tasks. The next workshop, “Clarifying Expectations”, walks participating faculty members through the process of developing an individualised supervision letter of understanding for their supervisees. After this is “Bumps in the Road”, which provides resources and strategies for conflict resolution. Finally, we offer “Supporting Students at Risk”, focusing on mental health issues and graduate student experiences. By sharing strategies, experiences, and concerns with peers, this interactive workshop raises awareness about different areas of concern and available resources. The underlying message is the need to clarify the boundaries of the supervisory relationship—the supervisor is the research adviser and should refer students to Student Services for issues related to mental or physical health and well-being. This suite of workshops is offered to all faculty members throughout the year. We are currently in the process of piloting the workshops at the faculty level and tailoring the content to specific disciplinary contexts. As part of our assessment

plan, we are designing regular evaluations of our programming and will use the data to inform future developments.

A parallel offering to the "At Risk" workshop has been designed for graduate students. "Managing your Supervisor", which is run three to four times a year, is a closed-door discussion session that provides an opportunity for graduate students to present personal experiences with their supervisors and receive feedback and advice from representatives from Graduate and Postdoctoral Studies and the Post Graduate Students' Society (PGSS). The panel introduces different supervisory styles; provides clarification of the roles and responsibilities of the student and supervisor; and offers strategies to manage communication, and to handle disputes and misunderstandings.

PhD Support Group

The PhD support group was established in 2006 and is well attended. The group meets bi-monthly during the academic year and helps students find balance in life and academia. The goal of this group is to provide doctoral students with a safe space to discuss their experiences with a group of people with common experiences or concerns, so they can provide each other with encouragement, comfort, and advice. Sharing in this way helps to normalise some of the challenges they may be facing. Through listening to others, students benefit by developing understanding and compassion for others while being able to share within a safe environment. This type of group counselling helps students maintain or regain focus and direction, encouragement, motivation, and a sense of connectedness.

Peer Support Networks

McGill's Post Graduate Students' Society (PGSS) is an active partner in supporting wellness and work-life balance management. In addition, PGSS offers family-care support through initiatives such as the very popular Study Sundays, where childcare is provided for half-day blocks; and the McGill Student Parents' Network, which helps parents connect. Other programs include a mindfulness and meditation series, and stress-reduction workshops that are offered each semester.

In this section, we have discussed well-being and student life in the context of the internationalisation and diversity of our campuses. As the second part of the model of success, we have seen that success means taking into account the needs of student well-being, from finances to supervision.

In the next section, we present the final aspect of the PhD success model, Career and Professional Development.

Part 3: Career and Professional Development

In 2008, CAGS, the Tri-Council federal funding agencies, and the Society for Teaching and Learning in Higher Education published a seminal report called *Professional Skills Development for Graduate Students* (CAGS 2008). This report outlined nine core skills considered to be essential for all graduates: career development, communication and interpersonal skills, critical and creative thinking, dissemination of research and knowledge translation, integrity and ethical conduct, life skills, research management and leadership, societal and civic responsibility, and teaching competence.

Just as the CAGS report highlighted the need to focus on professional skills development, responses from graduate students who participated in the CGPSS showed that they felt they needed more skills to succeed in their careers after graduation. Table 21.4 shows an improvement over time in students' perceptions of the information they received about courses, workshops, or orientation on teaching; advice about career options within academia; and advice about intellectual property issues. However, there was no significant change over time in student opinion about advice on career options outside academia or research positions, which hovers below the midpoint.

The data in Table 21.5 show that students feel that they need more support in skills and professional development. (Likewise, employers usually do not understand the rich skill set that doctoral graduates have). Our challenge is to help students realise that they possess the skills to solve complex problems as a result of their academic studies.

In response to the CAGS report in 2008, there was a review at McGill of professional-skills development initiatives at McGill, as well as other Canadian and American peer institutions. The review found that McGill's 11 faculties and dozens of service units were offering professional-development workshops for graduate students on an ad hoc basis. There was no overall coordination to determine needs, demands, and strategic goals. Consequently, given the fragmented quality of the

Table 21.5 CGPSS mean-score ratings comparison for 2007 versus 2013 (mean score out of 5)

	2007 (n = 1005)		2013 (n = 622)		
	M	SD	M	SD	
Courses, workshops, or orientation on teaching	3.0	0.11	3.25	0.15	***
Advice/workshops on career options within academia	2.56	0.10	2.71	0.13	***
Advice/workshops on career options outside academia	2.34	0.10	2.33	0.11	ns
Advice/workshops about research positions	2.38	0.09	2.38	0.11	ns
Advice on intellectual property issues	2.47	0.10	2.60	0.13	***

ns non-significant
***$P < 0.001$

offerings, students had difficulty learning about the opportunities and taking advantage of them. Furthermore, McGill's lack of comprehensive professional-development programming was not uncommon. In Canada, among the 15 top research-intensive universities, only the University of Western Ontario (360° Graduate Student Development Initiative) and the University of British Columbia (the Graduate Game Plan) had comprehensive programs; among our US peers, only four universities (Michigan, North Carolina-Chapel Hill, California at Berkeley, and Wisconsin) had comparable programs.

In response, in 2009, McGill invested significant resources to create SKILLSETS (www.mcgill.ca/skillsets), a centrally managed program that has developed and promoted offerings for all graduate students. The SKILLSETS slogan, "Unlock your potential", sends an explicit message to graduate students of the importance of complementary, transferrable skills as part of their graduate education experience. SKILLSETS was designed to provide a single point of contact for graduate students, postdoctoral fellows, supervisors, faculty members, academic administrators, and service units to access existing resources and coordinate the development of new ones. SKILLSETS provides both University-wide and discipline-specific offerings. SKILLSETS programming was developed to address each of the nine core CAGS skills identified in the 2008 report.

The main goal of SKILLSETS is to enhance professional-skills development and improve the overall educational and research experience, while complementing the academic research training received at McGill. SKILLSETS contributed three major components to the University's environment for graduate students: (1) improved communication strategies and channels; (2) partnerships with academic and service units as well as students; and (3) a comprehensive set of offerings. The development of SKILLSETS and related offerings was aligned with the CAGS (2008) framework, and was founded on five core principles:

1. Efficiency and non-redundancy: eliminate duplication and provide a centralised communication channel to and from the graduate education community.
2. Partnerships and integration: work in close collaboration with individuals and units who are providing or who wish to provide services.
3. Research and best practices: ensure that the development and offerings of activities and programs are substantively and pedagogically sound.
4. Working with the whole community: improve graduate education by working with students, instructors, academic administrators, and other service providers.
5. Be inclusive: accommodate as much as possible all requests for participation and assistance in programs and needs assessment.

In 2012, SKILLSETS was nationally recognised and awarded the CAGS/ETS Award for Excellence and Innovation in Enhancing the Graduate Student Experience. SKILLSETS remains a prominent professional-development program at McGill. McGill has supported the creation of an integrated and comprehensive transferrable-skills training program to help with graduate students' professional development through SKILLSETS and CaPS (Career Planning Service), helping students to address the range of challenges they will face as students and professionals.

SKILLSETS is just one example of targeted skills-development programs that have been initiated at McGill to support graduate student success.

The Graduate Writing Initiative is another such initiative. It was launched in 2013 to address the lack of coordinated support for PhD students with their writing and scholarly communication skills. While writing is widely recognised as central to the success of PhD students, there has traditionally been little explicit instruction to graduate students for improving their academic writing skills. The Graduate Writing Initiative led to the development of a writing program designed specifically for graduate students, called Graphos (www.mcgill.ca/graphos). Informed by exemplary models from peer institutions, Graphos has three types of offerings: (1) writing and communication courses developed to support graduate students at different stages of their degrees (e.g. carving out a scholarly niche, writing a literature review); (2) peer writing groups, which meet monthly for the full academic year and give graduate students the opportunity to learn how to give and receive feedback on writing; and (3) workshops developed and led by graduate students or postdoctoral fellows focused on specific genres, strategies, and writing-related topics. One of the underlying principles of Graphos is to teach future teachers, that is, give them experience in teaching roles with an emphasis on scholarly communication.

Another important initiative that informs career and professional-development initiatives has been the creation of McGill's Tracking Survey of PhD Graduate Outcomes.

National PhD graduate career data consistently show that only approximately 20 % of PhD graduates follow traditional academic career paths (Edge and Munro 2015). In order to better understand PhD graduate career outcomes, McGill's Graduate and Postdoctoral Studies (GPS), the Career Planning Service (CaPS), and the Office of Planning and Institutional Analysis (PIA) created the Tracking Survey of PhD Graduation Outcomes. The 2015 *Graduate Outcomes Survey Report* (Graduate and Postdoctoral Studies 2015) draws on data from two iterations of this survey (2013 and 2014), each of which reached out to two cohorts of PhD graduates (2 years and five years after graduation). In total, the survey has been distributed to 1493 McGill PhD graduates, with a response rate of 30 %. Respondents were from across the University, with 71 % (322) from the STEM fields (science, technology, engineering, and mathematics) and 29 % (131) from social sciences and humanities. The survey covers topics such as: types of employment, postdoctoral studies, skills and knowledge, community involvement and networking, and success and satisfaction (Graduate and Postdoctoral Studies 2015).

The graduate outcomes report shows that PhD graduates have found employment and feel that their studies were relevant. The report tells a story of success in that it shows that McGill's PhD graduates possess integrated transferrable skills that they are continuing to develop in their jobs in non-academic environments. Specifically, while the majority of the survey respondents did not have academic jobs, and this mirrors post-PhD employment trends across North America, almost all (91 %) reported feeling that their work was related to their field of study and built on their academic research skills. Many survey respondents have volunteered

to return to the University in order to contribute in a variety of ways, such as mentoring current graduate students or participating in workshops on career pathways and professional development. In future iterations of the survey, we will ask respondents to elaborate on their non-academic pathway choices, with respect to research and professional-skills development during their PhD programs, as well as the ease of transition from academia to jobs in other sectors.

In this section, we have presented the final aspect of McGill's model of success for PhD students, Career and Professional Development. Overall, the model is based on an outcomes-oriented definition of success, rather than on a metric of time to completion only. This provides a framework for validating the continued support of doctoral graduates who pursue non-academic career pathways. Our processes and initiatives will continue to evolve to respond to the changing landscape and needs, using an evidence-based approach. Our monitoring and evaluation plan of the programming includes regular check-ins with students and faculty through surveys, focus groups, and consultations.

Conclusion and Looking Ahead

In conclusion, there have been many significant changes in programming and initiatives to support PhD success at McGill over the past 8 years. These changes have led to the emergence of our success model and helped us focus on an outcomes-oriented definition of success that provides a framework for validating all career pathways of our graduates in academic and non-academic sectors. The model allows us to understand what transferrable skills helped them get there, and what kinds of institutional supports we can provide to foster their wellness and professional development.

There are several key takeaways from the integrated McGill model of success that can be implemented at other institutions. These include:

- cross-service unit collaborations that support academic, student-life, and professional development;
- faculty and student training and development about supervision and supervisory relationships;
- resources and buy-in from senior administration;
- people to carry out the vision and mission; and
- a campus-wide, holistic view of wellness.

As McGill moves forward towards its 200th anniversary in 2021, we will embark on a number of projects including more writing support (e.g. dissertation boot camp), an integrated and sustainable University-wide orientation, the introduction of the Individual Development Plan, and the articulation of a learning-outcomes framework for doctoral education. We believe that by building on our current initiatives with exciting future projects, we will enhance the doctoral experience and provide a solid foundation for graduate excellence and success.

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