Technology-Enabled Learning:
Policy, Pedagogy and Practice

Sanjaya Mishra and Santosh Panda

Editors

COMMONWEALTH *of* LEARNING

PERSPECTIVES ON OPEN AND DISTANCE LEARNING

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Commonwealth of Learning

The Commonwealth of Learning (COL) is an intergovernmental organisation created by Commonwealth Heads of Government to promote the development and sharing of open learning and distance education knowledge, resources and technologies.

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Foreword

This book comes at an unprecedented moment in history, when the COVID-19 pandemic has disrupted every sphere of activity. The impact on the education sector left millions of students out of school due to institutional closures. Governments, institutions, students and teachers had to make an almost overnight transition to distance and online learning. But crisis generates creativity, and many Commonwealth countries found appropriate solutions to ensure that students continued to learn. A range of technologies was used — printed text, radio, television, interactive radio instruction, community radio, multimedia, and online learning — based on the requirements of different constituencies.

However, the emphasis on online learning in contexts where electricity, computers and connectivity were not readily available led to protests from both students and teachers. In addition to the lack of resources, it was clear that effective online learning required adequate planning, quality content and teacher capacity. Most campus institutions were completely unprepared. On the other hand, the distance education system was well equipped to keep the doors of learning open.

Many open universities and open schools continued to teach while their campus counterparts were forced to close. Several of the latter quickly converted their courses for online delivery. As an intergovernmental organisation established to promote distance and technology-enabled learning (TEL), the Commonwealth of Learning (COL) responded quickly by curating teaching and learning resources, releasing guidelines on distance education, and launching a platform to create a network of organisations to collaborate and share expertise and resources. Some of the lessons learnt in the process are:

- with adequate ICT infrastructure, countries can develop a resilient education system;

- distance education, especially blended learning, can be the way forward for many educational institutions;

- synchronous technologies (such as video conferencing) are increasingly available but are not necessarily the only way to teach online;

- teacher readiness and capacity building are necessary for effective teaching and learning; and

- open educational resources (OER) need to be harnessed to provide quality content quickly.

Interestingly, these ideas resonate in the chapters of this book, *Technology-Enabled Learning: Policy, Pedagogy and Practice.* The editors of the book commissioned 15 chapters (excluding the prologue and epilogue) on COL's concrete interventions in TEL. Experts at COL partner institutions in ten Commonwealth countries have documented the research and best practices enabled through COL support. The book showcases some of the most successful examples of developing policy, improving pedagogy and supporting institutional practice. This led the editors to cover the wider issues around ICT in education, and the implementation of TEL and OER policies and practices. One key recommendation that emerges is to mainstream TEL to develop resilient education systems that can cope with sudden disasters.

I take this opportunity to thank the contributors and the editors for bringing out this timely publication. Special thanks to the peer reviewers and COL colleagues, who have contributed directly or indirectly to enriching this publication. I am sure it will inspire many educational institutions in the Commonwealth and beyond to adopt TEL policy, pedagogy and practice for achieving equitable quality education and lifelong learning for all.

I invite you to critically analyse the case studies drawn from different contexts, and to remix and adapt these practices to your own needs.

Professor Asha Kanwar

President & Chief Executive Officer
Commonwealth of Learning

Acknowledgements

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List of Abbreviations and Acronyms

AR	augmented reality
BL	blended learning
CBO	community-based organisation
C-DELTA	Commonwealth Digital Education Leadership Training in Action
CoI	community of inquiry
CoP	community of practice
DRM	digital rights management
EBLT	engagement-based learning and teaching
EdTech	education technology
F2F	face-to-face
HIC	highly interactive cloud
ICT	information and communication technologies
JOOUST	Jaramogi Oginga Odinga University of Science and Technology
L&T	learning and teaching
LA	learning analytics
LMS	learning management system
MCQ	multiple-choice questions
NPTEL	National Programme on Technology Enhanced Learning
ODeL	open and distance eLearning
OEP	open educational practices
OER	open educational resources
OUSL	Open University of Sri Lanka
PI	performance indicator
RGUKT	Rajiv Gandhi University of Knowledge Technologies
ROI	return on investment
SDG	Sustainable Development Goal
TASL	title, author, source, licence
TEL	technology-enabled/enhanced learning
ToC	theory of change
UMS	Universiti Malaysia Sabah
VR	virtual reality

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Prologue

Prologue: Setting the Stage for Technology-Enabled Learning

Sanjaya Mishra and Santosh Panda

Introduction

Information and communication technologies (ICT) are engines for growth in almost all sectors of human endeavours. Transformational changes in societies are visible due to appropriate use of ICT, and the field of education is not lagging behind. Across the globe, teaching and learning have undergone considerable transformation from the traditional classroom model to the current online and blended models, and developments in ICT hold the key to such transformation. Added to this are philosophical imperatives of open education and open learning, and pedagogical revelations from the behaviourist to the constructivist and connectivist. Educational institutions are taking steps to increase access to education, and even more effort is being put into improving the quality of student collaboration, engagements and learning. In such a situation, both learner and teacher competencies and skills hold the key across media types — starting from oral and written communication and static and broadcast media to the current interactive and networked media and technologies (Bates, 2016).

In recent decades, alternative and complementary developments in education and training provisions have emerged. The most dominant so far has been open and distance learning (ODL). More recently, during the COVID-19 crisis, when educational institutions faced lockdown, the advantages of ODL for providing access to educational opportunities with a focus on equity came to the forefront (COL, 2020; Kanwar & Daniel, 2020). While the key focus of ODL systems around the world has been to increase access to quality education, the uses and benefits of ICT go beyond ODL systems. The Commonwealth of Learning (COL) believes in the appropriate use of ICT and therefore promotes an integrated view on the use and adoption of technologies in teaching, learning and training at all levels. The range of promoted technologies includes the use of radio, television, stand-alone

computer-based learning, and fully online courses accessible through mobile and fixed devices.

While the use of ICT is about deployment of appropriate technologies for teaching and learning in many educational institutions, the focus of COL has been on how technologies can improve student engagement and learning experiences in every sphere of life — ranging from agriculture and community development to college/university teaching and continuing professional development. Especially in face-to-face institutions, the use of eLearning brings in more flexibility to the environment and enables flipped classrooms, leading to more interactions and learning. Evidence shows that the use of technology in teaching and learning environments increases motivation to learn, fosters collaboration, improves student achievements, makes administration transparent and improves the efficiency as well as quality of education (Farrell & Wachholz, 2003; Trucano, 2005; UNESCO, 2011). However, not all Commonwealth countries and educational institutions/organisations are at the same level of access to technology (including computer penetration and Internet bandwidth), and therefore, benefits from technology-enabled learning (TEL) are not comparable across the board. Moreover, it is not always about the access and affordability of new and advanced technologies; often, what is more relevant are educational applications of appropriate technologies.

The field is growing fast, and new innovations are coming up as swiftly as those that are fading away. It has been important, therefore, for COL to play the role of a pathfinder in TEL, and advise various Commonwealth governments and institutions to use relevant and appropriate technologies to increase efficiency and effectiveness in teaching and learning provisions, and to improve skills development and innovations toward sustainable development (Mishra, 2015b).

Significant research activities are underway across the globe on various aspects of TEL (Davies et al., 2017; Price et al., 2017), including the much-publicised flipped classroom (Bishop & Verleger, 2013) and TEL classroom (Lee et al., 2014). Seizing the opportunity and immense possibilities, as part of its strategic plan for its TEL initiative, COL decided to develop a comprehensive set of interventions in the Commonwealth countries and institutions. The overall approach to TEL has been scholarly in nature and has used both evidence-informed and evidence-based approaches to promote TEL (Nevo & Slonim-Nevo, 2011; Yorke & Knight, 2007).

Technology-Enabled Learning

In the early days of developing COL's TEL initiative, we defined TEL as the "application of some form of digital technology to teaching and/or learning in an educational context" (Kirkwood & Price, 2016, p. 1). The phrase "technology-enhanced learning" was deliberately avoided (cf. Chapter 16), as we wanted to emphasise the enabling nature of technology that supports student learning in different ways, including the provision of access to those who previously had no access to learning opportunities and also those who are studying on campus. COL's strategies and initiatives on TEL focus comprehensively on both policy and practices, with built-in provisions for capacity building and leadership development. Significant and sustainable interventions include: the Commonwealth Digital Education Leadership Training in Action (C-DELTA)

programme; ICT in education policy development, including open educational resources (OER) policy; TEL implementation in educational institutions; massive open online courses (MOOCs) on TEL and blended learning practices; and advanced ICT skills development. Considerable and visible progress has been made in all these areas, including the development of a community of practice (CoP) and a toolkit for the benchmarking of TEL (Sankey & Mishra, 2019). The projects are interwoven and are developed and implemented at three levels — national, institutional and individual (Figure 1.1).
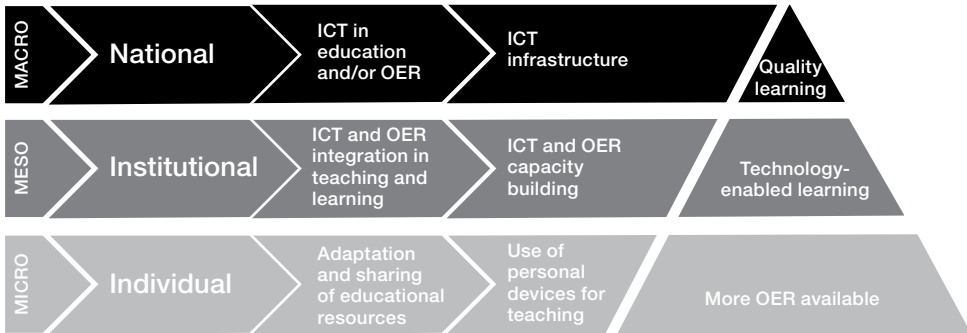
Figure 1.1. Levels of TEL interventions. (Source: Mishra, 2015a)

COL's support to governments and educational institutions for TEL is organised at three levels:

Macro level – review and development of ICT in education policies and OER policies at the national level. This is expected to provide an overarching framework to create an enabling environment for integration of ICT in teaching and learning at all levels and in all sectors of education.

Meso level – focuses on supporting institutions to build capabilities to develop digital education skills, and optimally use available open technologies and resources to increase access to education and improve the quality of learning.

Micro level – interventions that are designed to directly support teachers and students through institutional partnerships or the direct offer of online resources and learning opportunities, such as online courses.

Commonwealth Digital Education Leadership Training in Action

Today, imparting basic skills goes beyond the 3Rs (reading, writing and arithmetic). Digital education skills have become a key strand in the foundational skills for any job market. According to a report published by the Pearson group and prepared by the Economist Intelligence Unit (2014), leadership, digital literacy and communication are three important skills in the 21st century. The report entitled *New Vision for Education: Unlocking the Potential of Technology* identifies sixteen 21st-century skills, categorised into foundational literacies, competencies and character qualities. ICT literacy, communication and collaboration are three out of the 16 skills identified for fostering innovation and creativity (World Economic Forum, 2015). A recent report from the Corsham Institute's Thought Leadership Programme

emphasised that today's students will use technology throughout their lives, and therefore, digital education is a necessary skill to be included in every curriculum (Grand-Clement, 2017). The abundance of digital information available on the Web and accessible through smartphones and mobile devices, anytime and anywhere, makes it essential for anyone, including teachers and students, to know about, search and use these resources appropriately to enhance their abilities for improved livelihood (Mishra, 2018). The Economist Intelligence Unit's study reveals that inculcating a broad range of skills in children has become crucial for national economic development (Economist Intelligence Unit, 2014).

With a view to enhancing the competencies of teachers and learners in the Commonwealth, COL has been developing leaders in digital education through the C-DELTA programme (https://cdelta.col.org/). This is delivered in partnership with governments, educational institutions and civil society organisations, who use the free online course for learning and skills certification. The curriculum and course materials have been developed in collaboration with the University of Cape Town, South Africa (Brown et al., 2016). The course helps teachers and learners to integrate ICT effectively in teaching and learning. It promotes understanding of responsible online behaviour; finding, creating and sharing learning resources; and engagements in a personal learning network for self-development. Chapters 12 and 13 of this book present some of the experiences from the implementation of C-DELTA in different countries.

National ICT in Education and OER Policy

Technology integration in teaching and learning is very often hyped. Examples are the One Laptop Per Child Program (Robertson, 2018), which did not yield any improvement in enrolment or test scores (Cristia et al., 2012), and the growing distribution of tablet devices through government-supported schemes in the K-12 schooling sector (Tamim et al., 2015a). Research shows the prevalent misconception that putting technology in the hands of students will reduce access issues and transform education (cf. Mitra & Crawley, 2014). A meta-analytics study by Tamim et al. (2015b) for COL on teaching and learning from tablets further corroborated this. The study showed a significant preference for more student-centred pedagogical use of technology. The researchers found that when the devices were used with a student-centred approach, rather than within teacher-led environments, the effect size was greater. Further, it was reported that the use of mobile devices elicited positive perceptions within more student-active contexts.

Kozma (2008) identified three key reasons for governments to invest in ICT in education: economic development, social progress and education reform. However, there are always gaps between policy rationale and implementation (Kozma & Vota, 2014). The key challenges include: deploying ICT infrastructure, maintaining systems at the school level, training teachers on the usage of ICT in the classroom, developing relevant content, leveraging community inclusion to expand impact and sustainability, and covering the total cost of ICT ownership (Kozma & Vota, 2014). Considering these challenges, COL's interventions and policy support for ICT in education and

OER follows a systematic approach (see Chapter 2). However, it is important to also understand that the term "policy" is used to refer to an executive decision, a piece of legislation, a strategy approved by the government, or implicit steps taken by governments to support certain actions, in the absence of a public dialogue. In our context, a policy or strategy is an intent made by a government body, often with the involvement of stakeholders, that describes a problem and broadly outlines how the problem will be addressed (Evans & Cvitanovic, 2018). COL's systematic approach to policy development and implementation covers problem framing, policy formulation, decision making, implementation, and monitoring and evaluation (Dovers & Hussey, 2013; Howlett et al., 2009). Recently, in collaboration with UNESCO, guidelines for the development of OER policies (Miao et al., 2019) were developed to help ministries and educational institutions follow a theory-of-change model to demonstrate the impact of policy and to measure success. Key ingredients to measure any policy at the national level could be its impact on (i) social change (programmatics), (ii) internal decision making and interventions (processes) and (iii) stakeholder attitudes (politics) (Compton et al., 2019; Nicklin, 2019). COL's policy development strategy also focuses on open and inclusive collaborative engagements with stakeholders, evidence-based policy support (Beerkens, 2018) and capacity building.

As part of capacity building, COL has developed an online course (https://learnoer.col.org/) on OER that helps teachers as well as policy makers to develop a basic understanding of the subject. As a result, teachers are able to find, select, revise, edit, remix and integrate multimedia resources in their blended courses offered to learners. The use of OER helps in three specific ways to mitigate some of the challenges listed by Kozma and Vota (2014): (i) reduces the time for developing the courses, (ii) includes a range of resources critically analysed and adapted by teachers to improve student learning and teaching practices and (iii) reduces the cost of learning resources for learners. In a study commissioned by COL at Antigua State College, it was found that students saved approximately 704 Eastern Caribbean dollars (ECD) per year, and the use of OER increased student learning outcomes by 5.5% (EMARGE Ed. Consultants, 2017).

TEL Implementation at the Institutional Level

At the meso level, COL's programme for TEL implementation helps educational institutions to systematically integrate ICT in teaching and learning and offer blended learning courses. Meta-analysis of research on the effectiveness of blended and online learning suggests that on average, "students in online learning conditions performed modestly better than those receiving face-to-face instruction" (Means et al., 2013, p. 2). Further, the advantage over face-to-face classes was significant in those studies that reported the use of blended learning. The meta-analysis also found that blended learning involved additional learning time, more instructional resources, and several course elements that encourage interactions among learners. Those contributed significantly to student learning outcomes. Another meta-analysis revealed that "improvement in achievement related to BL is low but significantly greater than zero" (p. 115), and face-to-face learners may expect to experience

a 13% increase in achievement with the support of blended learning (Bernard et al., 2014). A more recent study further confirmed that blended learning is "significantly associated with greater learning performance of STEM-discipline students than with traditional classroom practice" (Vo et al., 2017, p. 17). Broadly, blended learning has several benefits over traditional face-to-face and chalk-and-talk approaches. Some of these are: (i) providing flexible learning opportunities to learners for some portions of the courses; (ii) enabling more interaction with teachers beyond class time, and in-depth discussion with other learners to benefit from multiple perspectives and experiences; (iii) enhancing opportunities for collaboration with other learners; and (iv) acquiring the skills of lifelong learning online. Despite these advantages of blended learning, there is a lack of adequate pedagogical skills and limited technology deployment to use blended learning in the developing Commonwealth countries.

At COL, the focus is on the policy–technology–capacity linkage to strengthen implementation of TEL in educational institutions across the Commonwealth. TEL implementation in each of the partner institutions, supported by COL, starts with an expression of interest from senior management for adopting a systematic approach to TEL. In order to have stakeholder buy-in, we emphasise evidence-based and evidence-informed approaches in the three phases of TEL implementation. Phase 1 starts with a baseline study of the infrastructure capacities and existing capabilities of teachers and students to use ICT for teaching and learning. This study informs the drafting of a policy for TEL through internal consultation, which is followed by faculty orientation with hands-on demonstration of the affordances of blended learning through the use of a learning management system (LMS). In Phase 2, COL provides the necessary advice on how to strengthen the infrastructure (the LMS and open-access repositories, in particular) and offers expertise to help build local capacities to use these technologies. The major focus of Phase 2 is to institutionalise the TEL policy by developing and offering some blended courses. COL facilitates quality assurance of the developed courses by using benchmarks and checklists available for this purpose. The capacity-building activities in the TEL implementing institutions are supported by a standard text, *Guide to Blended Learning* (Cleveland-Innes & Wilton, 2018; also available at https://openbooks.col.org/blendedlearning/) and a MOOC on *Introduction to TEL* (https://www.mooc4dev.org/telmooc/), offered in collaboration with Athabasca University, Canada. In Phase 3, COL encourages an evaluative research study to measure student learning and teacher pedagogical changes. This provides evidence of the success of the blended courses and information on necessary inputs to further revise/update the courses developed (see Chapters 4–7 and 9 of this book). COL has also developed a CoP platform (https://www.telcop.net/) to connect teachers and institutions in the Commonwealth who have been using blended learning for improving the quality of teaching and learning. Further, COL's *Benchmarking Toolkit for Technology-Enabled Learning* helps the participating institutions to benchmark their TEL processes and practices vis-à-vis other similar institutions. This facilitates a process of continuous reflection and growth after COL's interventions are withdrawn.

PHASE 1: Preparation	PHASE 2: Development	PHASE 3: Maturation
• Baseline survey • Policy development • Capacity building	• Strengthening infrastructure • Blended course development • Blended courses in use	• Evaluation of blended learning • Community of practice • Benchmarking TEL
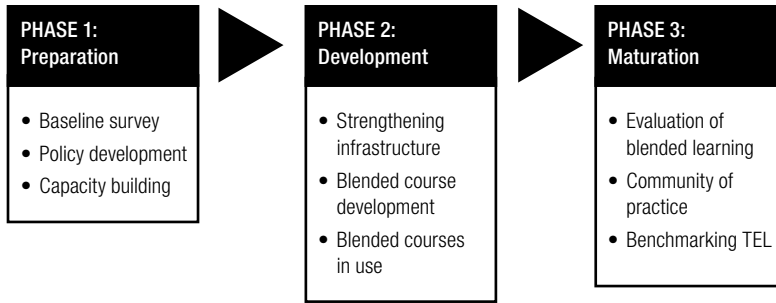
Figure 1.2. TEL interventions at the institutional level. (Source: Sankey & Mishra, 2019)

Advanced ICT Skills Development

The unfolding of the fourth industrial revolution has resulted in a mismatch of the talents available and those required by industry (Hays plc, 2018; OECD, 2014). At the same time, nearly 50% of companies expect that automation will lead to some reduction in their full-time workforce by 2022 (World Economic Forum, 2018). The 2014 OECD report on *Skills and Jobs in the Internet Economy* indicated an increase in demands for ICT jobs and highlighted the need to promote ICT skills among workers. A new report from the World Economic Forum (2020) emphasises technology skills, including programming, digital responsibility and the use of technology, as key employability skills of the future. Data from LinkedIn reveals that "youth with skill sets related to advanced information and communications technology (ICT) and the Fourth Industrial Revolution (4th IR) (i.e. statistical analysis, data mining, machine-learning, and algorithm) are in high-demand" (Barbarasa et al., 2017).

COL started to work with educational institutions in the Commonwealth in 2015 to develop advanced ICT skills courses that would help improve youth employability and entrepreneurship leading to livelihoods. Initially, six open universities in Asia and Africa joined to develop 12 courses as OER, leading to a Certificate in Web Application Development and a Diploma in Mobile App Development. At the time of writing, 26 advanced ICT skills courses have been developed in collaboration with several educational institutions. An analysis of the usage of these courses in September 2019 indicated over 70,000 downloads. These courses are developed as OER textbooks that can be adapted by institutions to offer courses, resulting in savings for students, as they do not have to buy commercial textbooks. The average cost of a textbook in the US has been estimated at USD 116.94 (Nyamweya, 2018). Therefore, the indirect value created by making these courses available as OER is significant. In addition, the ICT for Youth Employability project implemented in the slum areas of Kampala, Uganda for vulnerable boys and girls produced a 1:3.48 social return on investment, contributed towards employability, reduced the risk of STDs, and connected participants with employers (Gaeta & Bustamante, 2019).

Why This Book?

This book is not an evaluative report of COL's TEL initiative. Rather, it is an attempt to document the positive outcomes of the interventions supported by COL using a scholarship of teaching and learning lens. We do not cover all the projects supported by the TEL initiative, as many of these are in different stages of progress. Only those projects that were in an advanced stage of progress or completed by September 2019 were identified and chapters commissioned. The broad objective of the book is to highlight the lessons learnt as well as the best practices that can be used in successive development projects on ICT integration in teaching and learning, and that can be reflected upon by teachers and trainers to further integrate and improve upon their practices. In a way, this is a demonstration of the significant transformations cumulatively achieved by a wide range of stakeholders in governments and educational institutions.

Organisation of the Chapters

The book has 15 chapters and is organised into three sections, arranged under three thematic areas:

1. ICT in education: policy and national development
2. Technology-enabled learning strategies and implementation: case studies
3. Technology-enabled learning: research and evaluation

ICT in Education: Policy and National Development

The first theme is addressed by two chapters focused on analysing ICT polices and policy on technology applications in education. *Chapter 2* focuses on the analysis of a policy roadmap for ICT in education; three approaches to technology application in education — learning from technology, learning in technology, and learning with technology; and applications of various technologies in teaching–learning, including video, mobile learning, LMSs, social media, OER, MOOCs and learning analysis. While presenting an evidence-based approach to ICT in education policy formulation, this chapter also focuses on some emerging technologies such as blockchain, augmented reality, virtual reality, gesture-control technologies and wearable technologies. *Chapter 3*, using qualitative research through document analysis and content analysis, critically analyses the OER policies of select nations and institutions vis-à-vis the congruence between conceptual articulation and practical application. Responding to the COVID-19 context, this chapter strongly argues for the importance of policies and the reimagination of education to take full advantage of ICT and OER.

Technology-Enabled Learning Strategies and Implementation: Case Studies

The second theme, with five case studies, deals with TEL strategies and implementation. *Chapter 4* presents the case of blended learning implementation in an engineering university in rural India and analyses the positive impact blended learning had on the learning outcomes of engineering students. *Chapter 5* critically reflects on the processes and outcomes of the implementation of blended

learning courses as part of an overall TEL implementation at a premier women's university in India. *Chapter 6* deals with TEL implementation in technology-challenged environments, with specific reference to the National University of Samoa. Results showed that teachers' and students' use of blended teaching–learning through Moodle had a positive impact on interactions between teachers and students and also on teachers' reflective practices. *Chapter 7* focuses on learner engagement through TEL at a science and technology university in Kenya. The TEL platform "e-jooust" was created at the university to help faculty teach in a blended mode, with a special focus on mentoring and connecting students. The results of this research showed a positive relationship between TEL and the cognitive and emotional engagement of students in their learning. Students found the teacher to be the main motivator with respect to engagement, which emphasised the importance of blended learning. This further indicated the need for special attention to designing interaction and collaboration opportunities in the courses. The last chapter in this section (*Chapter 8*) focuses on a crucial aspect of TEL: capacity building. Using a series of professional development activities on OER-based eLearning in Asian universities, conducted in collaboration with Wawasan Open University, the chapter presents the lessons learnt in adopting a systematic and nimble approach to institutionalising TEL. The modality that worked very well included workshops on content development, follow-up workshops to review the progress and quality of content in print, and conversion of print to online course design and delivery. In the process, about 185 faculty members from four countries (India, Malaysia, Pakistan and Sri Lanka) were trained. Many universities in the region have institutionalised the use of OER and are successfully offering this capacity-building programme on OER-based eLearning.

Technology-Enabled Learning: Research and Evaluation

In this section, we present eight chapters written by scholars who have undertaken independent and/or collaborative evaluations of various dimensions of TEL. Six important issues are focused upon: methodological challenges, MOOC and TELMOOC, C-DELTA, learning resources, return on investment (ROI), and benchmarking of TEL. *Chapter 9* describes the methodological challenges faced while conducting research/evaluation of TEL at Universiti Malaysia Sabah. The reflections may enlighten future researchers, as well as inform current and planned evaluation studies. *Chapter 10* presents the design and implementation of the "Introduction to Technology-Enabled Learning" MOOC (TELMOOC), with a focus on including learner experiences and examining how the course changed the teaching practice of the participants. The fourth offering of TELMOOC had over 2,400 participants from 34 countries, and the learner experiences have been qualitatively rich, as evidenced by high levels of participation, interaction, and course completion. This is a very successful professional development programme for emulation. On a similar theme, *Chapter 11* presents a new approach that could be applied to evaluating the long-term impact of MOOCs. The "theory of change" (ToC) approach was developed, after careful scrutiny of various other approaches that the chapter describes. The individual learner was the focus, and the ToC-based impact goes beyond the quantitative study to include sequential mixed

method design to assess the long-term impact of MOOCs on individual learners' professional practices.

The next five chapters are concerned with leadership, resources, ROI, and benchmarking. *Chapter 12* reports the long-term implementation of COL's C-DELTA programme in Sri Lankan schools, intended to enhance the digital leadership skills of teachers who could then further foster sustainable digital education environments in their schools. The stories from this study suggest that the participating teachers significantly enhanced their own digital literacy, as well as influencing peer teachers and students to develop sustainable digital behaviour and act as change agents. *Chapter 13* extends the evaluation of C-DELTA across the countries where COL has implemented it. This chapter analyses various challenges and opportunities that came up during the design, development and delivery of the online course and offers insights into how stakeholders have used the C-DELTA platform to become change agents in teaching and learning.

Chapter 14 presents the findings of a research study on access to learning resources, availability, costs and significance of OER. This study showed that learners avoided programmes with a high total cost of textbooks. The cost of learning resources was a significant issue for learners in terms of their decisions to buy, share, rent or borrow textbooks and/or to consider alternative OER. This underlines the need for awareness of and capacity building for OER among learners as well as educators. The findings from this study also corroborated COL's strategic focus on OER and capacity building through its TEL initiative. *Chapter 15* analyses the ROI of COL's online capacity-building intervention for OER, called "Understanding OER." The study found that from the viewpoint of benefits accrued to the participants, the ROI was 212.42%, compared with 254.1% based on the cost involved for COL. This implies value for money, suggesting COL could consider more such online courses. Finally, *Chapter 16* presents a benchmarking framework for TEL, developed by COL, and presents the key benefits of using such a tool for the comparative benchmarking of institutions in the Commonwealth and elsewhere. The chapter also provides specific key principles for institutional quality assurance practices with respect to TEL, which could enhance institutional benchmarking standards and make them comparable to best practices across the globe.

In the book's epilogue, the editors take stock of TEL in terms of past developments and current practices, and critically reflect on the possibilities and challenges for mainstreaming TEL and building resilient education systems.

Conclusion

As this prologue has presented and discussed, TEL implementation has come a long way in the contexts of teaching, learning, training, lifelong learning, and sustainable and community development. The various chapters in this book highlight the successful implementation of TEL by COL, as well as the challenges faced and the lessons learnt from these initiatives. Today, it is no longer valid to ask whether we need the assistance of technology for teaching, learning and development. What is more important is to apply TEL in the context of specific needs and ask questions about how to improve its effect/impact. The future of TEL is promising as well as challenging. Readers of this book will see that

successful implementation of TEL projects requires policies, capacity and the use of appropriate technologies.

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ICT in Education Policy and National Development

2

Technology Applications in Education: Policy and Prospects

Sanjaya Mishra

Introduction

Transformation in the way we teach has not been commensurate with progress in human civilisation. While education contributes to most human development through teaching and research, the education systems themselves by and large have not mainstreamed changes. A decennial review of literature on return on investment in education by the World Bank shows that the "private average global rate of return to one extra year of schooling is about 9 percent a year," and average private return on higher education (15.8%) is more than on secondary education (15.1%). However, the average social rate of return for primary education, secondary education and higher education is 17.5%, 11.8% and 10.5%, respectively (Psacharopoulos & Patrinos, 2018). Knowledge plays an important role in development (Stiglitz & Walsh, 2002), and therefore, it is important to innovate in learning environments, classrooms, curricula, tools, techniques, and organisational structures and systems.

Everything needs renovation innovatively, including our current system of teaching and learning. How can we promote lifelong learning and make provisions for future needs? It is reported that "65% of children entering primary schools today will ultimately end up working in completely new job types, that don't yet exist" (WEF, 2016, p. 3). Therefore, it is important to rethink and realise that "business as usual" will not work in the future. We can't solve tomorrow's problems with today's tools. Knowledge can be used multiple times without depreciation in value, can be used by many people at the same time, and can be shared widely at little cost (Kozma, 2011b). Information and communication technologies (ICT) can help achieve these goals effectively.

Thomas Edison predicted in 1913 that books would be soon obsolete in schools, and motion pictures would be prevalent in the next ten years. This is yet to

happen. But educators all over the world have experimented with numerous media and technologies — each with unique attributes as well as different affordances and capabilities. From numerous innovations and research studies, we know that efficient, effective and engaging learning is about appropriate use of the available technologies and their attributes to optimise student learning.

ICT in Education Policies

Policies present the intentions of governments and institutions with respect to a particular area, providing a rationale for why it is important and indicating how challenges will be addressed. In many countries and institutions, the term "policy" is sometimes used interchangeably with "strategy" and "framework." Broadly, ICT in education policy and strategy provides the overarching framework to improve the quality of education and increase access to education for more people. Intergovernmental organisations such as UNESCO and COL have been working in this space for a long time, providing guidance and toolkits to help governments integrate ICT in teaching and learning. The World Bank is another international organisation that has been active in supporting the effective use of ICT in education. It may, however, be noted that ICT implementation in schools, for example, does happen without policies as well. But without a national policy or a strategic rationale, these experiments and efforts are unsustainable (Kozma, 2008). Many a time, without a shared vision and collaborative decision making, "[p]olicy becomes techno-centric, promoting the purchase of equipment or the training of teachers without providing a strong educational purpose or goal for the use of technology" (Kozma, 2008, pp. 1084–5). While having a policy is not necessarily a solution for the successful implementation of ICT in education, there are enough efforts in this direction to focus on implementation. The Systems Approach for Better Education Results (SABER) project of the World Bank provides a framework for the development and implementation of ICT in education policy. The components covered in the policy include: (i) aligning policy vision and planning, (ii) providing sufficient infrastructure and power, (iii) focusing on teacher use of ICT, (iv) developing learners' ICT skills and competencies, (v) supporting the development, dissemination and use of learning resources, (vi) collecting, processing and analysing education-related information, (vii) monitoring, evaluating and researching innovations and (viii) focusing on equity, inclusion and safety (Trucano, 2016). A good policy is not a panacea for all educational challenges, and often, the speed of technological changes exceeds the intention of a good policy developed through a consultative process with all stakeholders. Thus, having an understanding that technology will outpace the ability of policy makers to innovate is key to a dynamic policy. This also highlights that policies evolve and change over time.

COL therefore focuses on both review of the existing policy and development of a new policy. We also integrate new developments within the scope of that policy; for example, new ICT in education policies supported by COL in recent times have also focused on the inclusion of policy for open educational resources (OER). The ICT in education policy template of COL covers: (i) review of the policy environment, (ii) vision, mission and principles, (iii) infrastructure and connectivity, (iv) teaching, learning and assessment, (v) ICT management and administration, (vi) human resource and capacity building (of teachers

and IT staff), (vii) OER and open distance learning, (viii) e-waste management, (ix) digital citizenship, (xi) partnership and collaboration and (xii) policy governance, monitoring and evaluation. Gender equity, student success, access and affordability, and community engagement remain priority focus areas in the policy. Figure 2.1 shows the process adopted in policy development and the process of review supported by COL.
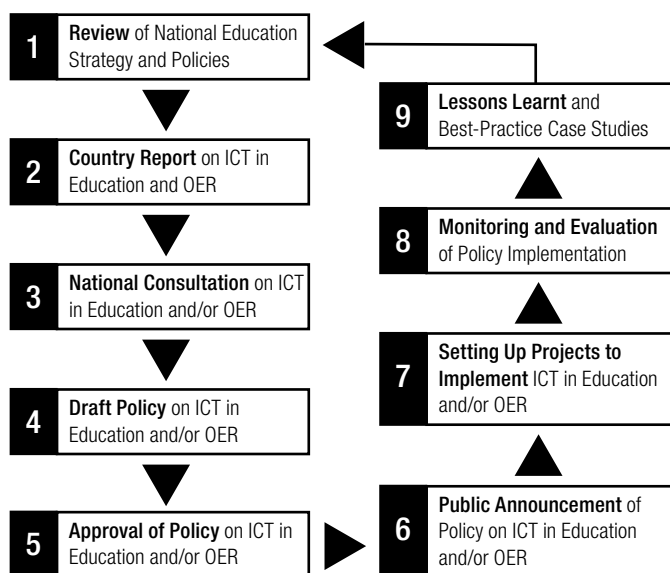
Figure 2.1. Policy roadmap.

Approaches to Technology Applications in Education

In the discussions related to ICT in education, policy makers and administrators are interested in knowing about prior evidence. A common question is: Do media influence learning? Research studies comparing media have revealed that learners learn equally well, irrespective of the means of presentation and communication. Clark (1983) emphasised that "media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries cause changes in our nutrition" (p. 445). Clark suggested that research should focus on instructional methods that are crucial in learning, whereas Kozma (1991), refuting Clark's assertion, has recommended examining how media influence learning.

Notwithstanding the debate over the influence of media on learning, media and technologies are here to stay in education, as they "do create different cognitive processes at different levels of efficiency (with regard to speed, ease, effectiveness). In other words, the form in which information is presented can determine how it is processed in a mind, and hence how it can be learned" (Cobb, 1997, p. 27). Kozma (2011a) presents a conceptual framework for using ICT in education, which is similar to this approach, and provides a three-step ladder: knowledge acquisition, knowledge deepening and knowledge creation. Mishra (2006) has presented the use of technology in learning at three levels — learning *from* technology, learning *in* technology and learning *with* technology.

Learning from technology is a situation where different media are used as carriers to deliver information from which we learn, e.g., reading a *textbook*, listening to *radio* and watching a *television* programme. We learn from all these sources of information. Meaningful learning here is a generative process (Wittrock, 1974), requiring learners to select relevant information from what is presented, organise it into a mind map and integrate the new map with prior learning. However, most of the time, learning from technology is passive and thus could be construed to be least effective. To enhance learning from technology, it is important that the source (media) of learning be designed specifically for that type of learning, making best use of its own symbol system. In order to learn from television, which uses an iconic symbol system to represent knowledge, it is necessary for learners to have some prior experience of the topic through media notes, and to establish the relevance of the topic for the individual learner. The use of learner control over media in media design also enhances learning, as the learner can pause and play the programme to think, reflect, analyse and assimilate new learning (Koumi, 2006).

Learning in technology is an environment facilitated by the use of technology. In such a situation, technology is *integrated* rather than used as stand-alone media. Thus, learners learn in a technological environment through multiple media. Such a situation is very much like a distance learning situation, or an interactive teleconference-based teaching–learning environment that enables a virtual classroom situation (Mishra, 2000). The employment of web-based learning or online learning, used also as blended learning, falls within this category (Mishra, 2001). The learning environment demands certain kinds of responsibilities from learners and assumes self-regulation and internal motivation as essential components of successful learning. Participation in the technological environment becomes crucial for learning to happen, and we can facilitate collaborative and cooperative learning through the use of new information technologies such as email, discussion boards and chat facilities available on the Internet. Learning *in* technology is an improved approach for effective learning, and it subsumes learning *from* technology. It is a highly demanding situation for instructional designers and course developers, as the planning and implementation of instructions are organised as separate activities, where planning takes more time and effort.

Learning with technology is a creative use of technology to allow and facilitate learners to learn by working with technology. This suggests that instead of watching a video programme or interacting with multimedia, learners are engaged in preparing a video or even developing the multimedia object itself. New information technologies, particularly computers and the Internet, provide this opportunity to learn with technology. For example, to learn about web-based learning, students can work directly on a learning management system platform to create a web-based learning environment. It is argued by Resnick (2002) that technology should be used to creatively express the hidden potential of learners, and this demands digital fluency. This approach goes with the constructivist approach to learning. Learning *with* technology envisages students' interpretive representation of knowledge expressed through the appropriate and creative use of technology such as multimedia, TV or radio. Such an approach towards learning has been proven effective in training rural women to use videos and

computers for developing literacy-training materials in the Commonwealth of Learning's Literacy Project in India (Farrell, 2004). Bonk et al. (1996) reported that in an experiment on learning with technology, fifth- and sixth-grade students created multimedia materials on weather. The results showed significant gain in student learning and interest in learning science. Learning with technology puts students in a more active role, where they creatively engage in understanding and identifying the hard spots, with appropriate meta-cognitive solutions to tackle the difficult concepts appropriately. As learning by doing is the essence of this approach, it is considered a superior approach to technology applications in learning. However, it requires considerably high resources for implementation.

Technology Applications in Teaching and Learning

While there are many technologies available for use in teaching and learning at different levels of education, a good fit is always what is appropriate in local contexts. However, in this chapter, we focus on some key technology applications that are either revolutionising education or have the potential to do so, if applied systematically and supported by policy, capacity building, and timely support to teachers. Lack of access to technology, functionality, technical support, and professional development are responsible for the failure of policies and the ineffective use of technology (David, 1994). The functionality of technology to support the subject taught, technical support to staff using the technology to teach, and just-in-time professional development to harness the potential of the technology are considered three key elements of success when deploying technology in education (Reyes Jr. et al., 2017).

Video Learning

There is a video revolution in learning. By 2015, YouTube had over 135 million "how-to" videos (YouTube, 2015). The chance of a learner going to YouTube is greater when he/she is searching for something specific to know/learn. The number of such YouTube users is growing at the rate of 70% every year (Mogensen, 2015). The relative ease of video creation and the availability of smartphones with cameras have created a new learning environment. Anyone can develop short videos for teaching, and teachers can use videos in their classrooms for flipped learning (Akçayır & Akçayır, 2018; Bergmann & Sams, 2013), helping millions to learn themselves. Kaltura's 2019 *State of Video in Education* report shows that 98% of learners see video skills as necessary in today's workplace, and 86% think that today's educators must include videos in their teaching (Kaltura, 2019).

Video provides several pedagogical affordances, which include the provision of realistic experiences, motivational influence, the ability to control and review, and the engagement of students as creators (Koumi, 2015). Creating a good educational video requires knowledge and skills for camera operation, editing/video production, and an understanding of multimedia learning theories. The Cognitive Load theory says that for a quality video learning experience, the designer should consider the *intrinsic load* of the topic, reduce the *extraneous load*, and optimise the *germane load* to help mentally organise the information presented (Sweller, 2011). The principles of multimedia instruction (Mayer, 2011) highlight that an effective video should focus on: (i) the coherence principle

— learning is better when extraneous materials are excluded and only strictly necessary content is covered; (ii) the segmenting principle — learning is better when content is presented in small chunks; recent research on engagement with videos shows that learners mostly use videos of six minutes or less (Guo et al., 2014) on one concept; (iii) the contiguity principle — learning is better when corresponding words and pictures are presented close by; and (iv) the signalling principle — learning is better when cues are used to direct learners' attention to key concepts.

Mobile Learning

Keegan (2002) has stated that "[m]obile learning is a harbinger of the future of learning" (p. 9). Mobile learning includes access to electronic materials and resources mediated by mobile devices for the exclusive purpose of teaching and learning support. As access to mobile subscription, including broadband mobile subscription, is growing, it has tremendous potential to transform education. Use of mobile learning can take various forms due to the range of devices available. These may include lessons delivered on handheld devices, the use of short message services, podcasting, video on smartphones, and even the use of educational apps and the gamification of learning anytime, anywhere. Mishra (2009), after a comprehensive review of the literature, concluded that "mobile devices can support small bite-sized content delivery, and therefore, its usage has to be for providing content in small nuggets, and in consideration of the storing and playing capabilities of the device in [the] possession of the target group" (p. 31). Further, on the basis of his analysis of mobile learning case studies, he recommended a set of guidelines for using mobile technologies (Mishra, 2009):

- Plan purposefully for the educational setting.
- Identify learners' needs, especially to understand why mobile devices should be used.
- Choose media based on the requirements, which could be served simply by using text messages.
- Technology implementation should include a detailed analysis of the available technologies and their cost-effectiveness in the long run.
- Employ user manuals, which help stakeholders use tools effectively through mobile applications with little need for training.
- Run the system to carry out thorough pilot tests, as failed implementation is demotivating for stakeholders.
- Evaluate performance and outcomes once the system is implemented.

Learning Management Systems

The use of a learning management system (LMS) is probably one of the most common EdTech tools in education today. According to a market research study, the global LMS market size is expected to grow from USD 9.2 billion in 2018 to USD 22.4 billion by 2023 (Markets and Markets, 2019). An LMS is an online application for the delivery and tracking of learning on the Web. Popular LMSs provide many features — discussion forums, course authoring, integrating audio

and video, practice quizzes of different types, assignment submission, grade books, portfolios, and others — integrated into one platform, and help create a learning environment that can facilitate anytime, anywhere learning. While face-to-face teaching can integrate an LMS and create blended learning, courses using an LMS can also be delivered completely online. The use of an LMS provides a range of affordances in the delivery of instructions, which include: (i) increasing the efficiency of teaching by offering the courses to a large number of learners beyond the campus; (ii) the provision of enriched learning experiences due to the use of several media, with the possibility of the teacher experimenting with pedagogical approaches; (iii) universities being able to project to prospective learners that the use of new technologies helps learners to gain digital learning experiences that are essential in working life; and (iv) by using LMSs, universities are also able to control the teaching and learning processes, including intellectual property (Coates et al., 2005). A recent study (Yuen et al., 2019) in 25 Hong Kong schools showed that developing positive LMS/eLearning beliefs is critical to ensure satisfaction and continuance in the use of LMS/eLearning technologies, and therefore teachers need to encourage more frequent use of the LMS for different learning tasks.

Social Media

The emergence of social media (especially due to the read-write nature of Web 2.0 tools) has empowered citizens across the world. Educational institutions are not far behind, as teachers are active in using social media to create communities and connect students (i.e., to encourage social networking), provide opportunities to reflect and express themselves (through blogs), and collaboratively create new resources and projects (through wikis). Not only does social media help learners to communicate among themselves and create a community of practice, but it also helps create global citizens. Several online tools available freely on the Web help teachers and students use social media for teaching and learning. A review of the use of social media and other Web 2.0 tools in education concluded that "a dialogic, constructionist, or co-constructive pedagogy supported by activities such as Socratic questioning, peer review and self-reflection appeared to increase student achievement in blog-, wiki-, and 3-D immersive virtual world environments" (Hew & Cheung, 2013, p. 47). The use of social media in teaching and learning must: be based on sound pedagogical reasoning; use the special features of the medium to enhance learning activities; be accompanied by clear guidance on the culture of expected behaviour; include provision for basic training to operate in a collaborative environment; and support effective moderation to focus on the key issues for learning (Rennie, 2014).

Open Educational Resources

In 2002, UNESCO organised the Forum on the Impact of the Open Courseware for Higher Education in Developing Countries, where it created the term open educational resources (OER) (UNESCO, 2002). OER are teaching, learning and research materials in any medium that reside in the public domain or have been released under an open licence that permits their free use and repurposing by others. UNESCO and COL convened the World OER Congress in 2012 with the financial support of The William and Flora Hewlett Foundation to celebrate

the progress of the OER movement and mark the ten-year anniversary of the term OER, which resulted in the OER Paris Declaration. The Declaration endorsed that OER promote lifelong learning; contribute to social inclusion, gender equity and education for those with special needs; and improve the cost-efficiency and quality of teaching and learning (UNESCO, 2012). As a follow-up, in 2017, UNESCO organised the second World OER Congress, which resulted in the Ljubljana OER Action Plan (UNESCO, 2017). Taking forward the recommendations contained in the action plan, in November 2019, the UNESCO General Conference adopted a Recommendation on OER. A global survey on OER conducted by COL in 2017 revealed that stakeholders believe the use of OER will assist developing countries to access learning materials (77.75%), enable continuous quality improvement (74.45%) and lower the cost of educational materials (80.88%) (COL, 2017). The availability of OER is increasing steadily and provides several pedagogical opportunities to improve teaching and learning environments, not only by providing access but also by providing learners with the ability to co-create learning resources.

Massive Open Online Courses (MOOCs)

"MOOCs are online courses designed for large numbers of participants that can be accessed by anyone, anywhere as long as they have an Internet connection, are open to everyone without entry qualifications and offer a full/complete course experience online for free" (cited in Mulder & Jensen, 2015, p. 135–6). Ever since the first MOOC was offered by the University of Manitoba, Canada, in 2008, over 900 universities have started one or more MOOCs. Between 2012 and 2015, 25 million people from around the world enrolled in MOOCs offered by several platforms (Zhenghao et al., 2015). By the end of 2019, the number of people taking up MOOCs has gone up to 110 million, and there were about 13,500 courses available (Shah, 2019). While there are many advantages and reasons for this growth (Lane et al., 2014), in the Indian context, "the main focus is on supporting and securing the outcome of the formal educational sector . . . given a growing population and a lack of qualified teachers" (Buhl et al., 2018, p. 191). In order to integrate MOOCs into teaching and learning ecosystems, the Government of India has launched its own MOOC platform (https://swayam.gov.in/), and the University Grants Commission (UGC) in India has issued a regulation that allows the taking of up to 20% of the total course credit hours being offered in a particular programme in a semester through the online learning courses provided through the SWAYAM platform (UGC, 2016).

Learning Analytics

"Learning analytics refers to the measurement, collection, analysis and reporting of data about the progress of learners and the contexts in which learning takes place" (Sclater et al., 2016, p. 4). Teachers and higher education institutions can use learning analytics (LA) to monitor the learning process; explore student data; identify problems; discover patterns; find early indicators for success, poor marks or drop-out; assess the usefulness of learning materials; increase awareness, reflection and self-reflection; increase understanding of learning environments; intervene, supervise, advise and assist; and improve teaching, resources and the

learning environment (Ferguson, 2013). Many LMSs these days have in-built learning analytics plug-ins and modules to help teachers as well as administrators engage with the data collected in the system. Papamitsiou and Economides (2016), based on a meta-analysis of LA and smart learning environment publications, concluded that the use of LA could help with designing effective smart learning environments by providing statistically significant critical insights into (i) the individual and collective learning processes, (ii) the identification of at-risk learners and the provision of scaffolding opportunities for them, (iii) motivators that help learners succeed, (iv) learners' contextual environment and personal characteristics and (v) the factors that make specific uses of technology effective for learners. While LA is a powerful tool to improve the quality of teaching and learning and provide the evidence much needed by policy makers and administrators, there is also growing concern about the ethical use of student data (Willis et al., 2016) and policy needed to protect responsible use of data collected from learners' experiences online (Scheffel et al., 2019).

Emerging Technologies

As we progress toward mainstreaming the use of available technologies, there are always further developments in the field of new technologies and their concomitant ramifications for education and training. If appropriately planned and deployed, some of these technologies could revolutionise the way we teach and learn. There are many implications of these technologies, but they do show a lot of promise. For example, the use of artificial intelligence in education could improve educational equity and quality in the developing world and improve learning outcomes by providing personalised instruction (UNESCO, 2019). The use of blockchain technologies in education will end the use of paper-based certificates and help in the verification of certificates by employers from anywhere in the world, thereby increasing student mobility (Grech & Camilleri, 2017). Augmented reality and virtual reality (AR/VR) applications are considered the next big thing in education, making it possible to provide immersive experiences for learners so they can interact with objects, concepts or processes in their educational setting at any level (Martín-Gutiérrez et al., 2017). In addition to AR/VR, the emergence of gesture control technologies and wearable technologies presents extraordinary promise by improving learning performance and motor skills (Hsiao & Chen, 2016) and providing better measuring tools for assessing learning effectiveness (Shi et al., 2019).

Conclusion

This chapter has highlighted the significance of ICT in education policies in the context of national development and has presented a case for the systematic and evidence-based deployment of ICT in teaching and learning, by giving examples of the process adopted by the Commonwealth of Learning. Augmenting the idea of knowledge acquisition, knowledge deepening and knowledge creation as a ladder of knowledge development using ICT (Kozma, 2011a), it has presented the use of technology in learning at three levels: learning *from* technology, learning *in* technology and learning *with* technology. Further, taking an evidence-based

approach, it has reviewed some technology applications in teaching and learning that have supported quality teaching and learning at different levels of education. It has emphasised that the appropriate use of technology is a combination of policy, capacity building and timely support to all stakeholders (teachers, learners and administrators). While new technologies continue to emerge and are experimented within the context of teaching and learning, it is important to emphasise that the sustainable use of educational technology needs careful planning (institutional), purposeful pedagogic integration (by teachers) and preparation of learners to use the resources optimally and take advantage of the affordances of ICT (by learners). Considering these factors, the COL approach focuses on developing capacities and strengthening systems at national, institutional and individual levels using both face-to-face and online approaches.

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3

COVID-19 Education Responses and OER–OEP Policy in the Commonwealth

Shafika Isaacs

Introduction

This chapter analyses global, national and local policy and practice discourses in open educational resources (OER) and open educational practices (OEP) through equity and social justice lenses. It also situates these analyses in pre-COVID-19 and emerging COVID-19 pandemic conditions. At the time of writing, the escalating coronavirus pandemic had ushered in a "new normal" for education systems worldwide. Near-universal school closures affecting 192 countries and impacting more than 60% of the world's student population (UNESCO, 2020d) heightened concerns about the vulnerability of many countries to significant long-term learning losses. Increasing cases of teenage pregnancy, higher school dropout rates, and students falling behind in curriculum learning as a consequence of school closures have led some to anticipate losses of 1–1.5 years of formal education, and have elicited projections of deepening education inequality (Kaffenberger, 2020; World Bank, 2020).

Under the COVID-19 emergency conditions, many countries have resorted to remote and distance learning strategies to support home-confined learners and teachers with learning continuity. Organisations such as UNESCO (2020c) and the Commonwealth of Learning (COL, 2020a) have produced issue notes and guidelines to support country governments and their partners. Key to their recommendations is the adoption of OER as integral to equitable and inclusive distance learning strategies. Indeed, COVID-19 has become a growth opportunity for the creation and use of OER and marks the beginnings of a shift towards OEP. These developments open the way for an examination of existing policies and how they can be developed further to harness both OEP and OER to mitigate short- and long-term learning loss during and beyond the COVID-19 pandemic.

This chapter takes stock of the way OER and related OEP policy and practice were historically conceptualised to meet the access, quality, equity and inclusion imperatives of SDG4, particularly in Commonwealth countries. These policies and practices are also viewed through a COVID-19 lens by examining the way they are positioned in global and local responses to COVID-19 pandemic conditions. Its guiding questions are:

4. How have OER and related OEP policies, in their various forms, been conceptualised historically to meet the education access, quality, equity and inclusion imperatives of SDG4?

5. How are OER and related OEP policies positioned in global and local education responses to COVID-19 emergency conditions?

6. What are the implications for the present-day and future imagining of OER and OEP in a COVID-19 world and beyond?

In answering these questions, critical reflection is undertaken based on a purposive sample of OER and OEP policy instruments and practices, compared with a sample of OER- and OEP-linked education responses to the COVID-19 reality.

Conceptual Framework

In situating the analysis of OER policy in an historical context, a pre-COVID-19 and a present-day COVID-19 world are contrasted. COVID-19 is identified as a disruptive, watershed moment characterised by emergency crisis conditions of unprecedented global magnitude. Some have likened it to a black swan, a concept derived from Taleb (2007), predicting that it has already catalysed permanent change in global systems and their linkages to education systems. Consistent with this view, COVID-19 has challenged neoliberal individualism by fostering a culture of care, compassion and social solidarity, and is being studied as a grand experiment in emergency remote learning and working (Winston, 2020). Others see it as a portal between an old world and a new one (Roy, 2020), where seeds of socially just alternatives can be sown.

The COVID pandemic shifted education systems in all affected countries into disaster management and emergency responsiveness gear. An emergency situation that affects education is a reference to all situations in which natural or human-made disasters destroy the usual conditions of life, care and education facilities, and disrupt, deny, hinder progress or delay the right to education (Right to Education, 2015). This chapter borrows the concept of emergency responsiveness developed by the humanitarian community, which relates to the ability to respond swiftly to external disruptions, undertake dynamic operations and adhere to foundational standards premised on respect, protection, equity and fundamental rights. Such standards also prioritise continuity and recovery of quality education, including free and inclusive access to schooling for all; safety, security and belonging; relationship building; and communication and transparency in decision making (Inter-Agency Network for Education in Emergencies, 2010).

While adopting the UNESCO (2019) definition of OER, this chapter also views OER as building blocks in the social construction of learning and of open and

flexible education practices. Thus, it associates OER with reuse, redistribution, revision, remixing and retention, referred to as the 5Rs (Huang et al., 2020; Wiley, 2014). It also adopts the concept of OEP, referring to the diversification of appropriate pedagogical practices through the active participation of learners and teachers as well as the use and creation of OER. As Wiley and Hilton (2018) state, OEP can also be referred to as OER-enabled education practices.

The conceptual complexities of openness are also considered; these are highlighted in the literature on the relationship between OER and OEP, as analysed by Arinto et al. (2017), Lambert (2018) and Ehlers and Conole (2010). They show how OER and OEP are integral to a culture of sharing and underpinned by sustainable development, equity, inclusion and social justice imperatives. The additional attention to OEP, however, shifts the engagements on OER from a focus on resources and content to one centred on social practice (Huang et al., 2020). Adding to these analyses, this chapter notes the COVID-19-inspired emergence of the practice of openness and flexibility in education in which OER and OEP are embedded, linked to the use of open technologies, open assessment practices and open pedagogies (Huang et al., 2020), which are underpinned by an egalitarian, emancipatory social justice intent in terms of their potential for expanding access, quality, inclusion and equity in education.

The idea of policy-as-practice is adopted under the influence of Ball's (1990, 1998, 2015) conceptualisation of policy as text and deeds in a given context, as the outcome of contestations between different role players and networks and the interaction between local and global influences. Policy text is a discourse, defined in terms of the social practices that inform the way that policy text is shaped and formed. Thus, policy documents as texts were examined with a critical lens for their content and beyond, by making connections to cultural norms and rituals that govern discursive formations, as explained by Hajer (1995).

Policy as deeds incorporates policy as a social practice, combining the influence of social, cultural and political processes. Levinson, Sutton and Winstead (2009) emphasise how policy involves intricate social practices and normative cultural production based on collaborative and contested relations among a range of actors across diverse social and institutional contexts. This approach suggests that policy is therefore not just that which is formally documented, and it is not divorced from practice. Hence, contrary to popular references in the development community that artificially separate the formulation of policy from its implementation and evaluation, this chapter emphasises how integral practice is to policy.

Moreover, in support of Vandeyar (2013), policy may also be developed spontaneously and informally, unofficially, "on the ground" through practice by schools, teachers and students, who may enact their own policy to determine appropriate procedures and conduct, which may either be codified or remain undocumented. In this respect, Vandeyar highlights the notion of policy as agency, which is a necessary condition for the implementation and ownership of policy.

Thus, an analytical framework (Figure 3.1) is proposed, in which OER and OEP policy are viewed at the macro level, "from above," differentiated from yet linked to that which emanates at the micro level, "from below." These two levels interact osmotically. Policy and practice from above usually operate at global and national levels and are influenced by or seek to influence policy at institutional and "on-the-ground" levels. This analytical framework also differentiates between pre-COVID-19 and present-day COVID-19 emergency contexts, where the latter represents a growth opportunity for OER and OEP at both levels.

	Pre-COVID-19 Emergency Context	Present-day COVID-19 Emergency Context
OER & OEP Policy-as-Practice from Above	• Macro level • Formally endorsed and adopted • Structured • Produced by national and supra-national governments, networks and partners	• Macro level • Non-formally adopted • Unstructured • Produced by national and supra-national governments, networks and partners
OER Policy-as-Practice from Below	• Micro and meso level • Formal and non-formal • Structured and unstructured • Produced by institutions, community organisations, families, and individual learners and teachers	• Micro and meso level • Formal and non-formal • Structured and unstructured • Produced by institutions, community organisations, and individual learners and teachers

Figure 3.1. A policy-as-practice analysis framework.

Methodology

Discourse analysis (Fairclough, 2003) is applied to review a purposeful selection of pre-COVID-19 and present-day COVID-19 OER policy instruments. These include five pre-COVID-19 international frameworks and declarations on OER within the broader framing of the SDGs. Three were pre-COVID-19 national policies on OER in Commonwealth states, one was an institutional OER policy, and one was a community-based organisation (CBO) approach to OER. The latter is also based on informal discussion with the CBO's representatives. Present-day COVID-19 responses include eight global education guidelines, one Commonwealth state's education response and one CBO's response (Table 3.1).

Table 3.1. List of policy instruments analysed.

	Pre-COVID-19 Emergency Context	Present-day COVID-19 Emergency Context
OER Policy-as-Practice from Above (Global)	• Qingdao Declaration (QD) • Paris Declaration on OER (PDOER) • Cape Town Declaration on OER (CTOER) • Ljubljana OER Action Plan (LOERAP) • UNESCO General Council Recommendation on OER (UGCROER)	• UNESCO COVID-19 Educational Disruption and Response (UEDR) • COL Keeping the Doors of Learning Open • Distance Learning Solutions (COLODLS) • Guidance for COVID-19 Prevention and Control in Schools (IASR) • UNESCO-IITE Guidance on OEP during School Closures (UOEP) • COL Guidelines on Distance Learning during COVID (COLDL) • UNESCO COVID-19 Education Response: Education Sector Issue Notes • Guidance on Open Educational Practices during School Closures: Utilising OER under COVID-19 Pandemic in Line with UNESCO OER Recommendation (UOEP)
OER Policy-as-Practice from Above (National)	• Rwanda National Framework on MOOCs and OER (RNFMOER) • ICT in Education Policy for Antigua and Barbuda (ICT4EAB) • ICT in Education and Training Policy – 2014–2019, Seychelles (SNPOER)	• Rwanda COVID-19 Response (SACR)
OER Policy-as-Practice from Below	• University of the South Pacific • OLICO Maths Education, South Africa	• OLICO Maths Education, South Africa

Sections of texts were sliced, and coded themes were derived from a collection of codes. Reports and updates on progress with OER policy and OEP were also analysed and compared with analyses from the extant literature.

Analysis and Findings

OER Policy-as-Practice from Above at the Global Level

At the global level, the research findings suggest that within a pre-COVID-19 context, a shared discourse prevailed across various policy support instruments on OER. References to OEP were less explicit initially. Pre-COVID-19 policy support instruments assumed the form of formal conference resolutions, declarations or recommendations, endorsed by wide-ranging government agencies and their partners. They are generally aspirational value propositions and recommended actions. They provide legitimacy and a basis for advocacy on:

- rights-based principles as reflected in the Qingdao Declaration (QD), the Paris OER Declaration (POERD) and the Ljubljana OER Action Plan (LOERAP);

- the transformative potential of OER towards enabling the realisation of access, equity and inclusion in education across a spectrum of contexts (LOERAP, POERD and QD);

- OER's potential to create opportunities for the provision of high-quality education and enhance the academic freedom and professional autonomy of teachers by widening the scope of materials available for teaching and learning (LOERAP and UNESCO General Council Recommendation);

- the realisation of cost efficiency and sustainability when OER are made available at scale (LOERAP, PDOER);

- OER being integral to policies on ICT infrastructure expansion as well as broader education policies across the lifelong learning spectrum (LOERAP);

- the potential of OER to provide opportunities to democratise knowledge (LOERAP) and to strengthen international cooperation on OER in support of the SDGs (UGCROER); and

- emerging attention on OEP based on the integration of OER, focused on innovative pedagogical options to engage both educators and learners (UGCROER and UOEP).

The intent of global policy support instruments is premised on supporting national governments, education institutions and communities to policy borrow (Steiner-Khamsi & Waldow, 2012) where relevant for local conditions. For example, the Ljubljana OER Action Plan makes explicit recommendations for actions that member states and institutions can take to promote the access, quality and equity dimensions of SDG4. The adoption of the UNESCO GC Recommendations marks a significant milestone in legitimising OER and OEP among governments across the world. The establishment of an OER Dynamic Coalition of global partners to promote critical actions to implement the recommendation (UNESCO, 2019) represents another essential landmark towards global OER adoption.

These macro-level frameworks from above and their global influence also conceptualise OER as a movement with human rights and social equity underpinnings (Gaskell, 2018). The global OER frameworks raise questions about the interrelationship between global and local conditions and the importance of relevance to local contexts, as emphasised by Miao et al. (2016). They are also positioned as being politically neutral in that the power relations and contestations embodied in the design, creation, distribution and consumption of OER and OEP are not made explicit. While equity and equality are alluded to throughout, and references to active learner and teacher participation through innovative pedagogical and assessment practices are evident, little or no explicit references or actions relate to social justice intentions that would accentuate power and politics. The QD and LOERAP are among the few that make a cursory reference to social justice. These observations are echoed by Buck and Valentino (2018) and Lambert (2018), who reflect on the continuing need to have social justice-oriented frameworks for achieving transformative practices with OER.

Politically neutral macro-level framings from above appear to transfer into global, COVID-19 education emergency response guidelines. An avalanche of free, online education resources has increasingly become available, arguably swelling the global OER arsenal. They include, amongst others, UNESCO's list of educational applications, platforms and resources aimed at the world's school communities, some of which are OER (UNESCO, 2020a). Similarly, COL made an expanded list of resources available that can support formal, non-formal and informal learning across the education spectrum (COL, 2020). The IASC (2020) also produced guidelines within a rights-and-equity-based framing, which emphasise protecting children and educational facilities, combatting the stigmatisation of those infected, and encouraging respectful, inclusive and supportive environments for all. The three global guidelines also assumed the form of hurried aggregations of online tools and resources in an urgent attempt to support the growing global emergency conditions. A host of forums have opened up to engage and train teachers on the merits of online platforms (The Economist, 2020), including the creation and use of OER. Social media chat forums continue to guide, curate and share knowledge among education planners, such as the forum organised by UNESCO (2020b). The global shift to home-based learning via virtual platforms has also exposed inequality related to inadequate learning conditions in the home for many, the lack of digital access, the absence of spaces to learn, the lack of meals usually obtained at school, and unfamiliarity with online learning. Moreover, the shift to remote learning has also raised the need to engage with more open and flexible frameworks of schooling and learning, presenting fertile conditions for conversations on OEP, as proposed by Huang et al. (2020).

OER Policy-as-Practice from Above at the National Level

The pre-COVID-19 global OER discourse is also reflected in each of the three cases of national OER policy as forms of policy from above. Here, cost efficiency, access to quality learning materials, institutional capacity building, and links to massive open online courses (MOOCs) and open and distance eLearning (ODeL) are dominant themes. The Seychelles Ministry of Education policy articulates OER as a means to "improve access to quality materials for learners and educators" and increase cost efficiency through reducing the cost associated with providing learners with study materials. The policy commits to ongoing advocacy and training in OER and open courseware amongst education stakeholders.

Similarly, Rwanda's dedicated OER policy framework identifies skills and capacity that institutions need in order to produce and use OER, and it provides an outline of advocacy campaigns in support of OER and MOOCs. It also includes an ODeL, MOOC and OER Courseware Development Phase in its OER framework. The ICT in Education Policy for Antigua and Barbuda goes further in its explicit commitment to Creative Commons licensing of all government-funded education material. It commits to providing proprietary copyright licensing only based on a submitted justification. As in Rwanda, OER adoption in Antigua and Barbuda was accompanied by investments in digital infrastructure in schools. While these investments translated into limited use of OER (by the 20% of teachers who were surveyed in 2015), they also reflected interest to learn further.

Moreover, policy commitment translated into a repository of Math OER and an Open Textbook Project that involved training teachers in creating OER (Peters-Richardson, 2016). Although the initial progress has been limited, these approaches reflect how policy is enacted and practised. Whether they extend into the realm of OEP, and whether they are successful in enabling equity and inclusion and the promotion of agency, will require further exploration.

These OER policies dovetail with the inclusion of OER adoption in countries' responses to the COVID-19 crisis, which encompasses the use of digital open content and non-digital formats such as educational workbooks and radio scripts. In Rwanda, in the face of school closures and the urgent demand for online learning access, attempts to promote equity in digital access assumed the form of zero-rating bandwidth access in homes, guides to support learners, parents and teachers, and educational broadcasting via radio and television. The use of educational radio was also rekindled in that country by adapting more than 100 literacy and numeracy radio scripts from around the world, aligned to the national curriculum (Kuwonu, 2020). Thus, at the country level, the COVID-19 environment placed more emphasis in policy and practice on OER as resources with the potential for translation into practice as OEP.

OER Policy-as-Practice from Below

At a micro level, education institutions in the Commonwealth states have adopted and implemented OER policies that link to policies on ICT in education or on ODeL. Hoosen and Butcher (2012) showed how OER policies at national or institutional levels have often been a response to the growth in OER activities, particularly in higher education institutions. Sometimes, however, policies were developed to support and guide existing and anticipated OER activities, projects and programmes, as reflected in the review of the OER policy of the University of the South Pacific (USP). In these cases, OER policy is conceived as being in relation to OEP but also as distinct. Cox and Trotter (2016, 2017) provide an institutional analytical framework and review the policies of three South African universities, distinguishing between "motivating" factors that incentivise OER activity in the institution, and hygienic factors that are necessary but not sufficient for promoting OER activity in an institution. It appears that the USP institutional policy emanates from motivating factors, given its supportive role in guiding OER activity at the institution. However, COVID-19 exacerbates systemic and symbolic inequalities at universities, causing some such as Czerniewicz (2020) to urge integration of the politics of online and blending learning under emergency conditions, as their absence will result in many students continuing to be denied access to remote learning and hence access to OER as well.

An example of the organised and spontaneous use of OER by learners and teachers "from below" is the OLICO Maths Education initiative that supports resource-challenged children and youths in South Africa by improving their mathematical understanding and learning outcomes. It has aggregated curriculum-aligned OER and demonstrates evidence of improved performance in mathematics based on the family- and community-oriented model of learning and of using OER. In this way, OER links with OEP and a commitment to promote equity and social justice by enabling the agency of teachers, students, parents, siblings and grandparents in their use of OER to improve

maths learning. The COVID-19 moment has enabled OLICO to advocate successfully for the zero-rating of their OER maths portal among mobile network service providers (OLICO Foundation NPC, 2020).

Pre-COVID-19 OER policy-as-practice configurations focused on how national governments, ministries of education and education institutions, as the units of change, could enable access to OER by teachers, learners and administrators. The home as a fluid, social learning space and unit of change, amidst the shifting learning mobilities of students and teachers, as analysed by Leander et al. (2010), has not been explicitly considered until now. The COVID-19 pandemic has illuminated the notion of "home as pedagogic space" and shows the home as a microcosm of systemic and structural inequalities across the world.

Conclusion and Recommendations

This chapter has attempted to answer the following questions: How have OER and OEP policies, in their various forms, been conceptualised historically to meet the education access, quality, equity and inclusion imperatives of SDG4? How are OER and OEP positioned in global and local education responses to COVID-19 emergency conditions? What are the implications for the present-day and future imaginings of OER and OEP in a COVID-19 world and beyond?

In its discourse analysis of 19 global, national and local policies and practices, it distinguished between pre-COVID-19 and evolving conditions under COVID, and between OER policy-as-practice from above and from below.

The findings and analysis suggest that successive permutations of global, national, and institutional OER policies have focused on issues of access, quality and equity, and that while these include social justice intentions, the latter are less explicit. It found that in all the policies examined, there were links to their aspirational intent and attempts to integrate the policies as practice — and in some cases, also as agency. The latter was more evident in the OER approaches from below. It also found interconnections between global, national and local policy and practices before and during COVID-19. Moreover, it found that there is growing opportunity for OER during COVID-19, and a burgeoning interest in OEP, particularly in the quest for a new imagining of learning, teaching and education delivery under increasingly unequal conditions. Here, the relationship between OEP and emerging ideas on open pedagogies, open assessments and open collaboration will likely be integral to anticipated attempts at re-engineering education.

By implication, a research agenda is recommended that carefully monitors OER and OEP policies as social practices during and beyond a COVID-19 world, focused mainly on ways in which growing education inequality and exclusion can be disrupted.

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Technology-Enabled Learning Strategy and Implementation: Case Studies

Designing Blended Learning Courses to Improve Student Learning

Indira Koneru

Introduction

In order to address the shortage of qualified and quality teachers in engineering colleges, the committee report by the All India Council for Technical Education (2019), *Engineering Education in India – Short & Medium Term Perspective*, recommended technology interventions, innovations in pedagogy (such as blending massive open online courses with core and optional curricula) and providing an individual learning path for each student. Though Indian engineering colleges have been using videos from the courses under the National Programme on Technology Enhanced Learning (NPTEL) for teaching, clear implementation guidelines are not provided to adopt a curriculum-integrated approach, nor have there been any studies that evaluate the impact of blended learning (BL) to suggest evidence-based BL practices that can improve learning outcomes in engineering education in India (Cutrell et al., 2015). To overcome the aforementioned challenges, Rajiv Gandhi University of Knowledge Technologies (RGUKT) partnered with the Commonwealth of Learning (COL) to strengthen its vison and mission and to deliver quality education through technology-enabled learning (TEL).

The Government of the Andhra Pradesh province in India established RGUKT in 2008 to provide engineering education opportunities for deprived rural youths through a six-year integrated engineering programme: a two-year pre-university course and a four-year Bachelor of Technology. The university's ICT-based pedagogy provided students with access to NPTEL video lectures, open educational resources (OER) and other e-content through local content servers, but not through a learning management system (LMS), for anytime, anywhere access. Though the teachers use word processors, spreadsheets, presentations, email, search engines and databases, they lack blended course design, advanced digital content creation skills and LMS skills (Venkaiah, 2017). In order to strengthen the existing ICT-based pedagogy and improve the quality of student–content, student–student and student–teacher interactions as well as students' learning outcomes, RGUKT partnered with the Commonwealth of Learning (COL).

COL's (n.d.) TEL initiative, based on the policy–technology–capacity approach, aims to have a transformative effect on teaching and learning by supporting policy formulation and innovation in the application of ICT in education, and the development of ICT skills. Partnering with COL enabled RGUKT to: (i) conduct a baseline study on TEL; (ii) develop a TEL policy in consultation with stakeholders; (iii) build technological and pedagogical capacity among teachers to design, develop and deliver BL courses through Moodle; and (iv) undertake an impact study. The study *Impact of Technology-Enabled Learning Implementation at Rajiv Gandhi University of Knowledge Technologies* (Koneru, 2019) evaluated the impact of BL on engineering students' learning experiences and learning achievement, and analysed the experiences of teachers in the design, development and delivery of blended courses. This chapter, an offshoot of the impact study, presents teachers' perceptions of their blended course design, development and delivery practices and the corresponding impact on students' perceptions, learning engagement and learning achievement.

Theoretical Framework

Blended learning (BL), a combination of face-to-face (F2F) instruction and online learning, leverages the strengths of both the classroom and online modalities to provide students with control over time, place, path and/or pace, enabling a personalised learning experience (Christensen, Horn and Staker, 2013; Graham, 2006; iNACOL, 2016). As a techno-pedagogical innovation, BL enables teachers to design an enriched learning experience through the organic integration of thoughtfully selected F2F and online approaches and create an enabling digital learning environment (Chafiq et al., 2019; Vaughan et al., 2013). Common solutions for creating enabling BL environments include LMSs, media-rich traditional and interactive content, asynchronous and synchronous tools, analytics technologies, and personalised or adaptive courseware. Like any other LMS, Moodle serves as the course hub for: course management and administration; communication and discussion; creation and integration of a wide range of resources, such as graphics, video and audio clips (e.g., MP3 files), PowerPoint slides, Flash-based applications and Java applets; and the assessment of subject mastery (Godwin-Jones, 2003; Lang & Pirani, 2014).

Teachers transitioning to a blended modality must do much of the design work up front in order to: (i) find the right blend of online and F2F instruction; (ii) ensure that the F2F and online activities mutually support one another; and (iii) make informed techno-pedagogical decisions when redesigning their blended course (Buus & Georgsen, 2018; Christensen, 2003; Linder, 2017). The choice of media, learning objectives, learning processes, learning content, greater access to knowledge, greater engagement and participation, learner interaction and connectedness, F2F support, and improved autonomy are significant factors in enhancing learner satisfaction and learning experiences (Kintu et al., 2017; Larsen, 2012; Lim & Morris, 2009; Renner et al., 2014).

Students appreciate a BL environment that provides greater access to knowledge, greater engagement in interactions with peers and teachers, greater convenience and flexibility, and a higher level of autonomy so they can regulate their own study of course materials and set the pace of their participation in online discussions as well as synchronous and asynchronous communication (Larsen, 2012; Owston et al., 2013). A blended course design centred upon good teaching

and learning principles and deeper approaches leads to enhanced learning experiences and transformative teaching practices (Hannon & Macken, 2014; Powell et al., n.d.). Supporting teachers to take maximum advantage of digital delivery so they can widen their pedagogical repertoire to include collaboration and student-centred learning design will advance BL (Bailey et al., 2018; EDUCAUSE, 2019).

Capacity Building

Teachers need a comprehensive set of competencies to integrate ICT into their teaching in order to design innovative and flexible learning environments and facilitate students' achievement of curricular objectives (UNESCO, 2018). Creating a BL environment necessitates: providing access to technology; ensuring adequate and timely support; and building technological and pedagogical capacity amongst staff (Cook & Giardina, 2011). COL's two capacity-building workshops on Moodle functionality, OER, screen-casting videos, blended course design, online facilitation, blended course development and other topics enabled the participating RGUKT teachers to:

- integrate a constructivist model of Moodle with course design (Timothy & Zimmerman, 2015);

- gain an understanding of the components of COL's blended course design template;

- redesign their courses using the backward course design and/or "understanding by design" approach proposed by Wiggins and McTighe (2002);

- write course and unit learning outcomes using Bloom's Taxonomy;

- structure an online course week-wise or unit-wise;

- self-record a course introductory video and Face/Flip (Ruffini, n.d.) videos using Screencast-O-Matic; publish on YouTube; and embed in the Moodle course in order to orient students towards the blended environment, provide online learning support and have pedagogical effectiveness with respect to their learning (Garner, 2008; Pang, 2009);

- create assessments, such as file submissions, and video-based assignments, such as ANSYS/Autodesk Inventor, professional software-based assignments and self-assessment quizzes to create a test-series environment;

- engage students in interaction through activities such as forums, chats and choices;

- promote learner–content interaction by creating interactive videos using the H5P plugin to increase learner engagement and enhance learner control over the content and process (Zhang, 2005);

- cover and share more materials (Karabulut-Ilgu et al., 2018);

- share and/or create learning resources in a variety of media, including Khan Academy videos, animated videos, video tutorials (on ANSYS 2D Modelling, ANSYS 3D Modelling, ANSYS Meshing) and OER, such as NPTEL and PhET Interactive Simulations;

- track students' learning progress and course participation;
- grade students' performance and provide feedback;
- communicate with and send bulk and individual messages and alerts to students through Moodle courses and the Moodle mobile app;
- transform the course design from "transmissive teaching" (i.e., transmission of knowledge), a teaching-centred approach, to "facilitative teaching," a learning-centred approach (Kember & Kwan, 2000).

During the first capacity-building workshop, the RGUKT faculty members explored Moodle functionality and modules and gained an understanding of the technological and pedagogical dimensions of COL's blended course design.

Blended Course Design

A BL environment necessitates that teachers assume the role of an instructional and/or learning designer. Designing a blended course impacts teaching–learning in multiple ways, requiring that teachers: (i) pay additional attention to alignment in the design stage to ensure that the F2F and online activities mutually support one another; (ii) shift from enabling blends through transforming blends; and (iii) develop pedagogically sound blended courses with interactive media, diverse learning activities and assessment tasks to engage students in active, collaborative, constructive, interactive and reflective learning (Linder, 2017; McGee & Reis, 2012).

COL's Blended Learning Course Design Template (see Annex 1), grounded on the "backward design" or "understanding by design" approach (Wiggins & McTighe, 2002), provided the RGUKT faculty with a framework for designing 20 blended courses. Redesigning the courses using the template enabled the RGUKT faculty to:

- define course objectives and unit learning outcomes;
- constructively align assessments (either Moodle-enabled or offline), activities and resources, including OER, with the outcomes;
- shift focus from content towards assessment;
- incorporate flexibility; and
- facilitate interaction.

The RGUKT faculty submitted their course design and had it reviewed by the COL facilitator for feedback, which helped them with improving the quality of their online course. Engaging teachers in thoughtfully (re)designing F2F and technology-mediated courses so as to accomplish student engagement in deep and meaningful learning through techno-pedagogically facilitated assessments and activities usually yields excellent outcomes (Cleveland-Innes & Wilton, 2018; McGee & Reis, 2012).

Research Questions

The following research questions helped in analysing teachers' blended course design, development and delivery practices, and their impact on students' perceptions and learning achievement.

- How do teachers describe the effect of the blended learning environment on their course design and instructional practices?

- How does teachers' practice affect students' perceptions of blended learning courses?

- How is the learning achievement in blended learning courses different from in other courses in the university?

- How do students' course dedication time and online course content views relate to their achievement?

Research Method

The study adopted a mixed-methods design, as it necessitated collecting, analysing and interpreting both quantitative and qualitative data at various stages. The use of mixed methods — i.e., the combination of quantitative and qualitative approaches — provided a better understanding of research problems than only one approach would have yielded (Creswell & Plano Clark, 2007).

Sample

The sample included 21 teachers and 1,632 BL students from 18 BL courses developed in the areas of Chemistry, Chemical Engineering, Computer Science, Civil Engineering, Electronics and Communications Engineering, Humanities, and Mechanical Engineering. The student sample was not randomised, as the research was limited to the 18 BL courses. Therefore, there may be a self-selection bias in the results.

Data Collection

Qualitative data from the teachers were collected through semi-structured interviews and self-reflection journals on their blended course design, development and delivery. Quantitative data were collected through a survey of students' perceptions of and satisfaction about their BL experiences, and the use of LMS data. Faculty interviews were scheduled using the Moodle Scheduler plug-in's[1] group scheduling feature, which allowed the researcher to add appointment slots. To book a slot, uploading the self-reflection journal was mandatory for the faculty; this was done by enabling the "File upload required" feature of the Scheduler plugin. Faculty booked their preferred time slot for sharing their blended teaching experience. As per the preferred dates and time slots, the RGUKT Nuzvid faculty interviews were conducted in person, whereas the RGUKT RK Valley interviews were conducted through the Zoom[2] video conference application.

To analyse the differences in students' academic achievement, the students' scores in the 18 January–April 2018 semester blended courses were compared with the scores of students in the January–April semesters of 2016 and 2017 taught by the same faculty. The intention was to compare the blended courses with the traditional courses offered by the same teacher who had followed the

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1 Moodle Scheduler plug-in: https://moodle.org/plugins/mod_scheduler
2 Zoom: https://zoom.us

same curriculum, assuming that the students in different batches had similar characteristics.

Data Analysis

Dedoose[3] (Version 8.0.42), a cross-platform computer-aided qualitative data analysis application, was used for analysing the qualitative data obtained from faculty interview transcripts and self-reflection journals. Quantitative data obtained from students' online survey responses and from students' end-of-semester results were analysed through descriptive and inferential statistics. The two-sample *t* test assuming unequal variances was used to determine whether significant difference existed between the end-of-semester marks attained by the BL and non-BL students.

Findings and Discussion

Respondents' Profile

Among the 21 BL teachers, 15 (71%) were from RGUKT Nuzvid, while six (29%) were from RK Valley campus, which included 11 (52%) male and ten (48%) female teachers. Out of 1,632 BL students, 730 (44.73%) were male, whereas 902 (55.27%) were female. A total of 909 (55.7%) students were from Bachelor of Technology programme, and 723 (44.3%) were from the Pre-University Course.

Effect of Blended Learning on Instructional Practices

The research question "How do teachers describe the effect of the blended learning environment on their course design and instructional practices?" sought teachers' experiences with blended course design, OER-enabled teaching–learning, and blended instructional practices.

Planning and designing a blended course

The majority of the faculty perceived that training on the "backward design" approach (Wiggins & McTighe, 2002) and Moodle had enabled them to (i) identify desired results by defining course goals and unit-wise/week-wise learning outcomes using Bloom's Taxonomy; (ii) determine acceptable evidence by designing assessments and the ways to conduct assessments — either Moodle enabled or offline; and (iii) plan learning experiences and instruction by designing learning activities and sharing and sequencing learning resources that equip students with the required knowledge and skills to improve their performance and achieve the desired results. They also maintained that designing their blended courses helped them with online course development and integrating assessments, activities and resources as planned. The following illustrative quotations extracted from the interview transcripts support the study findings.

> "Even though it took quite a lot of time to prepare the blended course design, it paved a path to me as a facilitator to ensure that the course has met all its necessary elements of concepts including recent advancements."

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3   Dedoose: http://www.dedoose.com

"Helped in planning entire course, topic-wise with resources and activities — assignments, forums, quizzes."

"Helpful for prior planning. . . . Inevitable to thoughtfully integrate offline and online activities."

"It is easier to develop the course page with blended course design document, as the design document contains all the OER links and learning objectives etc."

Blended course peer review

Guidelines and standards for the evaluation of online and blended courses help alert instructors to critical factors to consider when designing the online portion of blended courses (Owston & York, 2018). During the workshop on "Technology-Enabled Learning Implementation Review," held in March 2018, faculty were asked to use COL's Blended Course Learnability Evaluation Checklist (COL, 2018) for peer reviewing and self-reviewing the quality of their blended online courses.

The majority of the BL teachers realised that peer reviewing of blended course designs helped them to improve the quality of their online courses. They perceived that the peer-review activity was useful not only to identify the strengths and gaps in their own courses but also to identify and adopt their peers' innovative online teaching practices, such as audio-based resources, video-based assignments, interacting with students through Moodle's chat module, etc. The illustrative quotations given below support the key findings.

"Knowing others' course development using different Moodle modules and features helped in self-reviewing course development."

"Peer review helps in 1. self-analysis, 2. sharing knowledge and innovative practices, 3. inculcate innovate thoughts of peers (e.g., video-based assignment, Telugu faculty using chat)."

OER adoption

COL promotes OER adoption and adaptation to improve access to quality learning resources. During the capacity-building and course-development workshops, the COL facilitator trained the RGUKT TEL faculty on: understanding OER and Creative Commons licences; searching for and identifying OER unit-wise/week-wise; reusing OER with proper attribution in the TASL (title, author, source, licence) format; and integrating OER in their course design and online courses.

The majority of the teachers acknowledged that engaging in identifying course-relevant OER and adopting OER through a systematic course redesign process widened their domain and interdisciplinary knowledge, enabled them to provide multimedia learning experiences for students, and helped them engage students in searching for course-relevant and interdisciplinary OER. The following illustrative quotations extracted from the interview transcripts support the findings.

"OER enabled us to expand the scope. We're always restricted by the syllabus. With OER, students can improve their knowledge."

"Gained additional knowledge from the OER."

"OER improved domain knowledge."

> "Students showed interest in exploring course-relevant OER and in other subjects (ISRO rocket science)."

> "The concept of open education has enabled me to reach out the students [who have] difficulty in understanding the concepts and make them to explore the recent advancements in their interested area."

> "I collected resources for all the topics from open sources like NPTEL courses."

Though the faculty realised the potential of OER, 30–40% of them stated that they could not find course-relevant OER in their native language and relating to local contexts and standards; they therefore adopted OER to a lesser degree and expressed interest in releasing their own content as OER.

Blended instructional practices

Switching from the traditional approach of teaching to a blended approach enabled the RGUKT faculty to increase student motivation by engaging them in new forms of learning activities that will shape them into innovative and professional engineers (Lee & Sidhu, 2015; Natarajan, 2008). The blended instructional practices that improved teaching and learning efficacy included: flexible teaching, sharing multimedia-enriched resources, adopting innovative assessment strategies, communicating and interacting with students, improving domain knowledge, saving time, improving digital literacy, and others. Illustrative quotations provided below support the study findings.

- Flexible teaching:

  > "Moodle enabled me to even make my time to focus on my career advancement like doing my PhD."

  > "This semester I attended two conferences. At that time, I gave online assignment to our students."

  > "Met with an accident and couldn't open mouth, then felt the need of some online platform and tools to share teaching–learning content."

  > "Moodle-enabled blended learning enabled me to assign activities and assignments to students when I was on sick leave."

- Sharing multimedia-enriched resources enabled students to learn and review content out of class at their own pace and understand the concepts effectively (Cha & Koo, 2011; Tsai et al., 2015):

  > "Enriched students' learning with multimedia content."

  > "The animation videos can be shared and this enables students to understand concepts beyond the conventional teaching classes."

  > "It was very easy for me to give them tutorials about the software tool, such as ANSYS 2D Modelling tutorial, ANSYS 3D Modelling tutorial, ANSYS Meshing tutorial."

  > "Helped in sharing videos on complex molecule structures."

  > "I even provided audio of the poem, so that my students will get the correct pronunciation, accent and intonation while reading the poem."

  > "Created videos on Star Poems."

"Shared web resources, provide link to external game-based activity."

"Embedding videos on blended-learning course page made easy to the students to understand the concepts effectively."

- Adopting innovative assessment strategies, such as video-based / software tutorial-based assignments enhanced students' learning experience:

"Hands-on video-based / software tutorial-based assignments enhanced students' learning experience."

"Used quizzes for self-assessment."

"Quizzes were replacement to earlier weekly test."

"By giving quizzes, I could create competitive exams environment and spirit in them since nowadays most of the competitive exams are online based."

"I provided solutions for quiz questions, once they finish the test they can crosscheck their results through not only with answer but also with explanation; more or less I created a test-series environment."

- Improving communication with students:

"The process of blended learning has taught me the effective ways of communicating with students through Moodle platform and its features."

"In order to give any information, though there is no classroom teaching, the 'announcements forum' helped me a lot."

"Used Moodle messaging functionality for sending alerts."

"Helped in overcoming conventional teaching challenges — engaging students in discussions, receiving through emails."

- Improving interactions with students:

"Activities are the new things that happened in this course. These allow more effective interactions between the students and teacher."

"These technology-supported teaching techniques render better interaction with students."

"Pre-readings improve interaction and discussion in the class."

"From the learner point of view, with the online preparatory readings, the classroom interaction with the facilitator and peers improves, which eventually leads to the improving of the test scores."

- Improving domain knowledge:

"While searching for relevant open educational resources, I as a teacher could improve my knowledge which was advantageous while I am delivering the content to my students."

- Saving time:

"Handling large size classrooms have been made easy, lot of the time have been saved on developing more standard and more durable teaching materials with the help of already existing OER."

> "It helped me in providing the required content to my students whenever I want without running after the IT staff. Now, I can straightaway provide the link, which is saving my time."

> "During evaluation I used the dialogue box where I can give comments and grades by rectifying their wrong ones in the uploaded PDF document. It made the students to know their results within a few days which help me to save my time in evaluation process."

- Improving digital literacy:

> "Initially, faced challenges in understanding technology and Moodle-enabled teaching. Peers' support helped in improving my digital literacy."

The above quotations indicate that faculty were satisfied with their blended instructional practices.

Student Perceptions of Teacher Course Design and Delivery Practices

The study also asked: "How did the RGUKT teachers' blended course design and instructional practices impact students' perceptions of blended learning and learning achievement?" Student perception and satisfaction tend to be more positive when there is: greater convenience; efficient use of time; flexibility; relevant course content; an effective learner interface; opportunities for reflection; positive interactions and relationships with peers and teachers; collaboration and feedback; and a combination of synchronous and asynchronous communication (Chang & Fisher, 2003; Shee & Wang, 2008; Tobin, 1998; U.S. Department of Education, 2010). The research question "How does teachers' practice affect students' perception of blended learning courses?" adapted some of these criteria to measure students' perceptions of teachers' blended course design and delivery.

A BL approach necessitates that teachers rethink their course design, development and delivery practices to help students understand the course overview, learning objectives, assessment and evaluation, instructional materials, activities, technology, learner interactions, learner support, accessibility and usability. Teachers' attitudes and beliefs, their willingness to try new teaching methods, and their use of a balanced mixture of synchronous and asynchronous communication are all key factors in a successful BL course (Alammary et al., 2015; Owston & York, 2018; Quality Matters, n.d.). The students' mean perception in response to the various questions ranged between 3.84 and 4.06, indicating that students had a highly positive perception of blended course design. Between 60% and 70% of the students perceived their teachers as effective course designers and deliverers. The students' perception results indicate that teachers were good at describing the course and its learning objectives, activities and assignments (mean = 3.92), thereby communicating information (mean = 3.91) and expected performance in activities (mean = 3.89), organising the course (mean = 4.06), making learning resources available in multimedia formats (mean = 3.9), blending F2F with online learning (mean = 3.89), and maintaining the pace of the course (mean = 3.84), thereby enabling students to learn effectively. Designing or selecting the learning activities in alignment with the learning objectives of the

course and integrating the (online) delivery mode improves students' perception about the value of a blended course and the advantages of both F2F and online activities (Gerbic, 2010; Owston et al., 2019).

Achievement in Blended Courses

Similar to other impact studies, this study considered student grades obtained and/or improved as an indicator to establish the effectiveness of BL. The *t* test was used to measure "How is the learning achievement in the blended learning course different from in other courses in the university?" To analyse the differences in students' academic achievement, the scores of the January–April 2018 semester BL students were compared with the scores of non-BL students in the January–April semesters of 2016 and 2017 taught by the same faculty with the same curriculum.

The comparison of mean achievement scores of BL students and non-BL students showed mixed results. The values in Table 4.1 indicate that the differences in grades were statistically significant in nine out of 18 courses (50%): Chemistry (P2S2), Computer Organisation & Architecture, Design of Machine Elements II, Engineering Mathematics 1, Foundation Engineering, Heat Transfer Chemical Engineering, Mass Transfer Operations-II, Natural Language Processing, and Telugu PUC P2S2. There was no significant difference in the other nine courses (50%).

Table 4.1. Blended learning students' and non-blended learning students' grades: mean comparison.

Blended Courses	*t*	*p* value*
Chemistry (P2S2)	3.76	0.00
Computer Organisation & Architecture	1.96	0.00
English (P2S2)	1.97	0.1
Heat Transfer Chemical Engineering	1.98	0.00
Introduction to Artificial Intelligence	1.65	0.4
Natural Language Processing	1.98	0.00
Signals & Systems	1.96	0.09
Telugu (P2S2)	1.97	0.72
Foundation Engineering	1.97	0.05
Telugu (P1S2)	2.00E+00	2E-07
Chemistry (P1S2)	1.97	0.79
Computational Fluid Dynamics	2.06	0.41
Data Mining	1.97	0.94
Design of Machine Elements II	2.00E+00	6E-07
Engineering Mathematics 1	1.96	0.00
Environmental Engineering	1.98	0.99
Heat Transfer Mechanical Engineering	1.97	0.83
Mass Transfer Operations-II	2.18	0.00

* $p = < .05$

Further analysis of the blended course design and delivery of the 18 blended courses helped in understanding the reasons for the negative or zero impact of BL on students' achievement, and in identifying the difference (if any) in the

course design, content sharing, structured activities and course-delivery patterns that optimised student engagement (Dziuban et al., 2005; Garrison & Vaughan, 2008; Owston & York, 2018). The teachers of nine positively impacted blended courses shared or created multimedia-enriched resources and engaged students in active and interactive learning through forum discussions, chat interactions and interactive videos, and by providing solutions to quiz questions and creating competitive exams and/or a test-series environment similar to preparation for GATE (the Graduate Aptitude Test in Engineering). Aravinthan and Aravinthan (2010) examined the effectiveness of Moodle-enabled self-assessment quizzes in two engineering courses and found a strong correlation between students who attempted the quizzes and their final grades.

On the other hand, the teachers of the nine zero or negatively impacted courses failed to provide an appropriate mix of content richness, interaction and cognitive engagement (Zhang, 2005). In these courses, the deficiencies that resulted in negative or zero impact on students' performance included the following: (i) 70–80% of the learning resources were text-based files rather than multimedia, (ii) there were fewer activities, (iii) there was no moderation and no interaction in the forums and (iv) there were no or fewer assignment submissions and quiz attempts. The teachers failed to engage students in video-based learning in support of both practical and conceptual teaching (Carmichael et al., 2018), to motivate students to do the online assignments, and to provide adequate opportunity and support for student engagement through forums. The result was lower proficiency and academic performance (McGee & Reis, 2012; Montgomery et al., 2015; Wichadee, 2018). The results show the need for designing blended courses with appropriate e-facilitation strategies in order to establish a teaching presence online (Garrison et al., 2010) and improve students' online engagement, course dedication time and performance (Owston & York, 2018; Salmon, 2011). Rural students in particular, who are impacted by the digital divide and lack digital literacy, require online facilitation and guidance from teachers as well as IT and digital-literacy support staff to promote a new eLearning environment and improve their engagement in online courses (Amiel, 2006; Andersson, 2008).

Online Engagement versus Achievement

Blended learning has the potential to encourage cognitive engagement and to collect data for measuring engagement and correlating with educational outcomes (Halverson & Graham, 2019). Moodle data were analysed to seek answers to the research question "How is student online engagement related to achievement?" Time on task, interaction with instructor and peers through discussion forums, opportunity for deep analysis, problem solving and reflection, number of self-assessment quizzes completed, and average time spent on content pages are measures of student cognitive engagement (Cocea & Weibelzahl, 2011; Halverson & Graham, 2019; Macfayden & Dawson, 2010).

The data garnered from the course dedication and heatmap blocks were used to correlate students' course dedication time as well as the number of times they had viewed course resources and activities with their learning outcomes. The course dedication block estimates dedication time based on (i) clicks (every time that a user accesses a Moodle course page), (ii) sessions (sets of two or more consecutive clicks) and (iii) session duration (elapsed time between the first and the last click

of the session). The heatmap block overlays a heat map onto a course to highlight activities and resources with more or less activity.

In line with various educational research, the study focused on finding the link between time on task (also called academic engaged time) and learning (Gettinger & Walters, 2012; Halverson & Graham, 2019). The first correlation test determined the relationship between students' course dedication time and their end-of-semester results to ascertain whether the proportion of online time devoted to online activities influenced learning outcomes (Owston, 2018). The correlation coefficient value $r = 0.54$ indicated a moderately positive and moderately strong linear relationship between students' course dedication time and their achievement.

Data for the total number of views collected from the heatmap block helped in determining the relationship between students' views of course resources and activities and their end-of-semester examination grades. The correlation coefficient value $r = 0.48$ indicated a moderate linear relationship between students' views of course activities and resources and their scores. Though the study was limited to student course dedication time and views of resources and activities, further mining of data may help in quantifying cognitive engagement using other dimensions, such as effort and persistence, and time spent viewing videos (Halverson & Graham, 2019).

Conclusion

Though set up in a rural area of the province of Andhra Pradesh, the Nuzvid and RK Valley campuses of RGUKT have a relatively adequate infrastructure for introducing ICT into teaching, learning and evaluation, and for implementing TEL (Venkaiah, 2017). The RGUKT–COL partnership resulted in the development of a TEL policy, techno-pedagogical capacity building among faculty, and the systematic implementation and evaluation of TEL. This partnership enabled RGUKT not only to deliver quality technical education to rural students through TEL but also to showcase evidence of improved learning outcomes.

From the study findings, it is evident that when technology is pedagogically integrated with course design, transformative instructional practices and improved learning outcomes can result. According to the teachers, COL's capacity-building workshops enabled them to better understand Moodle functionality and to plan, design and deliver BL experiences using a backward design approach (Wiggins & McTighe, 2002). RGUKT's BL environment provided the teachers with a flexible teaching environment and enabled them to enrich students' learning experience with a mix of instructor-led teaching and TEL as well as traditional and interactive multimedia. However, some teachers failed to address the challenges associated with fluctuations and inconsistencies in student engagement with online activities (Orton-Johnson, 2009).

The comparison of student learning achievement in blended and non-blended courses showed mixed results, with improvement in nine courses and no improvement in the other nine courses. Student disengagement and lack of performance improvement resulted from several deficiencies: (i) text-based rather than multimedia-enriched learning resources were used; (ii) there were fewer activities to engage students in learning; (iii) there was no moderation or

interaction in the forums; and (iv) there were little or no assignment submissions and quiz attempts. The correlation between student engagement, as indicated by course dedication time and content views, and learning achievement, as indicated by grade, proved to be moderately strongly positive and linear. Though this study is limited to the most elemental indicators of engagement, future research could be conducted to mine cognitive and emotional engagement data and study the relationships between human- and machine-driven intervention strategies that help in designing personalised learning pathways (D'Mello & Graesser, 2012; Halverson, & Graham, 2019). Tracking, collecting and analysing LMS activity data and visualising student behaviours over time enables teachers to conduct further research into measuring engagement within an LMS and to bring an analytics lens to bear upon course design (Beer et al., 2010; Fritz & Whitmer, 2017).

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Annex 1: Blended Course Design Template

Course Title:

Programme:

Institution/Campus:

Course Facilitator:

Course Description:

Learning Objectives:

Course Structure Module-wise/ Week-wise	Learning Outcomes	Assessments – F2F / Moodle-enabled	Learning Activities – F2F / Moodle-enabled	Learning Content – F2F / Moodle-enabled		Facilitating Online
				Self-created / Web resources	Supportive OER with TASL attribution	
Module 1 / Week 1 / Unit 1	LO 1 LO 2 LO 3 LO 4	FA 1 (LO 1) FA 2 (LO 2 & 3) FA 3 (LO 4)				
Module 2 / Week 2 / Unit 2						
Module 3 / Week 3 / Unit 3						
Module 4 / Week 4 / Unit 4						
Module 5 / Week 5 / Unit 5						

Notes:

* Learning outcomes – statements that specify what learners will be able to do as a result of their learning

* Assessments – Formative Assessment (FA), Summative Assessment (SA), Peer Assessment or Self-Assessment and tools (MCQ, essay-type questions, project work, etc.)

* Learning activities – active learning, collaborative learning, constructive learning, social learning

* Learning content – printed textbooks; downloadable PDF / PPT / Word doc; multimedia – lecture videos, animations, images, YouTube / Vimeo / Khan Academy videos, OER, etc.

* Facilitating online

Activities:

1. Create a course introductory video (about this course, learning outcomes, course outline, learning activities and assessments, grading policy, expected participation) and unit introductory videos, if required.

2. Share course handout / session plan / academic plan.

3. Send introductory email to students one week prior to course start date, with pre-course preparatory activities.

4. Share your contact details and times, channels of communication, and turnaround times for grading assignments and responding to students' queries.

5. Provide contact details of technical support staff for troubleshooting login issues.

6. Create FAQ on how to: access and navigate the course site and learning resources; submit learning activities and assessments.

7. Send weekly email communications to students for wrapping up a unit/topic and introducing the next unit/topic.

8. Engage learners in interaction with peers and faculty — synchronous or asynchronous.

9. Provide learning support through discussion forums. Create forums for:
   a. Introductions
   b. Course announcements to establish online course presence
   c. Open forum for posting general queries and seeking learning support (encourage students to provide peer support)
   d. Learning forums for posting learning reflections (encourage students to rate their peers' reflections)

10. Engage learners in self-reflection, knowledge sharing and co-creation, recognising contributions by learners through badges.

11. Track student progress — course participation, activities and assessment task completion — and alert non-participants.

12. Create rubrics for maintaining transparency in grading.

13. Provide timely and constructive feedback / feedforward to improve learning.

14. Seek students' feedback on course and self.

5

Faculty Experiences of Delivering Blended Learning Courses

Jayashree Shinde

Background

The field of "educational technology" is often misunderstood as the use of technology in educational processes. The notion singles out technology and ignores the process of education (learning). The term "blended learning" (BL) is being misinterpreted in the same manner. Merely adding technology in face-to-face settings does not guarantee blended learning. The learning and cognitive processes are ignored when technology is perceived as an end. Blended learning with a conscious focus on integrating technology as a means to achieve meaningful learner engagement helps to enrich learning environments.

Learner-centred pedagogy has always been a focus of the Department of Educational Technology (DET) of SNDT Women's University (SNDTWU) in India, the institutional case for BL that is reported in this chapter, and BL has been implemented in the DET for a long time to make the learning process engaging.

Way back in 1995–96, when the term "flipped learning" was as yet unheard of or unexplored, the then head of DET at SNDTWU coined the term "zero lecture." Thereafter, the department conducted several faculty training programmes on the "zero lecture project." Self-learning materials, competency-based graded exercises, and task sheets for laboratories were introduced to minimise lectures in classes. Digitised materials replaced handouts and library resources, while e-resources, a learning management system (LMS) and ICT tools increased the feasibility and versatility of designing BL environments. Yahoo groups had been used as a learning platform by DET since 2001. The Moodle LMS has been changing the face of BL environments at DET since 2007. Google tools such as Google groups, docs and drawings have been the simplest collaborative tools available. Not only blogging, but even micro-blogging tools and platforms such as Edmodo were explored by master's students (Shinde & Patil, 2010). The integration of

Moodle and other ICT tools such as blogs, Edmodo, Padlet, Google tools, concept-mapping and infographic tools, and social media has led to more effective BL environments.

However, experimentation within a small group cannot change the face of an institution. Though the benefits of BL, flipped learning environments, and the LMS were being experienced by the department, convincing other higher education teachers, training them to integrate ICT, and scaffolding them were necessary. Though a few training workshops could help with sensitising colleagues and a few other higher education teachers, efforts on a larger scale were needed. Encouraging and initiating BL in other institutes of SNDTWU was a challenge.

Blended Learning: Conceptual Framework

Blended learning is a meaningful blend (not just a mixture) of face-to-face and online learning experiences with thoughtful proportioning and sequencing in the most effective way.

Blended learning is both simple and complex. At its simplest, blended learning is the thoughtful integration of classroom face-to-face learning experiences with online learning experiences. There is considerable intuitive appeal to the concept of integrating the strengths of synchronous (face-to-face) and asynchronous (text-based Internet) learning activities. "At the same time, there is considerable complexity in its implementation with the challenge of virtually limitless design possibilities and applicability to so many contexts" (Garrison & Kanuka, 2004, p. 96).

In the blended environment, both teachers and students assume new roles, so teachers can become online tutors and students more autonomous learners (Grgurović, 2011).

Beginning of Blended Learning at the University

The term "blended learning" at SNDTWU is operationally defined as the creation of a learning environment by teachers, in which:

- learners have access to some resources via the Moodle LMS and/or other ICT platforms/tools;
- individual and group learning activities are managed through ICT platforms/tools; and
- classroom time is used more for discussions, group work and addressing queries instead of lecturing.

BL environments, as per the above operational definition, necessarily require the integration of ICT in teaching–learning.

Leadership plays a major role when curriculum and technology-related changes are the goal. Changes are exceedingly slow, especially when users are suspicious about the benefits of technology and unsure of their own skill sets for using technology. Lack of confidence in oneself about acquiring new skills also affects one's acceptance level. Negative mindset and lacunae in a person's technological skill set affect technological interventions. Though leaders of educational organisations themselves may feel convinced of the benefits of BL, a top-down

approach does not help in such a scenario. Compulsions and rules/regulations may help in changing teachers' skill sets to some extent but may not always help in changing practitioners' mindset. SNDTWU has experienced different perspectives, teacher development paths, and approaches towards BL and technology integration from 2011 to the present.

Initiatives undertaken by the institute in collaboration with the Commonwealth of Learning (COL) in 2011 on a smaller scale resulted in a TEL policy in 2016 and a successful large-scale TEL implementation by 2017. The phases of the developments at SNDTWU during these six years are presented in Figure 5.1.
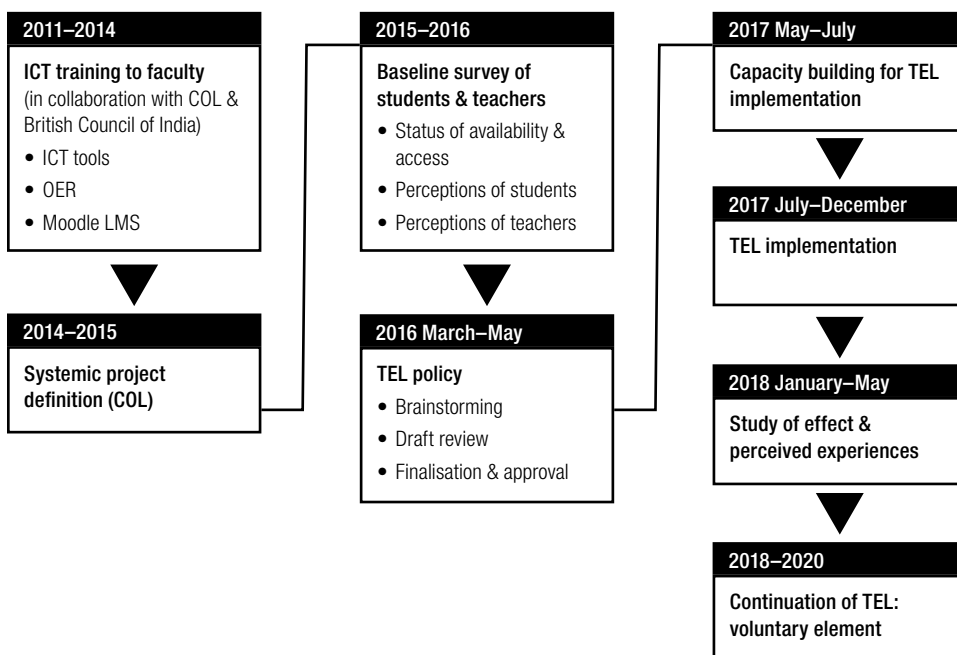
Figure. 5.1. Phases of development in the TEL implementation project.

These major phases are discussed briefly in the following sub-sections:

- Faculty training on ICT integration
- Baseline study at SNDTWU
- SNDTWU's TEL policy
- BL implementation at SNDTWU

Faculty Training on ICT Integration

BL was not possible without teachers who were competent at integrating ICT. Efforts to train faculty at the university started in phases. Training workshops, with calls for voluntary participation, were initiated in 2011–12. COL, in Canada, and the British Council in India came forward to support these efforts financially.

- Six-day workshops on "Integrating ICT in Higher Education," funded by COL, were organised during 2011–13. A total of 184 campus teachers and 71 teachers from affiliated colleges of SNDTWU participated in those workshops.

- A series of three-day workshops under the project Collaboration for Network of Educational Technologists in India, funded by the British Council, were organised during 2014–16. About 80 campus teachers, 30 teachers from the university's affiliated colleges as well as 60 teachers from universities in other states were trained during these years. Apart from these, 75 campus teachers were oriented by the then vice chancellor in planning blended courses, followed by demonstrations of the Moodle LMS. Teachers were expected to submit their course plans, and feedback on every course plan was provided.

This rigorous intervention achieved the following outcomes:

- University teachers started thinking seriously about using ICT tools and platforms.
- Others realised the advantages and role of BL and basic technology skills in their professional life as teachers.
- Some teachers started using computers for the first time.
- Use of email became a regular practice for some.
- Demand for computers for both students and teachers emerged during these workshops.

The university simultaneously initiated the process of establishing infrastructural facilities and achieved several milestones, such as a desktop computer for every teacher from graduate departments, labs for students on all campuses, fibre optics and a leased line for Internet and Wi-Fi, organisational emails, and the provision of on-demand support for creating LMS-based courses, during 2012–16. A few of the teachers joined training initiatives as resource persons. About six teachers responded to the call for developing and announcing online courses and offered short-term courses successfully.

Immediate implementation of BL was still not seen on a large scale. Lack of the necessary infrastructure and more rigorous training were the reasons cited by the teachers. The teachers' mindset was also a major challenge.

Baseline Study

Year 2014–15 proved significant in the process of creating a BL ethos in the university. Demand from campus students was an eye-opener for many teachers. This bottom-up approach was a result of the baseline survey on orientation and perceptions about TEL conducted across all three campuses of the university. The survey was the first joint initiative under the TEL project with COL. All teachers and a representative sample of students across all disciplines from all three campuses were targeted through the survey. The sample was administered using a comprehensive survey tool developed by COL (Kirkwood & Price, 2016). A total of 775 students out of a student population of 7,550 were surveyed. The sample of 775 was selected at a 99% confidence level with a 3.5% margin of error. Out of 280 campus teachers, 225 responded to the survey.

The results revealed some interesting findings. It was found that about 94% of teachers had Internet access at home, and 90% claimed to have Internet access

in the office. More than 90% had a presence on social media platforms. About 66% claimed to be proficient in the use of email and search engines, whereas 31% claimed to have basic skills in these areas. The Moodle LMS was used at the "expert" level by 18%, whereas another 40% claimed to have been trained in Moodle.

Though 70.5% agreed that they had undergone training, 63.6% said that the university provided regular training in the area. The rest expected more rigorous and regular training programmes and continuous support. Over 90% of teachers agreed about the benefits of using TEL for achieving effective learning, learner-centeredness and collaboration among students.

Learners' data proved extremely useful for future planning. Though a large majority of teachers often claimed that the campus students did not possess any technological facilities at home, nearly 88% of students claimed to have access to Internet, and 75% of them used smartphones to access the Internet. Most of the learners expressed the desire for teachers to use TEL environments. About 85% demonstrated a positive attitude toward learning through technology. Many, through their responses to the one open-ended question, claimed that the use of TEL would help them develop ICT skills and make them ready for the global world. The need for TEL thus emerged from both the teachers and the students, particularly from students who wanted to be skilled 21st-century learners.

TEL Policy

There was a dire need to have a policy framework within which TEL could be located. The findings of the survey were therefore shared with a group of about 30 teachers at the university, who discussed the need to prepare a TEL policy for the university. Brainstorming resulted in a draft TEL policy. Simultaneously, a strategic plan for TEL implementation was developed. The policy was formulated and then approved by the Management Council of the university in May 2016 (SNDTWU, 2016). COL's contribution was significant in the process of developing the policy draft.

Another two-day workshop was organised in June 2016, i.e., at the beginning of the new academic year. Discussion regarding TEL implementation in light of the TEL policy was conducted during this workshop. Planning of BL environments was discussed, along with the demonstration of the LMS and a few tools. The process of motivating faculty to use TEL began here.

These efforts towards TEL implementation did not leap forward on their own. There was a pause of one year in the process. Intrinsic motivation factors, such as a positive attitude towards TEL implementation, helped only five teachers to implement TEL immediately. Evidently external motivating factors were needed to support any such technological interventions. The remaining teachers accepted the call to implement TEL after a gap of one year as a response to the TEL project, with COL's support. Those who had already been using BL, ICT or the LMS responded to this call, as it was leading to a systematic (global) recognition of the efforts they had voluntarily begun. Participation in an international-level research project also proved to be a significant extrinsic motivator for many.

Related Studies on Blended Learning

BL in India is still at the exploration stage. The BL approach to teaching a three- or four-credit course implies teaching through face-to-face and online modes with proper weight given to both.

Many studies of BL have been undertaken across the world, looking at numerous aspects of the process, such as teachers' and students' perceptions of BL, achievements gained from BL, and teachers' and students' awareness about ICT integration. This section takes stock of what research says about teachers' experiences of using the BL approach in their teaching.

Experiences and case studies shared by authors reveal diverse aspects, approaches adapted, challenges faced, and strategies used for overcoming challenges while implementing BL. Studies about BL implementation as reported by Jeffrey et al. (2014), Sheffield et al. (2015), and Byrka (2017) are a few examples of how shared case studies help with learning new lessons about BL implementation.

Luo et al. (2019) analysed five courses through a case study approach on the basis of seven principles of flipped learning. They concluded that even though the ways in which faculty members approached flipped learning differed individually, the seven basic principles remained the same and were found in all courses: (i) every flipped learning course facilitator encouraged contact between students and faculty; (ii) it developed reciprocity and cooperation among students; (iii) it encouraged active learning; (iv) feedback was given promptly; (v) time on tasks was emphasised; (vi) it communicated high expectations; and (vii) it respected diverse talents and ways of learning.

Most of the studies undertaken to find out teachers' experiences or perceptions concluded that the teachers expressed satisfaction about student achievement through the BL approach (Oh & Park, 2009; Schindel et al., 2013). Sorbie (2015) found that teachers believed BL promoted individualisation, collaboration, organisation, engagement, real-world relevance and student-centred learning. Formative assessments were found to be an effective element of BL courses.

At the same time, teachers using the BL approach had voiced concerns about challenges related to time, technical training and institutional support (Oh & Park, 2009; Sorbie, 2015). Teachers also needed to learn many new skills, such as how to integrate materials, use hardware and software, and troubleshoot computer problems (Grgurović, 2011). Grgurović (2011) also reported that those who had been most successful at BL initiatives stressed the importance of institutional support for course redesign and planning.

Both extrinsic and intrinsic motivational factors have a significant impact on instructors' motivation to apply the BL approach. Along with efforts to increase motivation, different training models have been implemented across the globe to enhance capacity for using BL. At Taif University, Saudi Arabia, a systematic LMS process improvement model, named OASA, was proposed and studied to establish a systematic and effective faculty development programme for BL (Badawood et al., 2013). Wang et al. (2015) developed a Complex Adaptive Systems Framework to assess research studies related to BL. They found that only 11% of the reviewed research focused on teachers, covering teacher content, teacher technology, teacher learning support and the teacher–institution relationship. Among these

relationships, the one between the teacher and the institution emerged as key because it was related to institutional support for professional development.

Drawing upon the findings from previous studies, the BL experiences of faculty and learners through courses conducted by 15 teaching faculty of SNDTWU were studied. The study looked at the pedagogical paths designed and followed by the faculty, the extent of LMS use, and experiences and challenges while using BL.

Implementation of Blended Learning

The TEL implementation project, which aimed to promote BL environments, was planned for the 2017–18 academic year in collaboration with COL. The university vice chancellor supported the project and encouraged teachers to participate in this new initiative. Here, BL implementation was not merely for the sake of increasing the use of technology; the aim was to achieve a comprehensive BL environment on the campus. The project consisted of three aspects:

1. Training university faculty in TEL implementation to achieve BL environments.

2. Planning and implementing BL courses.

3. Evaluating the project using mixed-methods research.

Since the entire undertaking was considered a research project, a mixed research method was planned, consisting of an experimental study with quantitative analysis of the post-intervention data, and a case study approach to analysing qualitative data. The quantitative data of all the participating students was used. Examination scores were obtained from the centralised examination section of the university. A two-group, post-test, only quasi-experimental design was employed (for details, see Shinde, 2019).

This chapter does not aim to discuss the quantitative research findings. The process of developing a BL ethos across the campuses, and its continuation in the next two years, was enriching. Instead, the chapter focuses on the successes, challenges and lessons for the future continuation of BL. Data obtained from teachers' interviews, along with content analysis of LMS-based courses, were used for the qualitative analysis.

The phases of the BL project are presented in Figure 5.2.

May–July 2017	May–July 2017	July–Dec 2017	Jan–May 2018
Initial 5-day faculty training in BL	Session-plan design for BL	BL implementation by 15 faculty members	Data collection, analysis & report writing: semester-end examination results; teacher interviews; student interviews; analysis of LMS
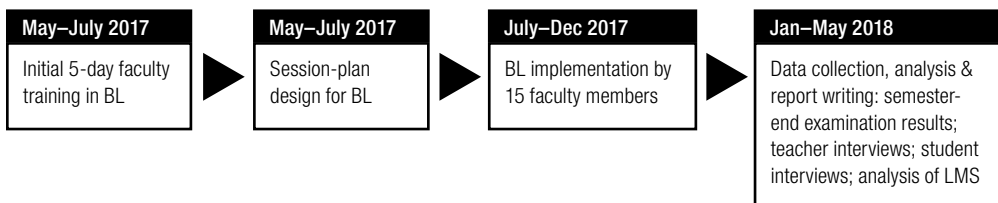
Figure. 5.2. Phases of the BL project at SNDTWU.

Training of University Faculty

The initial five-day training workshop was arranged in May–June 2018 in three phases:

1. One-day workshop: 5 May 2017 (orientation about BL and flipped classrooms, content chunking, writing objectives, planning out-of-class resources).

2. Two-day workshop: 29–30 June 2017 (planning in-class activities, introduction to the Moodle LMS, course planning with the help of templates).

3. Two-day workshop: 11–12 July 2017 (uploading resources on Moodle, ICT tools such as Google drawing, Padlet, blog, etc.).

Apart from the project investigator, who used BL in all her courses, the final team of 15 faculty members submitted BL session plans and started using the BL approach. One of the teachers taught two courses through BL, so a total of 16 BL courses were implemented during the July–December 2017 semester.

Planning and Implementation

The team of 15 faculty members selected one four-credit course each and submitted BL session plans for the July–December 2017 semester. The teachers were provided with courses created in the Moodle LMS. Teachers uploaded their resources on Moodle and started BL implementation right from the beginning of the semester. Some teachers tried to upload almost all of their resources at the beginning, but many gradually uploaded the resources one by one. Activities were planned during the course of teaching. BL was implemented during the July–December 2017 semester. Mentors were introduced to these teachers for pedagogical and technological guidance. Teachers interacted with the project investigator over the phone or met face-to-face when needed. A Moodle administrator was consulted from time to time for technical advice. A few features, such as LMS plug-ins, were added at the request of a few teachers. Moodle was supported on mobile phones, which resolved the issue of having access devices available.

Evaluation of the Project

1. Methodology

TEL intervention helped the faculty team to learn several valuable lessons, and many of the observations were worth studying as a case. The observations helped with understanding how the university approached BL, how TEL supports blended environments, and how teachers exploited the LMS in different ways and demonstrated different pedagogical paths towards BL. A case study approach was used as the qualitative methodology.

2. Sample

The final sample consisted of:

- Campuses: 2 (Juhu and Churchgate campuses in Mumbai)
- Institutes: 8

- Teachers providing BL: 15
- Courses selected for BL: 16
- Students under intervention: 628
- Students under intervention from multiple teachers using TEL: 396

3. Instruments

Interview and content analysis techniques were used for the qualitative data collection. Triangulation of data obtained through these techniques was used to derive interpretations.

a. Interview

Semi-structured interviews were planned. A set of indicative aspects was designed, consisting of the following:

- initial reaction to BL and motivation to participate
- role of initial training workshop and skill development for BL
- experience with LMS and its usefulness with respect to its features
- challenges faced while using LMS
- teaching–learning strategies used in the class
- time management for BL
- effect of TEL on learners' academic performance and behavioural qualities
- learners' reactions to TEL
- availability and challenges of physical infrastructure at the institutes
- overall experience

All teachers were interviewed by trained research assistants. The interviews were recorded, and transcripts were analysed by creating codes and categories.

b. Content Analysis

LMS courses were analysed using a content analysis technique. LMS courses were analysed against the following aspects:

- pre-instructional resources (syllabus, learning objectives)
- web resources
- teachers' resources, such as slide presentations, videos, etc.
- discussion forums
- special features of LMS, such as "lessons"
- quizzes
- instructions regarding other ICT tools, such as Padlet, blogs
- instructions regarding activities such as cooperative learning strategies

Findings and Implications

The findings of the evaluation study are briefly summarised in the following.

Use of the LMS

All but three of the teachers in the project uploaded syllabi to the LMS. One teacher posted a detailed content outline on the LMS, whereas another provided a link to a web-posted syllabus. More than 50% of the teachers posted course objectives and module objectives for their LMS-based class.

The LMS was mainly used by the teachers for sharing resources. Many resources identified by them were shared on this platform, including links, pdf files, slides, e-books, research papers, and videos. A few library books were also introduced on the LMS. Research papers and external links were shared by most of the teachers. Technology as well as social science and library science teachers shared ample five-minute to 30-minute videos on the LMS. Some had posted descriptive titles for the videos, whereas others had merely posted video links listed one below the other. Supporting tasks to ensure viewing of the videos were missing in most of the LMS.

More than 50% of the teachers designed quizzes on the LMS. Two management teachers, a maths teacher and a library science teacher used several quizzes during the semester. A teacher from the technology institute used a quiz for every module. A computer science teacher embedded quizzes in the "lesson" feature of the LMS in every sub-module. Teachers used the quiz feature for easy and quick formative assessment of large classes. A library and information science teacher uploaded a question bank, whereas a mathematics teacher uploaded a sample question paper with answer key. Assessment through tests was ignored by one-third of the teachers.

The LMS's assignment submission feature was not explored or used by many teachers. Though internal assessment makes up 50% of the grading in the graduate (master's) programmes at SNDTWU, only three or four teachers took full advantage of the assignment submission feature. Three teachers provided concept mapping for assignments. Students rarely submitted assignments on the LMS for three teachers, whereas a 100% submission rate to the LMS was seen for three teachers. A management teacher used Padlet for task submissions due to LMS size restrictions.

None of the teachers used the discussion forum feature to its fullest. A few teachers achieved partial participation on the discussion forum, whereas only one teacher from social sciences achieved 100% student participation. Teachers and students mentioned conducting several group discussions in the classroom, but not on the LMS.

Blended Learning Pedagogy Paths

Analysis of the data sought through interviews of teachers led to a few findings, which help with identifying different pedagogy paths for TEL. Triangulation of the data obtained from both the techniques — i.e., interviews and content analysis — was used to derive the pedagogy paths. Four paths were identified.

1. Upload several relevant resources to the LMS

The simplest possible and least interactive path was to upload several relevant resources to the LMS. Teachers expected learners to read and view resources in the forms of pdf files, ppt files, web links and videos. Some teachers uploaded only a few videos. Many of them planned a few quizzes. The classroom time was used

for discussion and group activities. Topics were briefly explained by some of the teachers, as learners were initially not comfortable with studying from learning resources on their own.

2. Optimal use of LMS features

LMS-based features were optimally used by some teachers. Discussion forums, lesson formats, quizzes, assignments, and (rarely) polls were some of the LMS-based activities that made learning experiences meaningful and helped with achieving learner engagement. Teachers focused on using the LMS to its fullest and did not appear keen on using other ICT tools.

3. Integration of ICT tools for learner-centred activities

A technologically more versatile path was followed by some teachers. They posted several resources and also used other ICT tools for pedagogically interesting and engaging activities. Blogs, Padlet and Google drawings were some of the preferred tools. Padlet was extensively used by two teachers. Though ICT tools other than the LMS were used, the aim was not to make teaching–learning technology driven but to create collaborative learning environments. Learners highly appreciated these ICT-based activities.

4. Pedagogically enriched environments with collaboration

Pedagogically enriched environments were created by a few teachers, who focused more on collaborative and cooperative classroom activities. Some of them integrated ICT tools, whereas others experimented with learner-centred pedagogies. Cooperative learning strategies such as Jigsaw and Think-pair-share were used in the class; and concept mapping, mind mapping, and real-life projects were some of the activities.

It can therefore be concluded that every individual teacher took decisions about using the LMS, other ICT tools and cooperative–collaborative pedagogies, depending on their own ideas about achieving learning objectives and learner engagement, as well their own skill sets. Learner engagement can be enhanced by exploiting the learner-centred features of the LMS and/or using collaborative ICT tools as well as by using learner-centred classroom strategies. Those who are not keen on exploring and experimenting with learner-centred environments need extrinsic motivation, handholding or sets of guidelines.

The overall experiences of teachers with implementing the BL approach led to several common findings:

- It is not a very easy process to make BL a regular, naturally evolving teaching–learning process. The day is still far off when the majority of teachers will stop thinking of BL as additional work and will instead start deriving benefits from it in terms of 21st-century learners' skill development as well as time efficiency.

- Some teachers gave up on the idea of using a particular feature of the LMS (e.g., downloading multiple assignments, uploading feedback files, etc.), instead of approaching the mentor or resource persons from DET for trouble-shooting.

- Some teachers did not even realise that there were solutions for their technical problems.

- A few teachers focused more on using the LMS so they could achieve TEL, but they missed how to use the BL approach in its true sense. Classroom pedagogies were often dominated by teacher-talk in such cases.

- A few teachers were highly motivated and were practising TEL regularly.

- Individual teachers approached TEL in many ways, which generated rich data about different TEL pedagogy paths.

- Teachers' extent of implementation ranged from using Moodle as a bucket into which they dumped all of the learning resources, to using optimal features to make the LMS learner centred and even adaptive. Classroom activities also varied, from discussion in large groups and addressing queries to cooperative learning activities. The extent of teachers' participation in TEL depends on their level of motivation, planning capacity, implementation of plans, as well as skill sets in technology and pedagogy.

Present-Day Scenario

Today, after a gap of two years, when the LMS and other activities are analysed, the following observations can be made:

- Twenty campus teachers joined an online training programme for Moodle in July 2019.

- A total of 21 teachers from different disciplines used BL with the support of Moodle during the 2019–20 academic year. From 1,200 to 1,500 students are benefiting from the LMS every year.

- The response to ICT-related faculty training workshops is increasing. About 140 campus teachers participated in an extensive faculty training programme in ICT integration during the COVID-19 pandemic, and many of them reported successful implementation during the lockdown period (May 2020). Twelve out of the 15 sample teachers contributed as e-tutors in this massive teacher-training programme. Forty-four campus teachers and 20 teachers from affiliated colleges of the university received extensive hands-on training in the Moodle LMS in July 2020.

- Readiness for online teaching with learner engagement is increasing.

Lessons Learnt

The following lessons were learnt during the implementation of the BL project.

- BL environments were mainly achieved by practising and imparting training in TEL. Training, continuous handholding and monitoring are needed in systematic implementation initiatives.

- Several one-day or half-day sessions on different ICT tools and cooperative learning activities need to be conducted during the semester.

- Mentoring needs to be more systematic, requiring reports about the interactions between mentors and teachers.

- Monitoring the LMS and even observing a few classroom activities may help to achieve better blended environments.

- Sharing of experiences within the group never happened in its true sense. One or two meetings for teachers to share their teaching–learning experiences with the whole group are needed.

- Project-related responsibilities such as submission of reports, administration of tests, and participation in meetings and workshops during the ongoing intervention need to be made mandatory. These can form part of the participation agreement with teachers. Written agreements of this kind may help with making them feel more responsible for participating in the project, which will ultimately help them and their learners to reap all the benefits of BL.

The journey of blended learning in a higher education institute is an enriching experience. Systematic implementation of a blended learning approach requires dynamic leadership, commitment from teachers, mentoring by colleagues, and systematic planning, as well as continuous monitoring at the institutional level.

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Implementing Technology-Enabled Learning in a Technically Challenged Environment: The Case of the National University of Samoa

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Introduction

This chapter is based primarily on a research study of lecturer and student experiences with the implementation of technology-enabled learning (TEL) using Moodle in a relatively tech-poor environment at the National University of Samoa (NUS; Chan Mow, 2017). To ensure a structured approach to TEL, the study was preceded by a baseline study that gauged the skill level of staff and students in TEL as well as an infrastructure audit of technology and ICT connectivity at NUS. The findings of the baseline study were used to develop a TEL policy and implementation plan, thus ensuring a structured and planned implementation of TEL at NUS. After a one-year period of TEL implementation using Moodle, an evaluation of Moodle was conducted, and that study is the subject of this chapter. Broadly, the Moodle research aimed to answer the following question: What is the impact of blended learning (BL) using Moodle on the lecturers' teaching and the students' learning experiences at the National University of Samoa?

Specifically, the research attempted to answer the following:

- Research Question 1: What impact does a training and mentoring programme have on the teachers' experience of designing and teaching in a BL environment?

- Research Question 2: How do learners describe the effectiveness of the BL environment in their course of study? An effective BL environment is, for the purposes of this study, defined as one in which students can learn with a positive learning experience. A positive learning experience for students is defined as one that meets their values, priorities and needs.

- Research Question 3: How do students perceive their teachers' practice and behaviour in a BL environment?

- Research Question 4: How is the learning achievement in a BL course different from in other courses at the university?

- Research Question 5: How do teachers' practices affect students' perceptions of BL courses?

- Research Question 6: What are the students' attitudes to learning in the Moodle training, based on the categories of "connected knowing" and "separate knowing"?

The next section discusses the relevant studies and findings in the literature, as well as the conceptual framework of the study.

Literature Review

Extant literature points to the increasing use of BL in education, its acceptance as a pedagogical approach, as well as its transformative power (Bransford et al., 2000; Dziuban et al., 2004; Garrison & Kanuka, 2004; Garrison & Vaughan, 2008; Graham et al., 2005; Osguthorpe & Graham, 2003; Shea, 2007).

Blended learning has been defined in a variety of ways. Cabero et al. (2010) explain that "blended learning is a formative action in which online and attending training are combined" (2010, p. 150). Osguthorpe and Graham (2003), as stated in Larsen (2012), identified the following six reasons for using BL: (i) pedagogical richness, (ii) access to knowledge, (iii) social interaction, (iv) personal agency, (v) cost-effectiveness and (vi) ease of revision. Of these, it was found that in a majority of cases, the main reasons for implementing BL were (i) improved pedagogy, (ii) increased access and flexibility and (iii) increased cost-effectiveness (Graham et al., 2005).

In an overview put together by Larsen (2012) on the findings from higher education studies on the use of BL, the main benefits were (i) improved learning outcomes, (ii) confirmed effect on student satisfaction and motivation (Amaral & Shank, 2010; Collopy & Arnold, 2009; Dziuban et al., 2004; Fulkerth, 2010; Lopez-Perez et al., 2011; Vaughan, 2010), (iii) improved classroom dynamics and (iv) improved flexibility (Collopy & Arnold, 2009; Fulkerth, 2010; Graham et al., 2005; Macedo-Rouet et al., 2009; Oh & Park, 2009; So & Bonk, 2010).

The above review highlights the main benefits of BL that needed to be investigated in this study, such as (i) improved learning outcomes, (ii) confirmed effect on student satisfaction and motivation, (iii) improved classroom dynamics and (iv) improved flexibility. These aspects form part of the evaluations in the current study through either the student survey or the lecturer interviews.

Methodology and Data Analysis

For this research, a mixed-methods approach was used — a judicious combination of quantitative and qualitative approaches. Creswell (2009) states that quantitative and qualitative data should be used "because they work to provide the best understanding of a research problem" (p. 11). Quantitative data were in the form of pre- and post-course student questionnaires. Qualitative data were gathered using staff interviews. Details of these appear in the "Procedures" section below.

Sample

The sample for this research comprised the ten lecturers who had successfully completed developing their courses from the March 2018 Moodle workshop and had offered these courses in the next semester. The sample also included all 238 students taught by these lecturers in these ten courses.

Procedures

A mixed-methods approach was employed, which involved quantitative and qualitative data collection from 238 students and ten lecturers. The lecturers had been trained in BL pedagogy and given pedagogical and technical support throughout the previous semester. In the following semester, these courses were taught using Moodle. Classroom activities included offering lectures and tutorials in face-to-face mode, providing online quizzes and exercises, and using bulletin boards and chat rooms to help coordinate activities. Students would also typically upload assignments into Moodle, and some of the lecturers uploaded assessment results into Moodle.

Early in the semester, in weeks 4 and 5, a pre-course survey — Moodle's internal Attitudes to Thinking and Learning Survey (ATTLS) — was administered to all students in the courses selected to be evaluated in the survey. This survey gauged the students' learning attitudes.

Over the course of the semester, the research team liaised with the lecturers to provide support and encourage their use of Moodle in teaching. At the end of the semester, students were given post-course surveys to determine their experiences in the BL environment. The surveys were loaded into Moodle, and students filled in the forms online. Lecturer interviews were also conducted to capture and evaluate their experiences with course development in Moodle and with teaching using Moodle. Student achievement data for the ten classes used in the study were collected from the previous year as well as the current year. These were used to evaluate any differences in student achievement between when the course was offered in non-BL mode and its current offering in BL mode.

Research Instruments

The following research tools and techniques were used.

1. Pre-Survey: Moodle's Attitudes to Thinking and Learning Survey (ATTLS)

Moodle's internal ATTLS is based on the theory of "ways of knowing," originally from the field of gender research (Belenky et al., 1986), and is a survey tool that evaluates the quality of discourse within a collaborative environment. Developed by Galotti et al. (1999), ATTLS measures the extent to which a person is a "connected knower" (CK) or a "separate knower" (SK). People with higher CK scores tend to find learning more enjoyable and are often more cooperative, congenial and willing to build on the ideas of others, while those with higher SK scores tend to take a more critical and argumentative stance to learning. Studies have shown that these two learning styles are independent of each other (Galotti et al., 1999, 2001).

2. Lecturer Interviews

Lecturer interviews provided answers to Research Question 1: What impact does a training and mentoring programme have on the teachers' experience of designing and teaching in a BL environment? Evaluation of the impact of training and mentoring was based on the following areas: (i) pedagogical training and planning, (ii) technological preparation, support and integration, (iii) collaboration and (iv) teaching impact.

3. Post-Course Student Experience Survey

The post-course student survey was adapted from and based on a study by Larsen (2012), which had the same objectives as the current study. The instruments used by Larsen (and subsequently this study) are built on the Web-based Learning Environment Instrument (WEBLEI), developed by Chang and Fisher of Curtin University (Chang & Fisher, 2003).

Scale I evaluates emancipatory activities. Tobin (1998) listed three main categories of emancipatory activities: convenience, efficiency and autonomy (Chang & Fisher, 2003).

Scale II evaluates co-participatory activities. Included under the co-participatory activities are six categories: flexibility, reflection, quality, interaction, feedback and collaboration.

Scale III evaluates qualia. Tobin (1998) described six categories of qualia: enjoyment, confidence, accomplishments, success, frustration and tedium.

Scale IV evaluates information structure and design elements as results.

In addition to the WEBLEI scales, Larsen (2012) introduced a fifth scale (facilitation) to evaluate how a teacher's practice and behaviour affect student perceptions of the BL environment.

The post-course student survey was a modified version of the Larsen study's student WEBLEI survey and divided into the following sections:

    a.   Digital skills

    b.   Infrastructure

    c.   Access (Scale I)

    d.   Self-discipline/interaction (Scale II)

    e.   Learner response (Scale III)

    f.   Learner results (Scale IV)

    g.   Facilitation (Scale V)

The WEBLEI scales were measured using a scale of 1 (almost never), 2 (seldom), 3 (sometimes), 4 (often) and 5 (almost always), or 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree).

Results and Discussion

Impact of Training

Research question 1 investigated the impact of a training and mentoring programme on the teachers' experience of designing and teaching in a BL environment. The evaluation of the impact of training and mentoring was based on the following areas: (i) pedagogical training and planning, (ii) technological preparation, support and integration, (iii) collaboration and (iv) teaching impact.

1. Lecturers found the training and mentoring given by the COL consultant to be useful, adequate and relevant for preparing and developing courses. Those with weak technology skills found the training a challenge. Their issue with technology skills was similar to what Coryell and Chlup (2007) as well as Hong and Samimy (2010) found, where students with weak technology skills found BL a challenge and were fearful of using technology in their learning. Another issue identified by lecturers was the timing and duration of their BL training. Training would have been more effective if it had been held at a less busy time and had been longer.

2. Lecturers found it easy to adapt to online pedagogy, with previous experience being an advantage. Lecturers also noted that younger students found technology more relevant than older students did. These findings are similar to those of Coryell and Chlup (2007), who described age as a factor in successful BL implementation and remarked that it can be more difficult to get buy-in from older students. Another experience shared by lecturers was that Moodle helped shy students interact in online discussions.

3. Most of the lecturers found that BL required more planning and was a lot more challenging due to time constraints. This is understandable given the lecturers had to learn new pedagogy and needed time to prepare; this is supported by findings from Kaleta et al. (2007).

4. The majority of the lecturers felt they had been given sufficient technical support by the COL consultant in preparation for BL. The research team also gave sufficient technical support during the teaching of the courses. The most serious issue in technical support was lack of Internet access in classrooms.

5. Lecturers found it easy to coordinate, integrate and manage face-to-face and online activities. These results indicate that Kaleta et al.'s (2007) advice to "integrate face-to-face and online activities to avoid teaching two parallel and unconnected courses" helped lecturers avoid the problem of treating the online parts as merely add-ons to face-to-face teaching (Hoffman, 2006).

6. Lecturers reported that "there was a lot of collaboration between us during planning and preparation of our blended courses." These findings support Hubbard's (2008) recommendation that teachers form a community of practice to support their learning. However, findings also showed that not all teachers liked to collaborate; the same emerged in Larsen's study (2012). Furthermore, the degree of collaboration during the teaching of the courses varied across lecturers.

7. All of the lecturers indicated Moodle had a definite impact on student–teacher interactions in that "students were more active," had "more time to work on their own," "contributed more to discussions" and had "more time to discuss problems." Such positive outcomes of BL reiterate earlier findings by Amaral and Shank (2010) and Shroff and Vogel (2010). But there were also challenges, as some lecturers indicated there had been no impact — for example: "Students still turned in assignments late and would not ask me about anything."

8. In terms of student learning, lecturers reported that Moodle or BL provided the advantage of catering for different learning styles; that students were more engaged and contributed more; and that students had access to all the course resources. That technology can facilitate student access to course resources was also part of the findings of Cartner (2009), Sagarra and Zapata (2008) and Sanprasert (2010). Further, such experiences of increased instructional flexibility mirrored earlier findings by So and Bonk (2010). However, some lecturers also reported frustration with students not taking full advantage of online resources, turning in assignments late, not engaging in class, and having poor attendance and attitude.

9. The majority of lecturers used Moodle to monitor students' participation and engagement in class activities. Lecturers were able to use grading on Moodle, display students' grades, as well as monitor students' logins and assignment uploads.

10. In terms of workload, all of the lecturers agreed that using BL was no extra work at all and meant less paperwork, fewer misplaced assignments or activities and greater effectiveness.

11. Perhaps the single most pressing issue identified at this stage (and previously) was insufficient access to Moodle, due either to the unavailability of computers or access devices at NUS or to a lack of Internet access. This supports assertions by Andersson (2008) that limited bandwidth and inadequate network connectivity affect users' ability to fully utilise BL resources.

12. Recommendations for improving the future use of Moodle focused mostly on the need to improve access to Moodle through better infrastructure and training, but there was also a recommendation to develop policies for accessing and using Moodle. NUS has adopted a TEL framework that covers the use of BL in all its courses. However, to operationalise this, more detailed guidelines for implementing BL and OER need to be developed.

Student Perceptions

Research question 2 evaluated students' perceptions about the effectiveness of the BL environment in their course of study. The responses for the six categories of the modified WEBLEI scale were all highly positive, with category means ranging from 3.69 to 4.2 (Table 6.1).

In the area of digital skills, positive responses indicated that students rated their computer skills highly, with female students rating their skills more positively than males. Across programmes, science students gave their skills the highest

rating. Responses in the infrastructure category, although positive, had the lowest rating across all categories.

In the access category, the responses were also fairly positive, indicating students were satisfied that lessons were convenient and available at suitable locations, and allowed them the independence to work at their own pace and meet their learning goals. As mentioned in the earlier discussion on lecturer responses, facilitating student access to different kinds of learning materials was also part of the findings of Cartner (2009), Sagarra and Zapata (2008) and Sanprasert (2010). Tests also revealed that female students more than males felt BL gave them greater flexibility in learning.

Table 6.1. Summary of overall means for each category in post-course student survey.

Categories/Scales	Mean	Std. Dev.	N
Digital skills	3.76	1.02	165
Infrastructure	3.69	.94	165
Access	3.89	.81	165
Interaction	4.04	.75	165
Attitude	3.72	.72	165
Response/Results	4.20	.68	165
Facilitation	4.44	.81	165

Note: Std. Dev. = standard deviation.

Most students showed highly positive responses about interactions and achieving their learning outcomes. As pointed out by Larsen (2012), such increased interaction can be regarded as a precondition for greater student engagement and improved preparedness, which are all positive attributes of BL courses found by researchers Amaral and Shank (2010), Osguthorpe and Graham (2003), Shroff and Vogel (2010) and Singh (2010). The analysis also showed that females on average felt more self-disciplined in the BL environment, felt free to ask the lecturer or students when they didn't understand, and felt they were regularly asked to self-evaluate. Further testing also indicated significant variation across courses and lecturers in the amount of communication among students via electronic means (e.g., email, discussion forums).

The response scale measured the students' sense of satisfaction, enjoyment, ability to collaborate and sense of boredom while learning in the BL environment. Most students responded positively, with the majority selecting close to "often." Again, these results reiterate and reaffirm the positive outcomes of BL, as discussed earlier.

The means for the individual items of the results scale were highly positive and ranged from 4.02 to 4.2, indicating students rated highly the structure and organisation of the course, its presentation and content, the online activities, the assignments and the quizzes. These findings are very positive and mirror earlier findings by Larsen (2012), indicating that lecturers did a good job of planning and presenting course content and were clear when conveying their expectations and directions to their students.

Student Perceptions of Teacher Behaviour

Research question 3 evaluated how students perceived their teachers' practice and behaviour in a BL environment. All of the student ratings for lecturers were very highly positive, with means ranging from 4.09 to 5. This demonstrated that students' perceptions of teachers' behaviour and practices in the BL environment were highly favourable. Results showed that lecturers were well prepared and available to answer questions, encouraged students to work together and help each other, encouraged different ways of learning, gave students quick feedback, expected students to do their best and respected their individual ways of learning. Again, as detailed in the findings, such good practice is consistent with recommended practice as outlined by Chickering and Gamson (1987). Results showed no significant teacher differences for most items in Scale V "facilitation" except for item 48, where there was a significant difference between students' responses to whether lecturers encouraged them to learn in different ways (F = 2.215, df = 9, *p* = .024) (Table 6.2).

Learning Environment

Research question 4 evaluated how the learning achievement in a BL course was different from in other NUS courses. Comparison of the mean achievement scores of TEL students and non-TEL students showed mixed results — the results were statistically significant in three courses (30%) and not significant in the other seven courses (70%). However, it needs to be noted that a more valid assessment of the impact of BL on achievement would require measuring it over time as well as having students exposed to a BL environment for longer than in the current study.

Table 6.2. Learning achievement in BL courses compared to non-BL courses.

Class	Non–BL Average	BL Average	*t*	*P*
HSO302	52.7	61.2	−.2083	.055
HED260	60.1	57.7	5.955	.000
HMK105	69.7	59.6	2.219	.032
HCH132	66.4	62.8	.486	.642
HCH232	65.7	52	2.105	.062
HCS182	62	68	−.37	.615
HCS188	69.9	60.7	1.141	.272
HNS364	64.3	62	−.381	.704
HMS205	84	79.1	1.26	.255

Effect of Teacher Practice on Student Perception

Research question 5 investigated how teachers' practices affected students' perceptions of BL courses. Results indicated that the only scale of student perceptions in which lecturer practice and behaviour had a significant impact

was on the "response" scale (F = 3.148, df = 9, p = .002) (Table 6.3). These results indicated that lecturer practice and behaviour had a significant effect on students' sense of satisfaction, enjoyment, ability to collaborate and sense of boredom/engagement in a BL environment.

Table 6.3. Results of ANOVA of lecturer versus scale means.

	Scale	Df	*F*	Sig.
Access	Between groups	9	1.788	.075
	Within groups	155		
	Total	164		
Digital	Between groups	9	1.179	.312
	Within groups	155		
	Total	164		
Infrastructure	Between groups	9	1.564	.131
	Within groups	155		
	Total	164		
Interaction	Between groups	9	.966	.471
	Within groups	155		
	Total	164		
Response	Between groups	9	3.148	.002
	Within groups	155		
	Total	164		
Result	Between groups	9	1.164	.322
	Within groups	155		
	Total	164		
Facilitation	Between groups	9	1.286	.249
	Within groups	155		
	Total	164		

Student Attitudes to Learning

Research question 6 evaluated students' attitudes to learning based on two categories: "connected knowing" and "separate knowing." Analyses indicated significant gender differences in the SK scores, with males attaining higher scores than females. Findings also revealed that the two scores were highly correlated, implying that students with high CK scores also had high SK scores. As indicated earlier, these findings are contrary to the findings of some previous studies (Galotti et al., 1999, 2001), indicating that these attitudes to learning are independent of each other.

Conclusion and Recommendations

Overall, the results of the study were positive in many ways and provide the necessary evidence to streamline and scale up TEL at NUS. Students' high levels of satisfaction revealed that the BL environment and teachers' practices were effective. However, the study also highlighted several challenges, the most critical being an insufficient infrastructure and a lack of Internet access in the classrooms to enable Moodle access. At NUS, the Internet and hence Moodle can be accessed only in selected spaces, such as the computer labs, the library and the foyer. In classrooms, there is no Internet access and hence no Moodle, and this was the main barrier to implementing BL. The lack of access devices, insufficient Internet connectivity and bandwidth, and LMS access issues are barriers to effectively implementing BL. Hence, it is strongly recommended that NUS look seriously at resolving these infrastructure issues.

With a TEL framework already adopted at the university, it is expected that the following recommendations of this study will receive adequate attention in the context of low-income countries in general and NUS in particular.

Recommendation 1: The university should address the lack of access devices, and the lack of Internet and Moodle access in NUS classrooms.

Recommendation 2: The university should develop guidelines on access to, use of and administration of Moodle.

Recommendation 3: The university should establish a technical support team with dedicated staff to provide timely support for solving and troubleshooting hardware, software and operating system problems, and to address technology limitations as well as access and connectivity issues in the shortest possible time.

Recommendation 4: The university should create an in-house team with adequate staff to motivate teachers and students.

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Improving Learner Engagements through Implementing Technology-Enabled Learning

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Introduction

The emergence of information and communication technologies (ICT) has changed the nature of the learning environments experienced by students. Educators have always created, selected and provided environments for learning, so the potential of technology-enabled learning (TEL) environments is a matter of great interest to them. TEL environments are seen as having the potential to provide opportunities for active, flexible and individualised learning experiences. It is argued that the connection between the learner and the learning environment is central to understanding how TEL environments motivate or engage students, particularly given the capacity of TEL environments to provide more individualised experiences. Indeed, individual differences among learners may become more evident as learning environments become more open-ended.

The Commonwealth of Learning (COL) supported Jaramogi Oginga Odinga University of Science and Technology (JOOUST) to undertake a systematic approach to institutionalising TEL through research, consultation, capacity building, and monitoring and evaluation. The activities included conducting a baseline survey to establish the level of preparedness in the institution, the faculty and the students, and developing and adopting a TEL policy and capacity building for faculty in the use of technology for teaching and learning (Gwada et al., 2018). This chapter documents how learners' engagement has been improved through this TEL implementation initiative.

The TEL initiative aims to increase access to quality teaching and learning by supporting policy formulation and innovation in the application of ICT in education, and the development of ICT skills. TEL is any technology that enhances the learning experience. Research by Entwistle et al. (2002) indicated

that quality learning is achieved through interactions between a variety of factors, including learners' prior experiences, their approaches to learning, their perceptions of the teaching and learning environment, the teaching and learning environment per se, teachers' pedagogical conceptions and subject knowledge, and course material organisation.

TEL implementation at JOOUST through blended learning courses aimed at improving teaching/learning interactions so as to improve student learning experiences and outcomes by providing them with flexible and interactive learning opportunities.

Related Literature

The concept of student engagement has become an important paradigm for educators and researchers, with ongoing discussions about its nature and complexity, and criticism about the depth and breadth of theorising and operationalisation within empirical research (e.g., Kahn, 2014; Zepke, 2018). The role that digital technology plays in affecting student engagement is a particular area of interest, as it has become a central feature within student educational experiences (Henderson et al., 2017; Selwyn, 2016). In the wake of the uptake and spread of digitalisation within education, research has continuously offered a more nuanced understanding of the consequences and potentials of technologies in education.

One of the more pressing aspects brought forward by a number of studies is the suggestion that learning technologies in education are not used as effectively as they might be (e.g., Gudmundsdóttir et al., 2014). These studies suggest that the strategies teachers use to engage students in traditional practice might not match those needed to engage students in activities that adopt learning technologies (e.g., Grissom et al., 2017), and that effective learning activities should be student centred and promote students' active learning (Grissom et al., 2017).

In this study, learner engagement was defined as the interest and motivation students had in their own learning of course content. Mandernach (2009) proposed that student engagement depends primarily on a number of factors, including an instructor's personal connection with students and the creation of an active online environment. Handelsman et al. (2005) developed an instrument to measure student engagement and found that it consisted of four dimensions for students in traditional face-to-face classrooms: skills engagement, participation/interaction engagement, emotional engagement and performance engagement. According to Richardson and Newby (2006), engagement is affected by the number of online courses that students have taken as well as the degree to which students take responsibility for their own learning.

Engagement is a vital learning process and has been identified as a major component in effective online teaching. It is seen as important for retention and enhances the quality of the overall student experience. The factors contributing to engagement are (i) interaction with peers, (ii) quality and frequency of interaction with educators and (iii) technologies to facilitate learning. Such

engagements are crucial for knowledge construction, richer learning experiences and meaningful learning, as they result in learners thinking and interacting with content and with other learners and educators (Dixson, 2015). The factors leading to consistency in learning are learners' interactions with teachers and other students, and educators' interactions in the learning community.

Theoretical Framework

Flow theory

Flow theory, though largely undiscovered by educators, was developed by Csikszentmihalyi (1990) as a theoretical perspective on student learning that integrated cognition, motivation and emotion. While it is not a theory of student engagement, applying flow theory in classrooms with the aid of TEL may help teachers create learning environments in which there is increased student engagement. Flow theory incorporates the idea of matching skills to challenge level such that the student is neither bored nor overloaded and anxious. This part of the process in achieving flow emphasises the cognitive domain for students as they apply skills or learn new ones when faced with challenging activities.

Engagement-based learning and teaching

According to Sarder (2014), the engagement-based learning and teaching (EBLT) approach consists of two basic elements that provide an effective method of establishing a facilitation technique for more student engagement. These elements are pedagogies and preconditions, where pedagogies are techniques that must be followed when instructing students, and preconditions are a set of guidelines that need to be followed for effective teaching. When TEL is implemented, the chances are very high that learning will become interesting and learners' engagement will correspondingly improve.

In addition to these preconditions for an actively engaged classroom, the EBLT approach acknowledges that teachers can emphasise several key aspects of pedagogy to facilitate student course engagement. The first key for successful teaching and learning is course design for rigorous and relevant instruction. EBLT argues that relevance can facilitate motivation and the conditions necessary for students to invest the time and energy necessary for optimal learning. The bottom line is that students are willing to work more and harder if the information they are presented with is relevant to what they already know.

The next aspect of pedagogy that teachers should focus on is course design to promote personalised learning. No two students learn the same way or come from identical backgrounds. Therefore, each student, when treated as an individual, will have unique learning requirements. A third aspect of pedagogy that results in an actively engaged student is the use of active learning strategies brought about by the implementation of TEL. Teachers and professors must seek out new and different ways of stimulating interest in classroom materials and discussions. TEL implementation at JOOUST created just such an environment through capacity building in teachers.

Research Questions

The purpose of this study was to understand variations in student engagement in relation to TEL implementation at JOOUST. The following research questions were addressed:

- What are the most engaging activities identified by learners in the blended learning mode at JOOUST?

- What are the most disengaging activities identified by learners in the blended learning mode at JOOUST?

- Which strategies or methods are used to improve learners' engagement at JOOUST?

- Is there any significant relationship between learners' engagement and TEL implementation?

Methods

The study adopted a mixed-methods design as it necessitated collecting, analysing and interpreting both quantitative and qualitative data. Mixed methods help generate a comprehensive view of how TEL implementation at JOOUST has improved learner engagement. The study collected quantitative and qualitative data to achieve triangulation.

Participants

The study was conducted at the School of Informatics and Innovative Systems, where the Centre of E-Learning is located. An e-portal named "e-joust" was designed to cater for the teaching and learning processes at schools/faculties offering their courses in a blended mode. The purpose of e-joust was to help students with their learning processes. E-joust enabled students to access learning materials, email, live chat sessions, online discussions, forums, quizzes, wikis, blogs and assignments anywhere, anytime. All students were required to use eLearning portals for their discussions, which allowed asynchronous interactions between teachers and students as well as between students. The teachers served as mentors to the students by facilitating the course and getting students connected online. Data were gathered through online questionnaires. A total of 383 questionnaires were distributed to students from four different programmes: Health Informatics, Business Information Systems, Information Communication and Technology, and Computer Security and Forensics. A total of 203 filled-in questionnaires were received for analysis.

Instruments

Based on a review of the related literature, and borrowing from other validated scales such as the Student Course Engagement Questionnaire (SCEQ) by Handelsman et al. (2005) and the Online Student Engagement (OSE) scale by Dixson (2015), we developed several drafts of an online engagement survey and pilot tested them with both undergraduate and graduate students. The university's Ethics Review Board approved the final instrument, which focused on two distinct engagement variables: emotional engagement and cognitive

engagement. We also added two open-ended questions at the beginning of the survey in order to obtain, albeit briefly, students' own thoughts about what they found engaging and disengaging in their online course, before they were exposed to constructs found in the validated scales. All of the measures used in the instrument showed adequate reliability, with Cronbach's alpha values ranging between 0.805 and 0.958, which are considered acceptable.

Data Analysis

To analyse students' responses to the two open-ended questions, we developed a coding scheme using a constant comparative method (Glaser & Strauss, 1967; Strauss & Corbin, 1997, 1998) to quantify and examine, using mixed methods (Creswell & Plano Clark, 2018), those activities that students considered most and least engaging. Data collected were coded by both of the authors independently for a sample questionnaire to arrive at an agreed coding scheme with a 49.5% interrater reliability score.

Possible missing data and outliers were examined to get accurate results from the analyses. As a result, the data were made appropriate to the analyses to be conducted (Mertler & Vannatta, 2005). For data analysis, descriptive statistics and correlation analysis were applied using the SPSS 20.0 package.

Findings and Discussion

Learner Demographics

In order to establish a context for the study findings, the student version of the online survey asked a series of demographic questions. The overall response rate was 53% (203 students), of whom 51.7% were male and 48.3% female, from four disciplines of study, spread over the four years of study.

Most Engaging Activities Identified by Students

The five most mentioned engaging activities were discussions, interactive assignments, specific topics covered in the course, use of media, and long-answer or in-depth individual assignments.

The majority (41.9%) of responding students mentioned discussions as an engaging activity in their online courses. Many just wrote "discussions," but others elaborated a bit—for example, *"I felt I could be more vocal than what I normally would be in class"*; *"The online discussion was a great way for shy students to speak up"*; and *"Discussions really got me involved in my online classes!"* Because so many respondents identified discussions as engaging, we reviewed these answers to investigate whether students provided greater detail and/or explanations as to why. In doing so, three threads emerged. Students seemed to enjoy (i) hearing different points of view, (ii) sharing their own perspectives and (iii) responding to thought-provoking questions. Regarding the third thread, sometimes the teacher provided questions, and other times the students posted their own questions.

More than a quarter of responding students (26.6%) reported assignments as engaging. Assignments were coded as "interactive" if they involved activities that

forced students to do something outside of their online learning environment or textbook. Students described many creative assignments as engaging, such as creating WebQuests, making a video, interviews and structured observation, playing an online game that tested decision making based on life's "uncertainties," and participating in online simulations. Assignments were coded as "individual" if they were a more traditional long-answer and/or analytical activity in a course (e.g., writing a paper or conducting further research), as opposed to shorter-term homework assignments. In examining students' responses in these categories, themes of independence and interactivity emerged — even within guided and more traditional assignments.

Regarding course content, 16.71% found specific topics in their classes engaging, and 14.8% were engaged through the teachers' use of media (videos, podcasts, or other non-traditional media and visuals). Common threads in the students' comments included (i) that it was presented in a more interactive or illustrative fashion and enhanced understanding of the more traditional materials and assignments in a course and (ii) that students could connect the content with their professional careers and/or everyday lives.

Disengaging Activities Identified by Students

The five most mentioned disengaging activities were course workload, individual assignments, general discussions, course organisation, and teacher feedback. More than one-fifth of students (23.0%) mentioned a course's workload as being disengaging. Students disliked *"a lot of reading," "having so many assignments due in a little amount of time," "daily deadlines that were sometimes difficult to remember," "the frequent amount of discussions that were due in such a short amount of time," "excessive amounts of weekly requirements (five discussion posts and responses and two one-hour quizzes every week)"* and *"having every single assignment from the publisher assigned to me."* A little over one-fifth (21.8%) of the respondents found individual assignments such as traditional long-answer or more analytical activities (e.g., writing a paper or conducting further research) very disengaging. In contrast to the engaging activities, discussions which included forum posts, blog posts and/or online chats were also felt to be disengaging by another 21.8% of the respondents.

In terms of course delivery and organisation, 18.2% of the respondents felt that they were disengaging because the structure of the course and/or the schedule of weekly assignments and due dates were confusing, limiting in some way, or too onerous. Low teacher feedback also contributed to disengagement, as 15.2% of the respondents stated that they found the level of feedback a teacher provided or the teacher's lack of responsiveness and timeliness with respect to grading disengaging.

Strategies or Methods Used to Improve Learner Engagement

The following strategies were tested and found to be effective in improving learner engagement at JOOUST.

Maximise feedback in student-to-student and student-to-faculty communication

Feedback is information formulated for the student once the teacher has analysed their progression towards attaining the target competency. It draws on explicit evidence from student work in one or more learning and evaluation scenarios. A large majority (80.29%) of the respondents felt that continuous feedback would improve their learning engagement. This is supported by Kuh (2009), who found that proper formulation of frequent and constructive feedback leads to better learner engagement. Three-quarters (74.87%) of learners also felt that technology had improved the way feedback was given at JOOUST; for example, lecturers used video and audio feedback. The preferred mode of communication between student and faculty was email, while others also preferred social media, newsletters or student meetings.

Adoption of active and collaborative pedagogical approaches

Learner engagement is improved by adopting active and collaborative pedagogical approaches that are supported by TEL. Two-thirds (66.50%) of the respondents indicated that adoption of flipped classrooms by their lecturers, supported by TEL, improved their engagement. This position is supported by Bonwell and Eison (1991), who found that active learning through problem-based approaches and flipped classrooms helps learners reflect on what they are doing. Most (86.70%) of the respondents felt that active learning through continuous blogging, participation in wiki groups and social networking for learning also helped improve their engagement.

Some respondents indicated the following:

> "Active learning through blogging, social networking for learning and wikis has improved my engagement in learning."

> "I am very happy to be able to study at any time of the day or night, from anywhere, and to be able to review the material as many times as I wish."

> "I find asynchronous technology-mediated communication between us and the teacher sufficient and satisfying."

Removing the walls of the classroom

Extending the classroom to a virtual space is another strategy for improving learner engagement. The majority of the respondents (80.79%) felt that implementation of the "e-jooust" learning management system (LMS) had made learning enjoyable and flexible and hence contributed to improving their engagement. Implementation of TEL at JOOUST has significantly removed classroom walls, reducing student boredom and increasing their engagement.

Student Engagement in Learning Due to TEL Implementation at JOOUST

Table 7.1. Student engagement in learning due to TEL at JOOUST.

Factor	Indicator	Average	Std. Dev.
Emotional Engagement	Did you enjoy the e-jooust activities?	3.84	.493
	Did you feel good about yourself?	3.96	.745
	Do you like to participate in these activities on e-jooust?	3.89	.834
	Did you experience frustration?	2.86	.987
	Were e-jooust activities fun and interactive?	3.99	.876
	Did you feel socially connected to anybody during this learning activity?	3.49	.692
	e-jooust activities fostered peer collaboration among learners.	3.99	.701
	Did you wish you had been doing something else?	2.53	1.054
	Were these activities interesting?	3.89	.583
	I think we can learn more by being active on e-jooust and participating in the activities.	3.87	.675
	Participating in blended learning activities improved my level of engagement in academic work and thus improved my performance.	3.98	.670
	I would like to have similar activities in the next term.	3.67	.825
Cognitive Engagement	How well were you concentrating?	4.5	.734
	Were you learning anything or getting better at something?	3.97	.843
	Did you set a goal for yourself prior to the e-jooust activities?	2.71	.912
	How challenging were the activities on e-jooust?	2.68	1.007
	Was it important to you?	3.87	.954
	Were the e-jooust activities convenient for you?	4.21	.678
	How important was it to your future goals?	3.35	.786
	Were you able to relate it to what you already knew?	4.24	.761

Data from the survey show that the applied approach was successful in enhancing engagement, both affective and cognitive. Table 7.1 depicts the description of variables used in the survey on student engagement as a result of TEL implementation at JOOUST. The survey scores suggest that the students were highly engaged while performing activities online. Emotional engagement ranged between 2.5 and 3.99; cognitive engagement was surprisingly higher, between 2.68 and 4.5. The lowest score was received for an item under emotional

engagement: "Did you wish you had been doing something else?" The highest rating was received for the cognitive engagement question: "How well were you concentrating?" These results clearly demonstrate the higher level of cognitive engagement among students.

The participants also felt the classroom activities were engaging and enhanced their learning. With scores ranging from 2.5 to 3.99, they believed the activities fostered peer collaboration and improved academic performance. Many commented that they were actively engaged and involved in the blended learning activities, describing them as *"fun, interactive and educational, convenient, different and most of all enjoyable."* However, some indicated that their primary concern was the inflexibility of the activities due to limited access to the LMS as a result of poor Internet connectivity within the university and their homes. This also hindered them from enjoying and learning from the online activities. In the face-to-face interviews, valuable comments were made about how students accommodated and engaged in blended learning. Insufficient contact with teachers generated the wrong perception that there was a delay in providing explanations to students who were not fully supportive of blended learning. Many believed that teachers played a major part in their learning and that without teachers' guidance, they would not progress.

The data on cognitive engagement revealed that students spent a great deal of time on assigned tasks during the semester, especially on the online project, whereas the data on emotional engagement showed that students felt interested in learning and were more confident and more experienced after the course.

Relationship Between Learner Engagement and TEL Implementation

To determine whether there was any significant relationship between learner engagement and TEL implementation, Pearson correlation analysis was conducted. Learner engagement was categorised in terms of cognitive engagement and emotional engagement. Table 7.2 shows the relationship between the learners' cognitive engagement and TEL implementation, with $r = .56$ and p value = .005, suggesting a positive relationship. The correlation between TEL implementation and emotional engagement yielded $r = .55$ p value = 0.005, indicating a strong and positive relationship between TEL implementation and learners' emotional engagement. This indicates that the more the university implements TEL in its programmes, the higher the engagement level of its students in academic work will be, which might improve both the quality of the learner experience and the students' performance.

Table 7.2. Correlation analysis of student engagement and TEL implementation.

	Login (e-jooust)	TEL Implementation	Cognitive Engagement	Emotional Engagement
Login (e-jooust)	1			
TEL Implementation	0.35	1		
Cognitive Engagement	0.15	0.56**	1	
Emotional Engagement	0.04	0.55**	0.11	1

** Significant at the 0.05 level.

Conclusion and Recommendations

The findings from this study demonstrated that TEL implementation through adopting blended learning did improve learners' engagement with learning activities in e-jooust and empowered students to be independent learners. Although students were positive about blended learning, they still considered the teacher to be the essential element for learning, engagement and the construction of meaning from their experiences. However, to engage students in deeper understanding, blended learning must be designed specifically to encourage autonomy through interactions, collaborations and participation in challenging activities.

There are various benefits of a blended learning approach: it is student-centric, innovative and results in active learning, and it is more personalised and engaging for students. This study showed how a balanced approach to blended learning can lead to higher student achievement and better student engagement.

The study found that group assignments, online discussion forums, course content that encourages active learning, and timely feedback were the most engaging activities for learners, while individual assignments and traditional long-term or more analytical activities (e.g., writing a paper or conducting further research) were the least engaging activities.

Regarding strategies or methods used to improve learners' engagement at JOOUST, the study concludes that maximising feedback in student-to-student and student-to-faculty communication, adopting active and collaborative pedagogical approaches, and extending the classroom to virtual spaces using the LMS are among the most suitable engagement strategies lecturers should use in order to improve learners' engagement.

Based on the analysis, the study contributes to the literature on blended learning and engagement strategies for learners. Strong implications can be drawn for both lecturers and universities wishing to implement TEL, and governments should engage in meaningful education reforms to support these new initiatives.

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Developing Institutional Capacities for OER-Based eLearning

Sanjaya Mishra and Manas Ranjan Panigrahi

Introduction

The emergence of open content in 1998 and the release of 50 higher education courses by MIT in their OpenCourseWare initiative in 2002 were foundational moments in the sharing of educational content via the Web. MIT's innovative course-sharing mechanism prompted UNESCO to organise a Forum on the Impact of OpenCourseWare for Higher Education in Developing Countries, in 2002, at which the term "open educational resources" (OER) was coined. The UNESCO Forum has since been considered a major landmark in the history of the OER movement. Speaking on the occasion, Professor V.S. Prasad observed, "The OpenCourseWare concept is based on the philosophical view of knowledge as a collective social product; and so it is desirable to make it a social property" (UNESCO, 2002, p. 15).

OER are teaching, learning and research materials that are in the "public domain" or are released with an open licence that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. Public domain in the context of copyright means works whose copyright has expired or whose author has relinquished his/her rights to the public. While there have been several ways to license any material as open, in recent years, Creative Commons licences have emerged as the predominant way to share openly licensed materials. However only Creative Commons licences without the non-derivative (ND) clause can be considered "open." These licences are over and above the copyright of a work. Thus, only if you own the copyright of a work can you share it openly.

While OER can greatly improve the provision of learning opportunities for all, educational organisations (especially open universities) that depend on copyrighted distance learning materials, including textbooks, can now use OER to offer their courses and programmes far more economically and efficiently. Though

this is a very exciting opportunity, not many institutions are in a position to actually use and remix OER or know how best to integrate existing OER efficiently and effectively in teaching–learning.

Online learning has emerged as the new generation of open, flexible and distance learning (Mishra, 2001). The trend is for distance teaching institutions to offer online courses. A study by the Commonwealth Educational Media Centre for Asia (CEMCA) in 2012–13 revealed that there were about 80 online programmes on offer in Commonwealth Asia (Pulist, 2013). However, because institutions lack the capability to develop and effectively use OER, they are unable to make the most of the opportunities presented by OER. Thus, only a consumer culture for OER is currently in practice, and since educational institutions do not see the benefits of investing in OER development, at least in the low- and middle-income countries, there are not many examples of OER-based eLearning practices.

The Asia-Pacific region alone has over 40 open universities that depend on the use of printed distance learning materials. Some of these universities are transitioning to using eLearning technologies to offer their programmes. Indira Gandhi National Open University, in India, started a Post Graduate Diploma in E-Learning using OER in 2010 (Panda, 2013) (As of writing, this programme is no longer offered.) The Wawasan Open University (WOU), in Malaysia, is the first open university in the region to adopt an OER policy, having decided early in 2012 to move from a blended mode of course delivery to an entirely eLearning mode with appropriate mixtures of offline and online digital materials, including OER. WOU under the OER Asia platform conducted a study on the use of OER in Asian institutions (Dhanarajan & Abeywardena, 2013). The study revealed that among academics in general, lack of awareness, skills and time impede their engagement with the OER movement. While there is growing awareness about the benefits of OER, there is still confusion among many institutions regarding licences and copyright-related issues. The WOU study suggested a need for further capacity building in the use of digital resources and OER for teaching and learning. The 2012 OER Paris Declaration (UNESCO, 2012) also urged governments to:

- support institutions to train and motivate teachers and other personnel to produce and share high-quality, accessible educational resources;
- promote quality assurance and peer review of OER; and
- encourage the development of mechanisms for the assessment and certification of learning outcomes achieved through OER.

This was re-emphasised in the 2019 UNESCO OER Recommendation, which amongst other things places a primary focus on building "the capacity of stakeholders to create, access, re-use, adapt, and redistribute OER" (UNESCO, 2019).

Institutional Capacity Building for OER-Based eLearning

During 2012–15, CEMCA's strategic plan included provisions to assist higher education institutions with adopting OER to improve the quality of education, and with training teachers in higher education institutions using the "train-the-trainer" mode, so as to develop OER-based online courses in Commonwealth Asia.

Within this framework, CEMCA partnered with WOU to create a professional development programme on OER-based eLearning to develop institutional capacities for integrating OER at WOU, and to help develop an online programme that would be available for building the capacity of teachers interested in OER in other institutions in Commonwealth Asia.

Objectives of the Programme

At the outset, the following objectives were agreed with colleagues at WOU. Overall, it was expected that the programme would help to achieve the following:

- compile cases of OER being used in eLearning
- develop the curriculum for a course on "OER-Based eLearning"
- develop the capacities of open universities to develop their own OER
- deploy OER in eLearning using appropriate instructional design models
- assist in the development of a model programme on OER-based eLearning, using OER

Implementation Strategy

CEMCA organised a workshop at WOU to help the participants understand how to integrate OER into the teaching and learning environment and how to write scenarios, and to discuss issues about remixing and student interactions. This workshop also involved participants from other institutions in the region, such as the Allama Iqbal Open University (Pakistan), Indira Gandhi National Open University, Krishna Kanta Handiqui State Open University (India), the Open University of Sri Lanka (OUSL), Open University Malaysia, and the National Institute of Open Schooling (India). The majority of the participants were from WOU. Besides orienting participants about the concept of OER and issues with integrating OER in the development of learning materials, the workshop generated the curriculum for the programme on OER-based eLearning and a framework for writing the modules. Groups of course writers from amongst the participants were assigned to work on the modules. Each module was assigned one coordinator from WOU to work with all the contributors. A set of guidelines for writing institutional case studies on OER was also developed and shared with select authors.

A follow-up workshop was organised by WOU for all the coordinators to review the progress in developing content for the modules and to prepare the five modules in draft form. In addition to providing a common structure for the modules, this workshop also assisted with preparing a content outline for a programme guide.

Once the materials were ready, a review workshop was held to finalise the modules. This workshop helped refine the materials developed by participant teachers in the first workshop. Through constant online mentoring by a lead facilitator, the modules had reached a final stage where only some polishing was needed after the workshop. One of the highlights of this workshop was seeing the module coordinators for WOU taking leadership roles and explaining the nuances of OER integration as trained professionals.

The next step was to develop the modules and case studies into print form and convert the same into an online course to offer online training by participating institutions. A Moodle platform was created at CEMCA, and with the support of a consultant, the course site was developed. The modules and case studies were also published.

The fourth workshop in the series leading to institutionalisation of the "OER-Based eLearning" course was held at Dr. B.R. Ambedkar Open University, India for participating institutions in Asia. The objective of the workshop was to provide an overview of the online course and train tutors to offer the course in their respective institutions.

OER-Based eLearning Professional Development

As a result of the sustained efforts of CEMCA and WOU, the "OER-Based eLearning" course was developed as an online professional development programme. The learning outcomes of the course were stated as follows:

> After completion of all five modules, the participants in the online programme will be able to:

(a) Demonstrate an understanding of OER and argue in support of the use of OER.

(b) Design appropriate learning experiences for OER-based eLearning.

(c) Find and evaluate the quality of OER materials used in different contexts.

(d) Use appropriate open licences to release educational materials as OER.

(e) Offer OER-based eLearning courses and programmes using appropriate technologies.

The special features of the online programme are as follows:

- It facilitates study at the learner's workplace.
- Each of the modules uses scenarios to help situate learning.
- There is an online mentor/facilitator to provide support.
- Peer learning occurs through online discussions.
- An open badge is granted for each module and an overall badge for the programme (Figure 8.1).

Outputs and Outcomes Achieved

The Educational Technology and Management Academy (ETMA) was commissioned by CEMCA to undertake an independent evaluation of the higher education activities of CEMCA, including the OER-based eLearning project. Some of the achievements listed in the evaluation report were as follows (ETMA, 2015):

- Five modules on OER-based eLearning were developed (CEMCA, 2014) by inter-country teams who worked face-to-face during the three successive workshops and also online during the interim periods between the face-to-face workshops. It is an interesting case of cross-border academic collaboration, indicating tremendous potential for inter-institutional and inter-country collaboration for course development.

- More than 130 teachers from four countries were trained in learning through OER. This was achieved through activities held in Malaysia, India and Sri Lanka. Thirty-five teachers from OUSL and 22 teachers from WOU were oriented in five modules on OER-based eLearning. In the process, four institutional case studies (Naidu & Mishra, 2014) on OER-based eLearning were developed and published for larger outreach. The net outcome was the training and orientation of more than 185 higher education professionals to use OER and eLearning, thereby contributing to an increase in the number of knowledgeable people on the subject in the Asian region.

- A three-month online programme on OER-based eLearning for teachers of higher education institutions was developed. Two universities (WOU and OUSL) have launched the online course for their faculty members.

- About ten universities/institutions in the region participated in the programmes conducted by CEMCA in partnership with WOU.

Concepts and Practices of Open Education COMPLETED	This badge means the learner has demonstrated a reasonable understanding of the concept of OER and related concepts of openness in education; is aware of the historical background of OER development; and can critically describe various OER initiatives undertaken by governments and institutions.
Designing Learning Experiences for OER-based eLearning COMPLETED	This badge means the learner has demonstrated a reasonable understanding of how to design and develop learning experiences for an eLearning course that integrates OER.
Searching and Evaluation of OER Materials COMPLETED	This badge recognises the learner has demonstrated a sufficient understanding of the knowledge and skills required to search for and select relevant types of OER, and apply appropriate methods of evaluation to ensure the selected OER matches the intended learning outcomes.
Licensing and Copyright COMPLETED	This badge means the learner has knowledge of the various copyrights and licences associated with OER.
Integrating OER in eLearning COMPLETED	This badge means the learner has demonstrated reasonable knowledge of the eLearning environment, OER, and the ability to integrate OER in an eLearning context.
OER-based eLearning COMPLETED	This badge recognises the learner has completed all five modules of the OER-Based eLearning professional development programme.

Figure 8.1. Badges in the online course.

A significant outcome of the programme is institutional adaptation of the course developed at WOU and OUSL. While at OUSL, the course was offered to

internal staff as a professional development programme, at WOU, the programme was launched online for a wider audience through its Centre for Professional Development and Continuing Education. In the process, WOU institutionalised the course, and OER is now at the core of the organisation as a strategy for sustainability. The adaptation of the course at OUSL enhanced participants' "critical thinking, creativity, collaborative learning as well as self-esteem" (Karunanayaka et al., 2016). In WOU's adaptation of the course, there were participants from eight countries (India, Malawi, Malaysia, Mongolia, Namibia, Philippines, Trinidad and Tobago, and South Africa).

Conclusions

In retrospect, the initiative may be construed as successful if we consider the effort and investment put into implementing this activity. Over three years, CEMCA invested approximately USD 100,000 in the project, of which 23% was used for consultants, 24% for the contribution agreement (with WOU and OUSL), and the rest for workshops and publications.

What are the key successes?

We see the following three significant successes of this initiative:

1. A group of teachers who initially were almost novices to OER developed the course materials of the five modules by reusing and remixing available OER materials on the subject. Thus, they became knowledge creators and champions of OER by undergoing a series of capacity-building activities.

2. Institutionalisation of the OER-based eLearning programme occurred in two universities (WOU and OUSL) in the region, with a transformative effect on the internal practices of both universities by integrating OER into course development.

3. Inter-institutional collaborative teams worked to develop content for the five modules, leading to improved capacity in over 100 teachers not only to develop OER but also to deliver online programmes integrating OER.

What were the reasons for the success of this initiative and its impact?

We see several reasons. Some of these are:

1. The initiative planned at CEMCA was timely and need based for many institutions in the region, and CEMCA's convening power in the region helped with institutional buy-in.

2. The senior management of WOU had the vison to support OER, and WOU also had a need to adopt an OER-based course development approach to change from its "wrap-around" course material, accompanied by a free textbook, to a more economically viable model that could also reduce the content development time (Liew, 2016). The project coordination team and the module coordinators at WOU were also excited about the possible impact of the project, and that was a motivating factor.

3. Support from a leading consultant to facilitate the transformation process provided mentorship and guided the development of the learning resources.

4. Institutional buy-in at WOU and OUSL, at the senior management level and the implementation level, helped achieve the success.

What are the key lessons learnt?

While the initiative was a success from the perspective of CEMCA, there are some lessons to learn and reflect upon. It could only be implemented at two institutions, though in the beginning, six institutions from the region participated in the workshops. The initiative was based at WOU and was developed primarily to strengthen the capacity of WOU to integrate OER-based eLearning. From that perspective, we had one more institution taking up the project outputs to adopt, and adding to the overall project outcomes. However, we could have also planned for increased implementation by other institutions. The cross-country team of content developers worked well and could be a model to consider in collaborative projects. However, it also required constant monitoring and identification of the right coordinators to develop the modules. The piloting of the online course developed at CEMCA was taken up by over 40 participants from different institutions in Commonwealth Asia. However, only eight of them completed all the modules. This was somewhat disappointing. Participants indicated the workload in the five modules was quite demanding for the 15-week course. We also found that the free availability of the course might have led to low course completion. An online course as a staff development activity could work well in Asia. But an online professional development programme, if not offered as a fee-based course, may not see high completion rates.

The foregoing discussion shows that CEMCA's collaboration with WOU helped to achieve outputs and outcomes effectively in this project. Though WOU had adopted an OER policy and initiated the promotion of OER through its OER-Asia conferences and workshops well before collaboration with CEMCA, we believe the collaboration and its capacity-building support strengthened the integration of OER in eLearning at WOU.

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Researching and Evaluating Technology-Enabled Learning

Methodological Challenges in Researching the Impact of Technology-Enabled Learning: The Case of Universiti Malaysia Sabah

Kaushal Kumar Bhagat and Fong Soon Fook

Introduction

Through rapid developments in the technology sector, technology-enabled learning (TEL) has gained a lot of attention among educators. Digital penetration that includes better Internet connectivity and an increased number of smartphone users is one of the factors contributing to the acceptance of TEL in both developed and developing countries. TEL refers to the application of information and communication technology (ICT) tools in the teaching and learning process. Researchers have identified several potential benefits of TEL. For example, Liou et al. (2016) developed a highly interactive cloud classroom (HIC) using augmented reality (AR) to teach an undergraduate materials science course. The results showed that the HIC model not only increased students' academic performance but also enhanced their motivation about the topic. In another study, by Bhagat et al. (2019), the researchers integrated an AR system into the formative assessment process for environmental studies at the elementary level. This system provided real-time and informative feedback, which improved the students' conceptual understanding.

Blended learning (BL) has received significant attention in recent years (Drysdale et al., 2013). Graham (2006) described BL as a combination of face-to-face instruction and computer-mediated instruction. BL can be further defined as "the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies" (Garrison & Vaughan, 2008, p. 148). Blended learning is an instructional approach that substitutes online learning for a portion of the traditional face-to-face instructional time (Owston et al., 2013). Staker and Horn (2012) classified BL into four different models: (1) the *rotation model*, where students rotate on a fixed schedule or at the teacher's discretion between learning modalities, at least one of which is online learning; (2) the *flex model*, where students move on an individually customised, fluid schedule among

learning modalities, and the teacher-of-record is on site; (3) the *self-blend model*, where students choose to take one or more courses entirely online to supplement their traditional courses, and the teacher-of-record is the online teacher; and (4) the *enriched-virtual model*, where students divide their time between attending a brick-and-mortar campus and learning remotely using online delivery of content and instruction. In Malaysian higher education, BL is defined as "the combination of face-to-face and online delivery where 30–60% of the course content is electronically delivered. The electronic delivery can be either asynchronous or synchronous" (Ministry of Education, 2014, p. 74). A typical course delivered via BL is further defined by specific requirement with regard to the content. The percentage of content that must be delivered via BL for the period 2016–2020 was set at 50%, which comprised a course synopsis, seven teaching materials, three online activities, and two assignments.

The effectiveness of BL in improving student performance has been the subject of multiple studies across different disciplines and age groups. BL offers some advanced features beyond the traditional course offering. It includes flexibility to access the course materials, is cost-effective and provides more opportunity to interact with instructors (Castle & McGuire, 2010; Prasad et al., 2018). López-Pérez et al. (2011) found students' perceptions of their learning outcomes in a blended course were positively affected. Owston, York and Murtha (2013) investigated the relationship between students' perceptions in a BL environment and their academic achievement. The results showed a significant relationship between students' perceptions and their final grades. The researchers also found that high achievers were more satisfied in a BL mode than low achievers. The authors concluded that BL might not be suitable for low achievers. Zhu et al. (2016) conducted a study to measure the impact of self-control and self-regulated learning on students' learning outcomes in a blended mode of learning. The results showed that self-control and self-regulated learning did influence the final grades of the participants. A meta-analysis performed by Vo et al. (2017) to analyse the effectiveness of BL on students' achievement in higher education revealed a significant but small effect size compared to traditional classroom instruction. The researchers concluded that BL could result in better learning performance for students in higher education. Asarta and Schmidt (2017) compared students' performance in BL and traditional course offerings. The results showed that students in BL outperformed the students in the traditional classroom. They also concluded that high achievers performed better in BL, whereas low achievers performed better in the traditional course. In a recent study, Yang et al. (2019) studied the impact of BL in a rural area. The results showed BL had a positive impact on students' learning experiences and significantly improved their academic performance.

From the above studies, we can conclude that TEL can improve students' learning performance, motivation, engagement and self-regulation in different domains and at different education levels. Measuring the impact of TEL is an important step to ensure the quality of TEL development and implementation. However, there are many methodological challenges to conducting impact studies on TEL. This chapter explores and discusses some of the methodological issues that the authors faced during the evaluation of BL implementation at Universiti Malaysia Sabah (UMS), Malaysia (Bhagat, 2020). The study assessed the effectiveness of BL

for students' learning performance and their perceptions about BL. In addition, it examined the relationship between online activities and final scores. This evaluation was supported by the Commonwealth of Learning (COL).

Methodological Challenges

Defining the Problem

Identification of the research problem is one of the first challenges that researchers face in the beginning of their study. It is very important to conduct a proper literature review to identify specific research gaps in the particular technology implementation. This helps in developing valid research questions, which provide a research direction for the evaluation process. The research questions may be either exploratory or evaluative. In the case of UMS, the authors first identified the definition of BL from the literature. In the next step, research gaps were identified from the existing literature to develop legitimate research questions. For example:

- Are there any significant differences in learners' performance for students of different achievement levels?

- Is there any significant relationship between learners' perceptions, motivation, digital literacy, attitude towards learning and final grade in a blended course?

- What impact does a training and mentoring programme have on the teachers' experience of designing and teaching in a blended learning environment?

- Is there any significant relationship between self-regulated learning behaviour indicators (e.g., total login time) and students' learning performance?

Identification of Dependent, Independent and Extraneous Variables

The first challenge is to identify the important independent variables, which play key roles in the implementation of a learning model or the ICT tools in a learning environment. This helps the evaluator know what impact they are measuring. In the case of the UMS study, the authors identified *gender* (male, female or unknown), *mode of teaching* (non-blended and blended), *achievement levels* (low achiever, average achiever or high achiever), *online activities on Moodle* (login frequency, total post, online session and total downloads) and *type of learners* (connected learners and separate learners) as the independent variables.

The second challenge is to identify the dependent variables, against which the impact of any intervention is measured. The dependent variables are selected based on the research questions/objectives/hypotheses. There is a close relationship between intervention output and desirable impact. Therefore, selection of the dependent variables plays a key role in the evaluation process. For example, if you want to evaluate the impact of your teaching intervention on students' learning performance, then learning performance will be your dependent variable, and you need to develop an instrument to measure learning performance.

The general question arises of how to identify independent and dependent variables. Independent variables are predictors that cause changes in the dependent variables, and these changes must be observable. On the other hand, dependent variables are the variables that are influenced by the independent variables. The authors identified *learning performance*, *learning motivation* and *learner's perception of BL* as dependent variables in the UMS study.

There is a third type of variable that we need to consider: the extraneous variable. Extraneous variables are not independent variables but can affect the results of the experiment. Therefore, it is very important to control for the effects of extraneous variables so that we can measure the impact of the chosen independent variables accurately. For example, if we have selected two groups for intervention and we conducted a pre-test, and if it was found that the participants in one group in the pre-test performed better than the second group, in this case, students' previous knowledge acts as an extraneous variable, as the students in the two groups are non-equivalent.

Data Collection

After finalising the focus of the investigation, the next important step is to collect valid data. This process depends on your research design and sampling process. Based on your research question, data collection also depends on the nature of the data — whether it is quantitative or qualitative.

Sampling is one of the important stages of data collection. This involves the selection of the participants from a target population. There are five different types of sampling: *convenience*, *random*, *systematic*, *stratified* and *cluster*. In convenience sampling, participants are selected based on their will and availability. This means the possibility of getting biased results. In random sampling, each subject has an equal probability of being selected in the example, so there is less chance of selection bias. Systematic sampling refers to the selection of participants from a population based on an ordered sampling frame. In stratified sampling, the population is divided into subgroups, and the members of each subgroup have similar characteristics; members from each subgroup are then selected randomly. In clustered sampling, the population is split into groups, called clusters, and then clusters are selected randomly (Bhattacherjee, 2012; Creswell, 2014).

There are two types of research design: experimental and non-experimental. Experimental can be classified into quasi-experimental and true experimental design. In true experimental design, participants are assigned to different groups randomly, whereas in quasi-experimental design, assignments are not random. Randomisation helps to reduce the effects of external influences on the results of a study (Koh & Owen, 2000). A non-experimental design includes the survey method, observational research, and cross-sectional research. It is always advisable to employ experimental research, as it provides the opportunity to manipulate the independent variables.

A sufficient sample size is an important issue and depends on many factors. A small sample size may lead to non-significant results. In an intervention study, the sample size must be at least 80–100. In the case of a survey study, it is always advisable to have at least 200 (Hair et al., 2006). There will be situations where

participants will not be willing to share information or complete the survey. This may not help with getting more responses from the participants and achieving an ideal sample size target. Qualitative data always enhance the results obtained from quantitative data. Therefore, if possible, the evaluator should conduct personal interviews or class observations to collect qualitative data. Interviewing participants is an important and sensitive stage of data collection. The evaluator must develop trust with each participant so that the subject can share their thoughts freely and without hesitation.

In the case study of UMS, the authors employed both a quasi-experimental design and a survey method. A total of 792 students participated in the survey, which is an ideal sample size (Dell et al., 2002). In addition to quantitative data, the authors collected feedback from the students about their experience of BL and interviewed faculty members who had employed the BL model in their teaching process.

Instruments for Data Collection

The quality of data depends on the validity and reliability of the instruments used for data collection. The evaluators can either use existing instruments or develop their own. Both scenarios have challenges.

To use existing instruments, you need to do a comprehensive literature review and find the instruments that are relevant to your research. Existing instruments are culture and language sensitive, so one needs to be very careful. The evaluator must go through the instruments and make the required changes before piloting. For example, if one has to select an instrument that was developed and used in the United States for further use in mainland China, first, the language needs to be translated. It is advisable to conduct a pilot study of the existing instruments in their own context and check their reliability and validity.

The development of a new instrument requires a lot of time and effort. The items in the instrument must be very specific, easy to understand and few in number. An ideal instrument should consist of four to five dimensions, and each dimension should have three to six items. Long questionnaires can generate boredom or irritation in participants, leading them to answer carelessly, which results in measurement error (Donnellan et al., 2006). Many empirical studies have shown the advantages of short questionnaires over long questionnaires in terms of effective response rate (Harris, 1997; Salisbury et al., 2005). The authors used existing instruments to measure learners' motivation and digital literacy, and developed a survey to measure students' perceptions of BL.

In the present research, a total of 2,068 students enrolled in different BL courses. However, during the data collection, only 792 students (38.2%) responded to the survey. The authors faced many challenges in data collection. First, the authors employed multiple scales to measure different dependent variables. Long and complicated survey forms can result in either no response or random responses. Therefore, it is suggested that researchers prepare their survey with fewer items and use simple language as far as possible. Second, the team involved in getting official approval and implementing the survey were not sufficiently trained. A team needs to have the whole survey process explained; this makes the process easier. Third, we faced difficulty in getting necessary approvals from the university authorities to access students' previous academic records. Therefore,

when planning the project's timeline, it is important to allow sufficient time to get all necessary approvals. All the students participated in the survey voluntarily. Completion of the survey generally took at least 30–40 minutes, depending on the number of survey items. Hence, it would have been better if the participants had been offered incentives, such as gift cards or coupons.

Selection of Appropriate Statistical Analysis

Applying appropriate statistical analysis is a key step in the evaluation process. For quantitative data analysis, an independent sample *t* test, a Pearson correlation coefficient, a likelihood-ratio test analysis of variance (ANOVA), an analysis of co-variance (ANCOVA), a multivariate analysis of variance (MANOVA), a multivariate analysis of co-variance (MANCOVA) and step-wise regression analyses can be used, depending on the independent and dependent variables in one's evaluation. The authors used an independent sample *t* test to compare the learning performance of the students in the non-blended and blended groups. In this case, there was only one dependent variable (learning performance) and one independent variable (learning group). Therefore, an independent sample *t* test was suitable. It has been observed that many researchers use multiple *t* tests to compare groups if there is more than one dependent variable. Multiple *t* tests increase Type-I errors, which affect the results, and therefore they should be avoided. In such cases, MANOVA should be used instead of multiple *t* tests. The authors employed a step-wise regression model to ascertain which self-regulated learning behaviour indicators predicted students' final scores.

Determination of the reliability and validity of the developed scale for the survey involves many steps. The first is to check the sampling adequacy for the exploratory factor analysis (EFA). The authors checked the missing values in the data. The normality of the data was examined through inspection of skewness and kurtosis. Recommended cut-offs for skewness and kurtosis are |3| and |10|, respectively (Kline, 2005). In addition, results from the Kaiser–Meyer–Olkin measure of sampling adequacy (KMO) and Bartlett's test of sphericity were calculated for the factor analysis. A principal component analysis (PCA) with varimax rotation was used to determine the factor structure from the collected data. An initial analysis was run to obtain eigen values for each factor in the data. According to Hair et al. (2006), only factors with an eigen value greater than 1 are considered representative. Confirmatory factor analysis (CFA) was then undertaken to establish the structural validity of the scale. In addition to model fit indices, and in order to examine the validity of the scale, it is also necessary to estimate composite reliability (CR) and average variance extracted (AVE), which can be obtained from CFA (Fornell & Larcker, 1981; Hair et al., 2006). According to Hair et al. (2006), for convergent validity, the factor loadings of each item should be greater than 0.7, CR should be at least 0.7 and AVE should be greater than 0.5.

Aspect-based sentiment analysis was performed on students' views about the blended course, collected from the responses. For this purpose, first, the authors trained on the model with the data set to perform document-level sentiment analysis, which categorised the sentiments into three levels of polarity: positive, negative and neutral. Next, the test-batch file was uploaded, and the output was generated as an .xlsx file with three columns: feedback, polarity and confidence

level. After that, the model was trained to perform aspect-based analysis. An activity theory framework was employed to analyse the in-depth interview data collected from the faculty members who instructed using the BL mode. Based on the instructors' interview results, an activity system was developed. Aspect-based sentiment analysis requires a large amount of qualitative data. Therefore, researchers need to make sure they have collected the required data from a large sample size. A research interview is an important qualitative data tool that provides a lot of information for depth analysis. Before the interview, the researcher should develop interview questions that are more structured and less open. During the interview, it is important to make the interviewee comfortable and establish a good rapport, which will build trust between the interviewer and interviewee. Building trust helps the researcher extract a large, rich amount of the interviewee's experiences during the intervention (McGrath et al., 2019).

Concluding Remarks

We discussed in this chapter the critical methodological challenges faced by evaluators in evaluating the impact of technology-enabled learning, such as blended learning. We suggest following an appropriate sampling process and research design. Random sampling should be followed as far as possible because of its several advantages over other sampling processes. Use of appropriate statistical analysis will help to avoid unnecessary measurement errors. Therefore, the data analysis method should be chosen wisely based on the identified dependent and independent variables. Researchers frequently use surveys in TEL studies. It is important to remember to validate the survey before implementation. Addressing the above discussed methodological issues will help researchers collect quality data and improve the research quality of TEL impact studies.

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Understanding TELMOOC Design and the Learner Experience

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Introduction

"Introduction to Technology-Enabled Learning" (TELMOOC) is a massive open online course developed by the Commonwealth of Learning in partnership with Athabasca University. The purpose of TELMOOC is to provide an accessible learning opportunity to teachers, particularly across the Global South, in the use of technology and open educational resources (OER) for teaching and learning. Consistent with the Commonwealth of Learning's vision of learning as a means to empowerment, economic growth and social inclusion, and Athabasca University's commitment to global research in open learning, the longer-term goal of TELMOOC is to encourage local implementation of open, technology-enabled courses and programmes and to support the development of locally based networks for educational change.

Over five weeks, the course introduces the benefits, principles and specific applications of integrating technology into education, as well as OER and theoretical frameworks for technology-enabled learning (TEL), including the community of inquiry (CoI) framework and the Technological Pedagogical Content Knowledge (TPACK) model. Each week, a new unit of materials is released, with initial concepts presented by the instructor through short video segments followed by lessons structured around a series of Read, Review, Respond, and Explore activities, in which participants are asked to read more deeply into the topic, review online resources or tools, and respond to discussion prompts in the lesson forum. At the end of each week, participants working towards certification take a short quiz based on their content knowledge, with the option to complete a technology-enabled lesson plan at the end of the course to demonstrate practical application of the course material and achieve a higher level of certification.

Alongside these structured learning activities, the course also provides some measure of open-ended, connectivist (Siemens, 2005) opportunities in the learning environment. Here, participants are invited to generate their own topics for discussion, share resources, and request or offer support to their fellow learners. While these more self-directed, open education opportunities have been described as problematic in MOOC design (Bell, 2011), the inquiry-based blend of structure and openness appears to support a wide range of learners. In particular, these participant-generated topics allow learners to share stories, introduce issues or obstacles in applying educational technologies in their own local context, and draw upon the experiences of others in similar settings, allowing for a more practice-based, contextualised, and locally relevant learning experience than would be possible through the structured material alone (Crosslin, 2016). From earlier testing of MOOC design and delivery, we choose to support this connected, networked learning with carefully designed facilitator and instructor support. To further enable this connectivist learning, the course team includes several facilitators who monitor and guide participants to useful topics, and a faculty member who orchestrates the activity as a whole, highlighting and summarising emergent themes through regular video-based announcements.

Each iteration of the course draws approximately 2,500 registrations, for a total of approximately 10,000 registrations to date. Although intended primarily to support the educational development needs of Commonwealth countries, TELMOOC has, over its first four iterations, included participants from 136 countries worldwide, with the majority of registrations from the Global South, including Southeast Asia, the Pacific nations, Africa and the Caribbean. India has consistently been strongly represented in the student numbers, as has Canada, the home nation of the two course development partners. Targeted marketing efforts for each iteration, combined with local promotion through ministries of education and institutions, have been successful in increasing both registration and completion numbers in specific areas, including Bangladesh, Fiji, Greece and Rwanda, creating over time a highly diverse, global participant base, while traditionally dominant nations in MOOC participation, including the United States, have only a minimal presence in the course.

Participants of informal learning opportunities such as MOOCs can be expected to have a number of learning intentions, not all of which may align with conventional measures of success such as completion rates. In the Global South, where opportunities for recognition of professional development may be rare or even inaccessible, the certification of course participation and completion have proven to be popular and highly valued; as the course has matured and both the design and expectations have been clarified, certification rates for TELMOOC have risen from 9% to 28%, with the majority of certificates awarded at the higher, application-oriented level. Recent research and evaluation work has begun to explore both the local and the long-term impact of TELMOOC as a means for promoting TEL and educational development globally.

Background Information

The design and delivery of any MOOC takes significant thought and activity. As members of the Athabasca University staff and faculty, we must conduct any such distance, distributed and digital teaching and learning experience with

reference to our mission: to remove barriers to learning and provide the greatest accessibility possible.

MOOCs are a recent but very popular phenomenon, garnering much attention from administrators looking to reduce the cost of education, and educators looking to increase access. Rigorous research into savings and efficacy, however, is in short supply. As a team of experienced distance and online educators, we guided this MOOC design project with (i) our expertise in online instructional design and technology for learning and (ii) our commitment to cost-effective design and delivery. The currently available general information sources on MOOCs are also in use, including a published synthesis of available information sources (Liyanagunawardena et al., 2013; Sanchez-Gordon & Luján-Mora, 2018) and other research outlining the benefits and challenges of this new education form (Joksimovic. et al., 2017; Walji et al., 2016).

In the current context of an evolving distance education and the digitising of higher education, online learning offers opportunities for a more engaging and collaborative experience than the traditional versions of industrial distance education or transmission models in higher education. We engaged in this MOOC design exercise with this view in mind. We also considered what we thought were possible design limitations of the earliest versions of MOOCs, the so-named xMOOCs and cMOOCs. Briefly, cMOOCs offered too little support, especially for those without high levels of education, and xMOOCs tried to create the scale provided by industrial distance education, without the necessary scaffolded instruction of five generations of distance education (Taylor, 2001). Davidson (2012) suggests that "far too many of the MOOCs . . . use talking heads and multiple-choice quizzes in fairly standard subject areas in conventional disciplines taught by famous teachers at elite universities." This is a likely extension of the teaching model used in lecture-based delivery in place-based institutions. It is unrealistic to expect the MOOC initiative to contribute to higher and K-12 education without careful reference to existing instructional design requirements in online design and delivery.

Many of the qualities for which MOOCs are praised are general attributes of online learning. Like any type of online education, MOOCs can (i) increase access, (ii) foster equity in the learning environment, as they are colour and gender blind and class neutral, (iii) create affordable, convenient learning opportunities and (iv) develop expanded learning skills for students, related to self-direction, self-regulation and collaboration. Online opportunities can provide quality education to an increasing audience previously left out of elitist, geographically bound and expensive place-based higher education. MOOCs take this a step further, allowing free access to any interested party who signs in and partakes of the experience. However, it is not yet clear whether these new versions of online learning carry all the requirements of a sound, measured learning experience with appropriate and necessary outcomes (Shah, 2017; Walji et al., 2016). MOOC design should borrow from small-scale online design and delivery as well as face-to-face models where applicable, but it will also need to move beyond.

Material and activity choice play a part in the instructional design process:

> Instructional Design (ID) is part creative arts and part science
> which utilizes theoretical as well as practical research in the areas

of cognition, educational psychology, information technology, graphic and Web design, and problem solving. ID aims to create the best instructional environment and learning materials to bring a learner from the state of not knowing, not feeling or not being able to accomplish certain tasks to the state of knowing, feeling and being able to accomplish those tasks in a given subject area through carefully organised interactions with information, activities and assessments. (Sheninger, 2016, p. 18)

We hypothesised first that earlier MOOC design offerings only approximated sound instructional design, as described by longstanding distance education ID models such as Dick et al. (2005) and Morrison et al. (2004). Additionally, we thoroughly explored the CoI theoretical framework for online design and delivery (Garrison et al., 2000).

Teaching Presence as Defined by the Community of Inquiry Framework

In keeping with research that demonstrates teaching presence as a key to success in online learning (Akyol & Garrison, 2008; Garrison et al., 2010; Kozan & Richardson, 2014), TELMOOC was designed with three levels of teaching presence, as represented by instructors in various roles. First, the lead course instructor offered direct instruction and consistent presence through the use of a combination of pre-recorded video and pre-set text segments. This instructor acted as the figurehead of academic quality and offered continuity throughout the course. This served as the element of direct instruction. The second layer of teaching presence guided participants through the design and organisation of the course, reviewing direct instructions and responding to common themes or discussion threads. This "Inspirer" role had both cognitive and social elements in the presentation style and content. The third level of teaching presence was "Facilitators," who responded to learner emails, discussion board posts, and activities.

The aim of the facilitated forums is to help establish focused learner support networks within the MOOC. Instructor–learner interactions and learner–learner interactions, on both social and academic topics, are encouraged throughout the course. As TELMOOC was offered over time, the planned amount of instructor-initiated activities from both the "Inspirer" and the "Facilitators" was scaled back to encourage further learner–learner interactions. The number of Facilitators was reduced from one Facilitator for every 100 participants to one Facilitator for every 250 participants. In addition, facilitation techniques to encourage more learner–learner interactions were employed.

TELMOOC is a course in TEL that is offered according to the subject matter being taught. This uniqueness requires careful and continuous review for consistency between what is being taught and how the course is being delivered. The outcomes of this unique MOOC design will be reported in further publications. Some of the results are outlined below.

Research Question

Based on consistent participant performance and testimonials observed in the fourth offering of TELMOOC, we believe that participants place a high value on the course

content and experiences. Our research question guiding this deeper exploration of specifically what benefit TELMOOC participants are finding from the course was: What did the TELMOOC provide that adds to or changes your teaching practice?

Methodology

Recent research and evaluation work has begun to explore both the local and the long-term impact of TELMOOC as a means for promoting TEL and educational development globally. When considering the impact of educator learning experiences, we need to consider the additions or changes to educator practices when they develop and deliver education for their students. Examining data collected from TELMOOC 4 (Cleveland-Innes et al., 2020), we provide evidence that course participants place considerable value on the content and experiences of the course.

In the fourth delivery of the TELMOOC, there were 2,425 registrants originating from 84 countries worldwide, including Bangladesh (11.3%), Fiji (14.6% registrations) and India (11.7%). The participants represented all levels of education, from early education to university, as well as government and other organisations. One measure of the success of the refined TELMOOC (being the fourth iteration of the course) was the 685 certificates awarded (154 Participation certificates and 531 full Completion certificates). This resulted in a certification rate of 28.2%, the highest certification rate of TELMOOC offerings to date (Cleveland-Innes et al., 2020). This completion rate is considerably higher than typical MOOC completion rates, which fall under 10% (Khalil & Ebner, 2014). While conclusions cannot be drawn from the certification rate alone, it does indicate that participants are finding value in the course and the certificate awarded.

In this study, data were collected from two separate sources. Firstly, a question was asked of participants in a general forum post. Secondly, the TELMOOC post-course survey asks participants several questions related to the value of the TELMOOC to the participants' education practice. The limitation of the data set is that it is comprised only of statements that teachers self-report. Despite this limitation, the findings highlight the value educators ascribe to TELMOOC participation as a professional learning experience. As TELMOOC content is about TEL theory and practice, we wanted to know what elements were particularly beneficial for improving or expanding education practices that utilise digital technology.

Findings

The rich data available in TELMOOC provided multiple opportunities to verify course outcomes. For this segment of our work, we focused on the question: What kinds of practice learning occur, if any, as a result of educator participation in TELMOOC? The first data set was collected from participants who chose to answer a question posted to one of the general course forums. Upon completion of the fifth week of the TELMOOC activities, the live course instructor (the Inspirer) posted and pinned a question into the general forum section of the course LMS. Pinning meant the post would remain at the top of the general forum list, so it would continue to appear each time a participant chose to view the general

forums. In this way, the forum was made more noticeable than other general forum threads, which were created by course participants. The question posted in this forum was "What do you believe this course has provided that will change your teaching practice?"

A total of 178 participants posted a reply in this forum, most of whom did so within 48 hours of it being posted. This convenience sample of participants provided 178 responses in total, of which 162 or 91% were valid responses to the question posed (16 answers were discarded). The 162 valid responses were analysed, and four codes emerged from an initial round of coding where 231 distinct code instances were identified. The four codes were: learned more about TEL, improved TEL teaching practice, learned about OER, and gained confidence with TEL. The results of this coding are presented in Table 10.1.

Table 10.1. Responses to "What do you believe this course has provided that will change your teaching practice?"

Code	Code Instances	Percentage of Total Codes
Improved TEL teaching practice	83	36%
Learned more about TEL	79	34%
Learned about OER	61	26%
Gained confidence with TEL	8	4%
Total	231	100%

The second data set collected is the end-of-course survey results. In TELMOOC 4, this survey was completed by 349 participants out of 2,425 registrants. The survey results indicate a very positive response to TELMOOC 4, with 303 (94.4%, $n = 321$) agreeing or strongly agreeing with the statement, "Overall, I was satisfied with TELMOOC," and 311 (95.4%, $n = 326$) agreeing or strongly agreeing with "TELMOOC met the learning objectives." Some of the respondent evaluations of the course and its delivery are summarised in Table 10.2.

Table 10.2. Course satisfaction and valuation by participants.

Survey Statement	Agree or Strongly Agree (%)
Overall, I was satisfied with TELMOOC.	94.4%
The TELMOOC experience will assist me in the use of educational technology for teaching and learning.	94.7%
The course activities reinforced the course material.	90.2%
The course material was of good quality.	90.8%
Assignments were helpful for acquiring knowledge and skills.	91.1%
The quizzes helped to test my knowledge.	92.9%

Survey responses about the instruction and community aspects of the course were more mixed, as shown in Table 10.3. Of the three layers of instruction, it appears that participants responded slightly more positively to the Inspirer role, a rich and multi-dimensional one that combines instruction, direct student support, assessment and a more personal presentation through weekly videos that respond directly to activity in the course.

Participants responded very positively about the practical benefits of the discussions, seeing them as a useful resource. Similarly, although they may have had more mixed responses for any particular role within the community, they nevertheless felt a strong connection to that community, with 87.3% agreeing or strongly agreeing with the statement, "I felt like I was a part of a community in the TELMOOC." This might suggest some uncertainty about the individual roles played by the Inspirer versus the Facilitators, for example, but nevertheless an appreciation of the whole.

Table 10.3. Evaluation of the course and COI engagement.

Survey Statement	Agree or Strongly Agree (%)
My learning was supported through facilitation by the roving instructors.	78.4%
My learning about TEL was supported through my discussions with other students.	75.3%
My learning about TEL was supported by reading other student posts.	79.3%
TELMOOC discussions provided me with information about resources that I will be able to use in my own teaching.	89.2%
I felt like I was part of a community in the TELMOOC.	87.3%

The end-of-course survey also allowed for open-ended suggestions and feedback. A considerable number of respondents used this opportunity to thank the course organisers and to describe the value of the course for their practice:

> "TELMOOC has come at the right time when we need it most. In fact, we needed it like yesterday. Thumbs up to the never relenting instructors, facilitator and my fellow participants. It was a journey worth taking."

> "I learned a lot about using technology in education. In my teaching there are many constraints (internet is available but our school has one projector that is shared by all instructors, classrooms are outfitted with just desk-chairs and whiteboard, projector has to be moved from one room to the next, students would have to use their personal devices to access the internet and some do not have). Despite these however, the course was helpful in locating media and determining what is best suited for use. I would like to say thanks to our instructors who were instrumental in delivering high quality instruction. It will take my delivery to a higher level."

> "The TELMOOC on technology in education was well thought out, planned and orchestrated. Thank you to the entire team, for your

time, your timely responses [and] other resources; and for imparting much needed knowledge."

One of the important questions that surrounds educator professional development activities is: How do they impact the teaching practices of educators? We explore this in the following discussion section.

To frame the data in a way that answers our question — i.e., to determine what kinds of practice learning occur as a result of educator participation in TELMOOC — we used the KSA (Reh, 2017) or Knowledge, Skill and Ability framework. Reh (2017) states that this framework is often applied to employment or hiring scenarios, but we feel it can also be used for understanding training or developing a globally distributed educator workforce. In addition, we consider educators a distinct professional group, for whom their professional development (PD) learning must engage them in authentic, practice-situated, collaborative experiences (Borko, 2004). These KSA and PD elements provide us with an approach from which we can view and evaluate learning that results from TELMOOC participation.

Discussion

Skills

The first type of learning evidenced as a result of MOOC participation is about how to engage in online learning. Not only are more teachers today able to engage with technology in the classroom, but also there is more technology in the personal lives of teachers than ever before. At the same time, many mature-age teachers were educated before digital technologies existed in education settings. Learning about online learning is a skill-development type of learning. Therefore, exposure to online teaching — including both online pedagogies and technologies that make online teaching possible — is one of the skill-development outcomes that TELMOOC provides. The specific skills developed in an online course include: accessing online documents and content videos, discussion forum participation, sharing online resources, accessing and sharing website hyperlinks, conducting online assessments, and using/navigating a learning management system. Evidence that the TELMOOC experience provides these skill-development opportunities can be seen in all codes presented in Table 10.1. Similarly, in Table 10.2, participants reported 91% agreement that "assignments were helpful to acquire knowledge and skills." The following participant comments describe this skill development in their own words:

> "This course was an eye opener for me, it has provided me with technical knowledge and skills to maneuver around an MOOC it has also allowed me to comprehend how to engage our students on an online platform."

> "I am already designing and offering online courses under [the] MOODLE platform. I gained certainly reasonable knowledge and skills in designing and delivering online courses better for effective learning experience."

Knowledge

The second type of learning that occurs in the TELMOOC is learning about the content that comprises the subject matter of the course. One of the global challenges for educators is to be able to access content experts to support their development of knowledge that will support TEL, particularly since digital technologies are continuously evolving. An even more critical challenge is to be able to access these content experts at a time that is suitable to busy teacher schedules. The TELMOOC provides for this, as it offers anytime, anywhere digital access to content, removing the need for teachers to be physically present at a specific time and place. At the same time, the content experts are often available to guide discussions and answer questions regarding the content. So content or subject-matter learning specific to the needs of the teacher is a type of knowledge learning that is occurring as a result of MOOC participation. Evidence of this type of learning is found in Table 10.1, where 60% of the learning was reported by participants as learning more about TEL or OER. In Table 10.3, there is 75–89% agreement with statements that indicate learning in the TELMOOC online community supported their learning about TEL. Learning from others' forum posts or participation in online discussions allows participants to situate the knowledge in their own context. Two participants stated that knowledge about OER provided significant value for their teaching practice:

> "The most valuable lessons for me were related to finding OERs and understanding permissions. I have already found some new resources to complement my current courses."

> "The most significant change that will guide me in my teaching is to always look for OERs which will enable me to prepare my lectures in a way that my medical students can also utilize those OERs."

Ability

A final type of learning that can be considered in the TELMOOC course experience is the development of abilities. Participation in TELMOOC provides an opportunity for educators to develop the skills of an online learner by engaging in TEL, including using online tools, technologies and a CoI educational design. This then supports educator development of online and blended teaching abilities as a result of participation. Participant comments that reflect this refinement of educator ability describe this more clearly:

> "This course has augmented my ability to facilitate online."

> "This course has made me more aware of the positive and negative impact of technology in the classroom. With this awareness, it has enabled me to use technology to be more effective in my teaching styles and how to use technology to enhance the learning outcome of my students."

Finally, we can consider how the TELMOOC provides authentic, practice-situated, collaborative experiences for educators, which Borko (2004) states are some of the critical aspects of professional development. Table 10.3 provides evidence of the value of collaborating with other TELMOOC participants.

In summary, exploring KSAs as a framework for describing learning resulting from TELMOOC activities provides one way for us to evaluate and articulate their value to a profession or credentialing organisation. Furthermore, the teaching profession is likely not the only one that can greatly benefit from MOOC participation, particularly since TEL is a large component of many other professions. As one participant put it:

> "I am a university student and, to be honest, teaching as a profession does not appeal to me. However, I believe that some of the information I gathered from this course may be of help to me, regardless of what profession I might choose."

Conclusion

We interpret the high levels of participation, engagement and completion of our multiple offerings of TELMOOC as evidence of scalable, community-driven, inquiry-based, high-quality course offerings. In our testing of this MOOC design, we have enough evidence to encourage us to continue to explore "the possibility for innovative instructional designs to support self-regulated learning" (Zawacki-Richter et al., 2018, p. 248) via MOOC experiences. The emphasis here is on the word "support," as no definition of self-directed learning requires the absolute exclusion of self-directed social learning.

In addition, for this particular MOOC topic, using the knowledge, skills and ability elements of learning outcomes has allowed us to gain a clear picture of the value of this topic, technology-enabled learning, for educator practice. In one participant's words: "There has been a huge impact on the evolution of computer usage and the integration of newer technologies in my mode of teaching as influenced by TELMOOC. It makes the prospect of communication and collaboration possible and therefore improve[s] my skills, knowledge and experience in teaching practice."

Technology-enabled learning is an ever-evolving component of the digital age, and while educators may use digital technology tools in their daily lives, using TEL in their education practice requires ongoing professional development and experiences. It is clear that programmes like the TELMOOC that can reach educators when they have time, on their own digital devices, and that engage them in meaningful discussions situated in their own contexts, have considerable value.

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Evaluating MOOCs' Long-Term Impact: A Theory of Change Approach

Leigh-Anne Perryman

Introduction

MOOCs are increasingly positioned as helping achieve educational equity in the Global South (Laurillard & Kennedy, 2017), often in connection with Sustainable Development Goal (SDG) 4: "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." However, some argue that MOOCs strengthen the dominant academic culture of the West, to the exclusion of alternative voices, "exacerbating existing educational divisions" (Czerniewicz et al., 2014, p. 122). Consequently, there have been calls for more locally relevant MOOCs in the Global South with respect to both pedagogy and content. There has also been demand for rigorous evaluation of MOOCs' long-term impact on learners and other stakeholders in diverse contexts, in order to ascertain whether such courses are achieving their intended outcomes.

This chapter details a new approach to evaluating MOOCs' long-term impact on participants and other stakeholders, across diverse contexts. The approach, which adapts the "theory of change" (ToC) model, common for planning and evaluating international development interventions, is particularly suitable for evaluating professional development-focused MOOCs.

The Evolution of MOOC Evaluation

An evaluation of a MOOC's long-term impact on professional practice might usefully ask:

- What is the course's impact on participants' attitudes and behaviour, especially their professional practice?
- How does this impact vary across diverse contexts?

- What factors have contributed to and/or limited this impact, and how do they differ across diverse contexts?

- What is the course's impact on stakeholders other than the participants themselves — for example, on participants' colleagues and peers, on other people with whom participants have professional relationships (e.g., learners, patients, service-users or clients), on institution/organisation leaders, and on society more generally?

The model introduced in this chapter addresses each of these areas and stands at the end of a MOOC evaluation timeline spanning over a decade.

Connectivism and MOOC Evaluations

The earliest MOOC evaluations can be seen as ahead of their time in focusing on learners' experiences as part of a network rather than on quantitative accounts of demographics and completion rates — a feature of many subsequent evaluations. A reason for this is that the first MOOC — "Connectivism and Connected Knowledge" (CCK08), launched in 2008 — was based on the principles of connectivism (Siemens, 2005), which sees learning as happening in the connections between people and digital artefacts within the context of a network.

Connectivism-focused MOOCs, or cMOOCs, dominated early evaluations. Of these, both Fini (2009) and Mackness et al. (2010) focused on CCK08. Fini (2009) was unusual in considering the impact of contextual factors such as time constraints, language barriers and ICT skills on learners' attitudes towards learning network technologies but, in common with other early evaluations, did not consider impact beyond the end of a course. It was some years before evaluations returned to considering learner context. Mackness et al. (2010) focused on the four key characteristics of connectivist online courses suggested by Downes (2009) — autonomy, diversity, openness and connectedness/interactivity — identifying inherent tensions between these characteristics, but did not develop a formal evaluation framework around these characteristics.

The launch of two further cMOOCs in 2010 and 2011 — "Personal Learning Environments, Networks and Knowledge" (PLENK10) and "Connectivism and Connected Knowledge" (CCK11) — resulted in another group of studies focused on networked learning. Milligan et al. (2013) observed that this "led to the emergence of a rather unusual research base where a small amount of empirical research, published in niche journals and peer-reviewed conferences, is supplemented by a large body of more anecdotal and reflective research published outside the traditional peer-reviewed journal system."

Kop and various colleagues dominated the empirical research. Kop and Fournier (2010) based their study of PLENK10 on Bouchard's four-dimensional model of learner control and combined data regarding participants' opinions of their experiences with analytics data and virtual ethnography, yielding a fairly broad picture. Stewart (2010) considered whether prior social media literacies among PLENK10 participants correlated with reported value experienced from the course (they didn't), but the value of the study was limited by a very small sample ($N = 40$) and the inappropriate use of quantitative statistics despite the small sample size. Kop (2011) considered the levels of learner autonomy, presence and

critical literacies required in active connectivist learning in her mixed methods evaluation of PLENK2010 and another MOOC by the same team, but the study was light on detail. Kop et al. (2011) covered both PLENK10 and CCK11 in their investigation of the roles of educators and learners in creating networked learning experiences, and Levy (2011) also focused on PLENK10, with a study of learning and interaction in the course through the lens of his own experiences as a participant. None of the CCK08, PLENK10 and CC11 studies either focused on impact beyond learners' study of the course or used a formal evaluation framework as the basis for their evaluations.

The Dominance of Quantitative Studies

Following the early focus on cMOOCs, MOOC evaluations between 2013 and 2015 were dominated by quantitative studies of factors easily measured at scale — for example, completion and retention rates and learner demographics (e.g., Clow, 2013; Guo & Reinecke, 2014; Kizilcec et al., 2013; Liyanagunawardena et al., 2013; Yang et al., 2014). Deboer et al. (2013) correlated clickstream-based data about learner participation with survey-derived information about learner demographics in their quantitative study of the first MIT MOOC, "Circuits and Electronics." Campbell et al. (2014) used surveys, learning analytics and clickstream data to explore the similarities and differences between the learning paths of live learners and archived learners in two Coursera MOOCs on statistics and programming. Again, though, none of these studies looked at the impact on learners and other stakeholders after a course had ended, nor did they consider the significance of contextual factors as enablers of or barriers to impact and participation. To date, MOOC evaluations still tend to use quantitative methodology, perhaps because of the availability of large datasets for these massive courses and the affordances of learning analytics.

An Increased Focus on Learners' Experiences

By 2013, increasing numbers of evaluations were focusing on the learner experience, looking at topics such as the relationship between MOOC structure, content and pedagogy and participants' achievement of the course learning outcomes (Creelman et al., 2014), the intentions of MOOC learners (Campbell et al., 2014; Reich, 2014), learner self-regulation (Hood et al., 2015), learning paths across several MOOCs (Perna et al., 2014), patterns of engagement in cMOOCs, and the significance of learners' skill level, motivation and disposition (Milligan et al., 2013). The focus on learners' experiences during their study of a MOOC has continued to the present day, alongside plentiful evaluations of MOOC quality, exploring the effectiveness of structure, content and pedagogy in terms of participants' learning experience and their achievement of course learning outcomes (e.g., Creelman et al., 2014; Gamage et al., 2016; Margaryan et al., 2015). Veletsianos and Sheperdson (2016) give a useful overview of empirical MOOC studies produced between 2013 and 2015.

Of the studies focusing on learners' experience, several (e.g., Fini, 2009; Haggard, 2013; Koutropoulos & Zaharias, 2015) consider context-related barriers to and enablers of participation, including non-relevance of the content offered, the languages of instruction, the diversity of learning needs, and cultural differences

in pedagogy. More recently, Bonk and Lee (2018) and Jain (2018), amongst others, have discussed participation barriers related to technology and Internet access. Henderikx et al.'s (2019) study of the factors influencing the pursuit of personal learning goals in MOOCs gives a useful summary of the barriers to MOOC participation that have been identified to date.

Evaluations Focusing on Professional Development

Since the first MOOC was launched, a slowly growing body of evaluations has focused on the use of MOOCs for professional development, dominated by those covering medical and health education. Of the earliest evaluations, Sneddon et al. (2010) are very distinctive in addressing the long-term impact on professional practice of the FutureLearn MOOC "Antimicrobial Stewardship: Managing Antibiotic Resistance" as early as 2010. The use of a post-course survey and a second survey six months later is a strength of the study. However, a fairly small sample size and the fact that the respondents for the two surveys were not identical limited the study's value, and the authors confirmed that "measuring . . . real impact on clinical practice remains a challenge" (p. 1091).

By 2013, MOOCs' function as professional development was beginning to be considered more widely — for example, Kleiman et al.'s (2013) study of MOOCs as training for teachers where resources are scarce, and Vivian et al.'s (2014) study of the design and implementation of a MOOC aimed at supporting Australian teachers with the implementation of a new computing curriculum. Both studies considered short-term impact on MOOC learners' practice, but neither evaluated the longer-term impact of MOOCs on participants' practice and on other stakeholders, and neither considered the influence of context on learners' study outcomes or used an evaluation framework.

These shortcomings are common amongst other evaluations addressing professional development. For example, Stephens and Jones (2014) considered short-term impact on MOOC participants in their survey-based study of professional development MOOCs within Library and Information Services. Pre- and post-course surveys were used to collect data about learners' expectations and motivations for enrolling in MOOCs, opinions regarding the course design and course content, and perceptions regarding the course's value as a professional development tool. However, the study did not consider contextual factors that might enable or inhibit impact, or any other causal factors that might explain the apparent impact of the course. The lack of attention to the complexities of causality remains to the present day and is addressed by the ToC-based model featured in this chapter.

A Focus on Context in Professional Development-Related MOOC Evaluations

Hood et al.'s (2015) evaluation of the Coursera "Introduction to Data Science" MOOC is one of the earliest studies to examine a course's impact on learners' professional practice while also considering the significance of context. They conclude that their study, which addresses the impact of self-regulated learning levels on learners' performance, "provides empirical evidence that a learner's current context and role influences their learning in a MOOC," that levels of

self-regulation can help explain variance in learners' practice when studying a MOOC, and that learners who are already working in the area that is the focus of a specific MOOC are more likely to apply their newly acquired knowledge to their professional role. Laurillard's (2016) exploratory study about a professional-development MOOC intended for teachers from emerging economies also touches on context when reporting that while the overall reach of the MOOC was good, teachers from emerging economies were underrepresented amongst those participants who completed the MOOC, and completion rates were higher when the job status of the participants was also higher. Again, though, neither Hood et al. (2015) nor Laurillard (2016) consider long-term impact on participants' practice or on other stakeholders, or the complexities of causality.

Increased attention to context in MOOC evaluations came in from 2015 onwards with the MOOCKnowledge project, which generated several evaluations focused on Spanish MOOCs, also generating the evaluation framework discussed in the Theory of Change section in this chapter. These evaluations included Castaño-Muñoz et al.'s (2018) report on a MOOC initiative, supported by the Spanish Ministry of Education, intended to offer teachers professional development in the use of ICT for teaching and learning. However, the study is limited in its focus on Spanish participants in MOOCs and again does not examine the longer-term impact of MOOCs on educators' practice and on other stakeholders, or the complexities of causality. Indeed, Castaño-Muñoz et al. (2018) themselves suggest that future research should "go beyond . . . descriptive analysis and measure the real impact [of MOOC participation] on teaching practices and efficacy of the educational systems" (p. 622).

Also arising from the MOOCKnowledge project, Henderikx et al. (2019) built on earlier studies on barriers to MOOC participation (Henderikx et al., 2017a, 2017b, 2018) in their investigation of whether learners' age, gender, educational level and online learning experience are predictive of the barriers they experience while studying MOOCs. However, their study is limited in only focusing on demographic factors and the quite abstract concepts of "workplace issues" and "family issues" (p. 189), which don't get unpicked in their quantitative study. In addition, in providing statistical generalisations across the large, diverse cohorts that are typical of MOOCs, Henderikx et al. (2019) miss the opportunity to identify the influence of external factors on learners' study experience, and the extent to which those factors differ across contexts and between individual learners.

Evaluations of Longer-Term Impact, Including Impact on Multiple Stakeholders

In 2017, Pickering and Swinnerton were amongst the first to consider long-term impact on MOOC participants' professional practice. Their largely quantitative, survey-based evaluation of the FutureLearn MOOC "Exploring Anatomy: The Human Abdomen" covers learner demographics, motivations, course engagement, the benefits of study and the MOOC's impact on clinical practice but is limited by a small sample size. In their report, Pickering and Swinnerton (2017) explicitly note the lack of research exploring MOOCs' long-term impact not only on learners themselves, but also on beneficiaries other than learners (e.g., wider society). One reason for this may be the difficulties involved in measuring

this type of impact, as evidenced in the small number of existing frameworks and models for MOOC evaluation, discussed in the Theory of Change section in this chapter. Of the few exceptions, Alturkistani et al. (2018), focusing on medical education, have evaluated the long-term impact of a MOOC on "Real World Evidence" on participants' professional practice and on stakeholders other than the participants themselves. They conclude that "participants were not able to take skills from the MOOC and apply them to daily life" (p. 33), and they touch on the significance of contextual factors for enabling or inhibiting long-term impact — for example:

> In terms of knowledge application, support and availability of the right resources in the workplace are essential because learners are not able to apply learning in their workplace if lacking the right resources and support. Developers of MOOCs for continuing professional development should take into consideration work-related barriers when designing their MOOCs. (Alturkistani et al., 2018, p. 33)

Patel et al. (2019) brought together consideration of long-term impact on MOOC participants and other stakeholders, contextual factors, and the use of an evaluation model, in their evaluation of the "Eliminating Trachoma" (ET) MOOC developed by the London School of Hygiene and Tropical Medicine and collaborators. An online survey ($N = 76$) and interviews were used to explore the impact of the ET MOOC on participants' professional practice and on other stakeholders, and context-specific factors that may be limiting impact. Patel et al. (2019) report impact in the form of changes to participants' confidence and practice, and in terms of knowledge transfer amongst participants' networks. Their approach is discussed in detail in the next section.

MOOC Evaluations Using Frameworks and Models

Amongst the numerous MOOC evaluations reported over the past decade, only a few base their study on a defined evaluation framework. Four frameworks dominate these studies. Each has strengths and limitations and has informed the ToC-based model outlined in this chapter.

Kirkpatrick's Model

Kirkpatrick (2005) offers a commonly used model for evaluating the efficacy and adoption of educational interventions. It comprises four levels:

- *reaction* – learners' feelings about the learning experience
- *learning* – the resulting increase in knowledge or skill resulting from the learning experience
- *behaviour* – the implementation of acquired knowledge/skills in employment/other contexts
- *results* – the broader impact of the training on an organisation (or, by extension, any other environment or stakeholders, though this is not covered in Kirkpatrick's original model)

Several MOOC evaluation studies have adopted Kirkpatrick's model, including Goh et al. (2018), who focus solely on the first two levels, Alturkistani et al. (2018),

who use (to varying extents) all four levels in a medical education setting, and Lin and Cantoni (2017), who also cover all four levels in their evaluation of a tourism MOOC. However, Kirkpatrick's model, while popular, offers limited value for MOOC long-term impact evaluation. It does not directly address the significance of contextual factors in enabling or inhibiting impact at levels 3 and 4, and as such does not offer a particularly nuanced approach to analysing complex relationships between cause and effect, or to capturing and understanding the impact of context on learners' experiences, and on changes in their attitudes and behaviour. Nor does the model address alternative causes for any reported impact. Thus, it offers little potential as a basis for understanding and comparing how mechanisms of change differ for individual learners and other stakeholders, in diverse contexts.

The MOOCKnowledge Model

A model directly focused on MOOC evaluation, and placing more emphasis on the significance of context than is allowed by Kirkpatrick's approach, is that developed by Kalz et al. (2015) in connection with the MOOCKnowledge project. Kalz et al.'s model (Figure 11.1) conceptualises "the impact of socio-economic background variables, ICT competences, prior experiences and lifelong learning profile, variance in intentions, environmental influences, outcome expectations [and] learning experience" (p. 62) on learners' MOOC study outcomes.

Kalz et al.'s model maps the background (or distal) variables that may account for variances in MOOC learners' attitudes and behaviour, and that exist at "an individual level, a social level, and a task level." Such variables include "demographic data, the socio-economic status of the participants, their lifelong learning profile, previous experiences with open online courses and IT competences" (p. 67). The model also maps the proximal variables that directly influence learner intention and behaviour, identified as attitude, perceived norm and perceived behaviour control (i.e., self-efficacy) (following Fishbein and Ajzen's [2010] reasoned action approach].

The MOOCKnowledge model had relevance for developing the ToC-based MOOC impact evaluation approach in identifying variables that may explain variances between the impact of MOOC study on learners' subsequent practice, and related variance in longer-term impact on other stakeholders. As such, the model has the potential to help MOOC providers identify factors beyond their control but that could compromise a course's intended long-term impact. However, the model is limited in that the identified proximal and distal variables are largely restricted to intrinsic factors, rather than extrinsic factors such as sociocultural, political, geographical and economic context, and infrastructure constraints such as Internet connectivity and the availability of resources such as up-to-date and reliable hardware and software. Arguably, this is a major shortcoming for applying the MOOCKnowledge model to evaluations of heterogeneous cohorts comprising learners from very diverse contexts, especially in the Global South.

Douglas et al.'s Contextualised Evaluation Framework

A model focused on broader contextual factors than addressed by Kalz et al. (2015) is Douglas et al.'s (2019) Contextualised Evaluation Framework. Douglas et al.
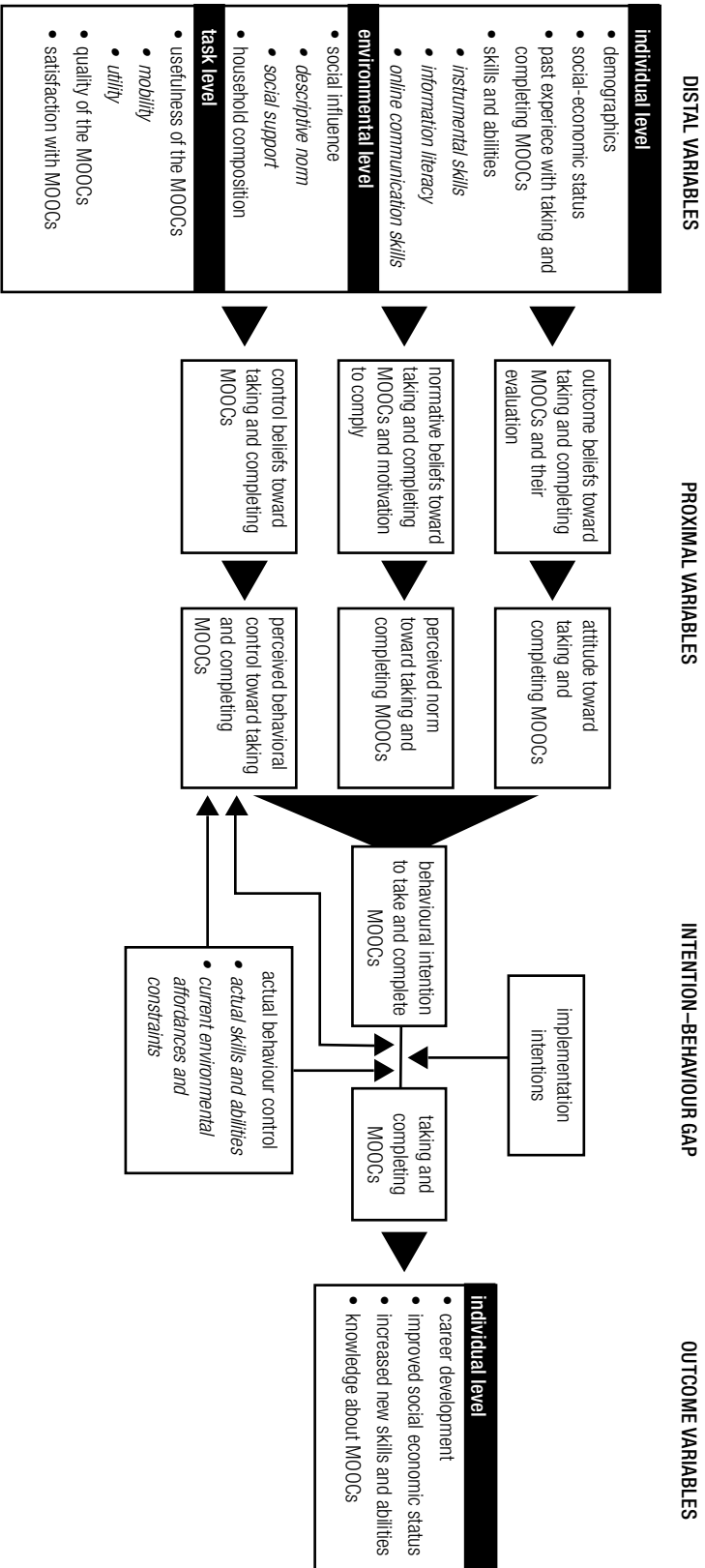
Figure 11.1. Research model of the MOOCKnowledge project. (Kalz et al., 2015, p. 67)

(2019) explain that their framework "includes a theoretical perspective that, in an open educational context, learner characteristics (e.g., intentions for learning content, level of preparedness for content, current career state, socio-economic demographics) and course characteristics (e.g., content, pedagogy, instructional design) influence learner behavior and ultimately the learning outcomes" (p. 206).

Douglas et al. make important points about the need to consider multiple dimensions of learner context, and all stakeholders' values and intended outcomes. However, their framework is limited to modelling the relationship between learner and course characteristics, learner behaviours and learner outcomes in a very general sense, and it lacks the detail necessary to be the basis of a comprehensive long-term impact evaluation. Even so, it has influenced the ToC evaluation model presented in this chapter in its underlying principles.

Patel et al.'s Adaptation of Wenger et al.'s Value Creation Framework

As already noted, the first MOOC evaluations focused on courses' function as networks, in line with Downes's (2013) argument that:

> MOOC success . . . is not individual success. We each have our own motivations for participating in a MOOC, and our own rewards, which may be more or less satisfied. But MOOC success emerges as a consequence of individual experiences. It is not a combination or a sum of those experiences — taking a poll won't tell us about them — but rather a result of how those experiences combined or meshed together. (para. 10)

An emphasis on MOOCs as networks returns in Patel et al.'s (2019) application of Wenger et al.'s (2011) Value Creation Framework (VCF) approach to an evaluation of the "Eliminating Trachoma" MOOC produced by the London School of Tropical Hygiene and collaborators. Wenger et al. (2011) originally developed their VCF as a conceptual foundation for promoting and assessing "the value of the learning enabled by community involvement and networking in communities and networks" (p. 7). Their VCF comprises five cycles:

- *Cycle 1. Immediate value: Activities and interactions* "considers networking/ community activities and interactions as having value in and of themselves" (p. 19).

- *Cycle 2. Potential value: Knowledge capital* addresses value derived from social learning that is not immediately realised, and which can comprise:

  - Personal assets (human capital), including "a useful skill . . . new perspective . . . confidence, and status" (p. 20).

  - Relationships and connections (social capital).

  - Resources (tangible capital), including "information, documents, tools and procedures" (p. 20).

  - Collective intangible assets (reputational capital), for example, "the reputation of the community or network, the status of a profession" (p. 20).

  - Transformed ability to learn (learning capital), specifically to learn through participating in a facilitated network or community.

- *Cycle 3. Applied value: Changes in practice* are "the ways practice has changed in the process of leveraging knowledge capital" (p. 20).

- *Cycle 4. Realised value: Performance improvement*, "what effects the application of knowledge capital is having on the achievement of what matters to stakeholders" (p. 20).

- *Cycle 5. Reframing value: Redefining success*, the impact of social learning in causing "a reconsideration of the learning imperatives and the criteria by which success is defined" (p. 21).

Table 11.1 shows Patel et al.'s (2019) adaptation of Wenger et al.'s (2011) framework for use in their impact evaluation of the "Eliminating Trachoma" MOOC.

Table 11.1. Patel et al.'s (2019) application of their adapted Value Creation Framework to the "Eliminating Trachoma" MOOC.

Cycle 1 **Immediate value**	What happened during participation? • Level and kinds of participation • Quality of interactions • Use of resources • Networking • Personal value of MOOC learning • Barriers
Cycle 2 **Potential value**	What changed as a result? • Skills and/or knowledge acquired, confidence • Change of view • New social connections • Experience with online learning • Barriers
Cycle 3 **Applied value**	What difference has participation made? • Use/reuse of skills, knowledge, connections or materials from the course for trachoma elimination or in another personally relevant sphere • Barriers/enablers
Cycle 4 **Realised value**	Is there evidence of sustained difference to self-ability or to an eliminating trachoma programme? • Increased effectiveness or quality or outputs • New achievements • At personal or organisational levels • In trachoma elimination or in another personally relevant sphere
Cycle 5 Transformational value	Has understanding of what is important changed directly because of the course? • At personal or organisational levels

The ToC-based MOOC evaluation approach outlined in this chapter covers VCF Cycles 2, 3, 4 and 5. It builds on the evaluations identified in this chapter, bringing together their strengths and addressing their limitations in a model that:

- allows for evaluation of long-term impact on MOOC participants and other stakeholders;

- offers a basis for identifying the influence of external factors on learners' study experience, and the extent to which those factors differ across contexts and between individual learners; and

- offers a systematic framework for investigating the complex relationship between cause and effect that must be unravelled when conducting a long-term impact study, and for investigating and comparing the mechanisms of change in very diverse contexts.

The Theory of Change Approach

The ToC approach, developed by Weiss (1995), is commonly used in international development evaluation (see Vogel, 2012). As Breuer et al. (2016) explain:

> The ToC is often developed using a backward mapping approach which starts with the *long-term outcome* and then maps the required *process of change* and the short- and medium-term outcomes required to achieve this. During this process, the *assumptions* about what needs to be in place for the ToC to occur are made explicit as well as the *contextual* factors which influence the ToC. Additional elements of a ToC can include *beneficiaries, research evidence supporting the ToC, actors in the context, sphere of influence, strategic choices and interventions, timelines and indicators.* These elements are usually presented in a diagram and/or narrative summary. (p. 2)

A key value of ToC is that it makes explicit the conditions and assumptions required to enable change, discussed presently, and their dynamic and iterative nature. ToCs are intended to be revised throughout the evaluation process, and for MOOC evaluators, a ToC should be developed in at least two phases:

- speculatively, informed by existing literature, in advance of conducting the evaluation, as a basis for identifying variables and developing related questions for use in data collection; and

- in more detail in light of the collected data, as a way of understanding the impact, and impact mechanisms, across cohorts and within individual cases.

Developing a ToC allows practices to be linked to outcomes, and in identifying assumptions, a ToC gives priority to the reasons why impact may not be achieved, as well as the drivers of impact.

The ToC approach outlined in this chapter was first developed for an evaluation of the long-term impact of the TELMOOC co-produced by the Commonwealth of Learning and Athabasca University (see Perryman, 2020) — an openly licensed course intended to "provide an accessible learning opportunity to teachers, particularly in developing countries, to expand upon their knowledge and skills regarding the use of technology in teaching and learning" (Cleveland-Innes et al., 2017, p. 1). Figure 11.2 shows a simplified version of the ToC developed for that evaluation.
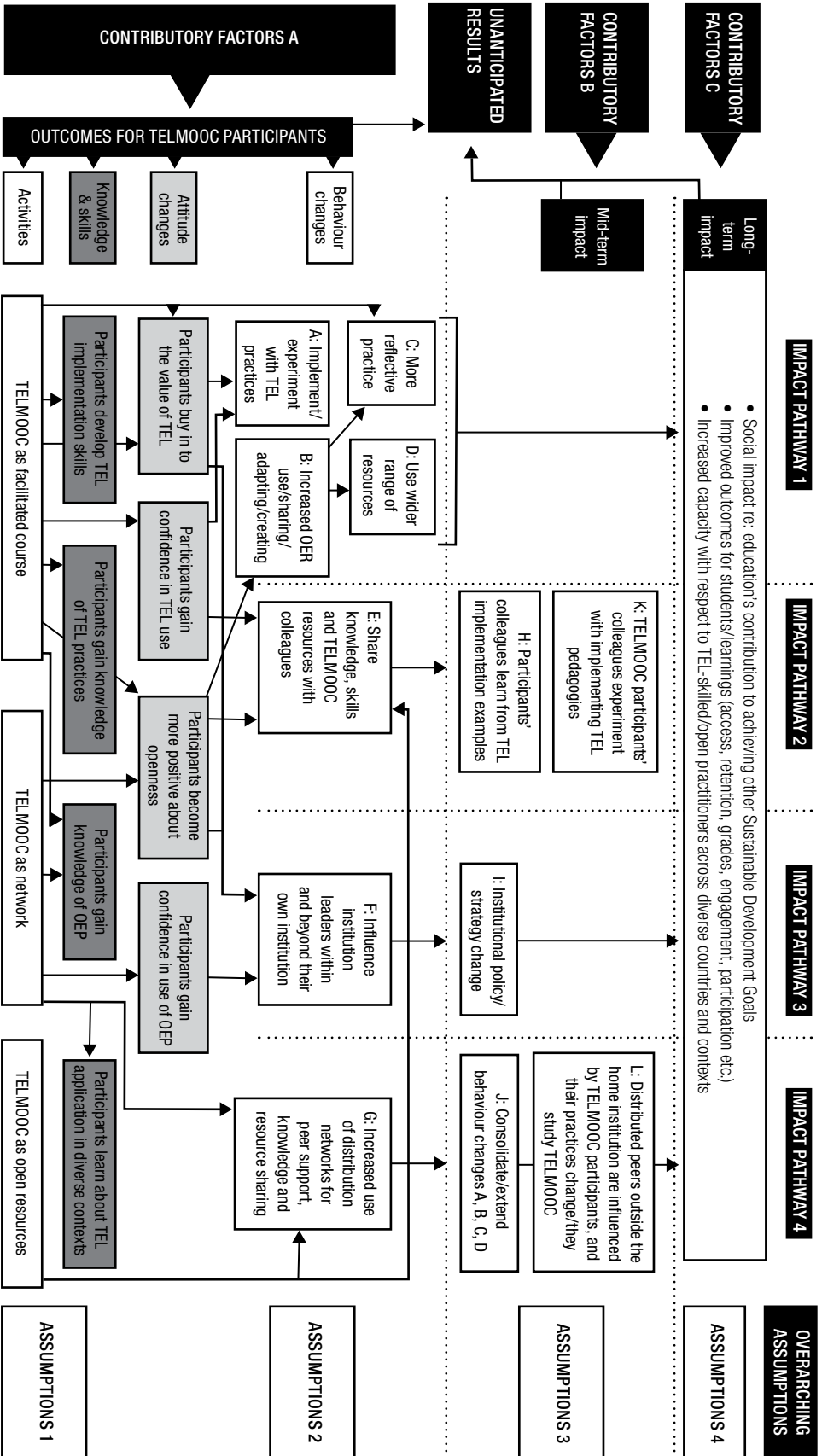
Figure 11.2. ToC for MOOC impact evaluation.

Figure 11.2 features the following components:

- Three categories of activity contributing to any identified impact — the MOOC as a facilitated course, as a network (following Downes, 2013; Garrison, 2009; and Wenger et al., 2011) and as downloadable and shareable open resources (applicable where content is openly licensed).

- Four impact pathways, indicating hypothesised mechanisms of short-, medium- and long-term impact on MOOC participants and other stakeholders, grounded in related literature.

- Three sets of contributory factors hypothesised to account for some of the impact identified in the evaluation.

- Five sets of assumptions assumed to be true for the hypothesised impact to be realised, and a risk to achieving impact, where an assumption is not true.

- One set of "unanticipated results" — a place for recording outcomes and impact other than that hypothesised in the impact pathways.

The Impact Pathways

The four possible impact pathways in Figure 11.2 are relevant to MOOCs focused on professional development. Other pathways could be developed for MOOCs with different functions. The impact pathways are derived from four related hypotheses:

- *Pathway 1:* MOOC participants make changes in their own practice as a direct result of their study of the course (and any contributory factors), leading to longer-term impact on learners and on society more generally. This pathway encompasses Cycles 3 and 4 of Wenger et al.'s (2011) VCF as adapted by Patel et al. (2019).

- *Pathway 2:* MOOC participants share knowledge, skills and resources with colleagues, who are also influenced by participants' change in practice, leading to practice changes for colleagues and subsequent longer-term impact on other members of society (e.g., learners, patients, service-users). This pathway encompasses Cycles 3 and 4 of Wenger et al.'s (2011) VCF.

- *Pathway 3:* MOOC participants influence institution leaders, leading to institution-wide policy/strategy change and long-term impact on society.

- *Pathway 4:* MOOC participants' learning is enhanced by their being part of a massive cohort of MOOC learners, functioning as a community of practice/network (see Downes, 2013; Wenger, 1998; Wenger et al., 2011). They gain networking experience and skills, and make connections that last beyond their study of the course and are a source of peer support as they experiment with the application of their newly gained skills and knowledge to their own practice.

The "Contributory Factors": Considering Causality

The ToC-based framework shown in Figure 11.2 features a "contribution-oriented" (Stern et al., 2012, p. 38) approach investigating "the contribution an intervention is making to outcomes and wider impacts" (Gates & Dyson, 2017, p. 31). Accordingly, it features three clusters of "contributory factors":

- *Contributory factors A (relating to the impact of a course on its participants):* For an education-focused professional development MOOC, these might include factors such as performance targets and promotion aspirations, colleagues' and other peers' support, institutional priorities/policies and funding, managerial support, government policies, other professional development, and participants' access to resources such as hardware, software and Internet data.

- *Contributory factors B (relating to the impact of a course on participants' colleagues and peers):* These will be similar to contributory factors A.

- *Contributory factors C (relating to the impact on stakeholders other than participants and their colleagues):* For an education-focused professional development MOOC, these might include factors such as student ICT skills, school attendance, family influences on students, students' financial situation, and the support available from the community.

The inclusion of these contributory factors is informed by current thinking around causality — whether reported and observed phenomena such as changes in attitudes, behaviour and outcomes are attributable to the intervention being evaluated. Gates and Dyson (2017, p. 36) identify five ways of thinking about causality: successionist, narrative, generative, causal package and complex systems. The ToC-based MOOC impact evaluation strategy outlined here combines narrative, generative and causal package approaches.

- *The narrative approach* foregrounds "the importance of human agency in causality by attending to human perception, motivation and behaviour" (Gates and Dyson, 2017, p. 35), treating context as "an important factor in determining whether a program will work in a certain setting" (Gates & Dyson, 2017, p. 35).

- *The generative approach* involves building and verifying a theory-based explanation of how causal processes happen — identifying mechanisms that connect two events as a means of "understanding why, for whom, and under what conditions interventions work to produce specific results" (Gates & Dyson, 2017, p. 36). The use of a ToC approach is generative in nature.

- *The causal package approach* involves "examining the contributory role components of interventions and combinations of multiple interventions play in producing outcomes and impacts" based on the idea that "many interventions do not act alone, and the desired outcomes are often the result of a combination of causal factors, including other related interventions, events, and conditions external to the intervention (Mayne, 2012)" (Gates & Dyson, 2017, p. 36).

Assumptions: Considering Context

The ToC evaluation framework and narrative approach to causality involves considering the significance of multiple contextual factors in both driving and inhibiting impact on participants and other stakeholders in specific settings. These factors are represented as "assumptions" in Figure 11.2. ToC and are informed by relevant existing studies addressing the influence of context on

MOOCs' short-term and longer-term impact, and by more subject-specific studies investigating factors enabling and inhibiting impact in a particular domain.

The TELMOOC evaluation in which the ToC approach was first introduced featured the following assumptions, reproduced here as an indicative example.

Overarching assumptions

- All other assumptions will vary with context.
- Some assumptions are more significant than others.
- Where an assumption does not hold, it poses a risk/barrier to impact.
- Impact of behaviour change outcomes outweighs any negative impact of external influences.

Assumptions 1

- Participants achieve TELMOOC learning outcomes.
- Participants are active in the TELMOOC network.
- Increased knowledge leads to increased confidence.
- Peer support will lead to positivity about openness and TEL.

Assumptions 2

- Educators have capacity and autonomy to make changes (A, B, C).
- Curriculum allows flexible resource use and pedagogies (A, B, C, D).
- Peers are supportive of OER use (B) and TEL implementation (A).
- Relevant OER are available (language, culture, subject, currency, level) (B).
- Educators have sufficient ICT skills (A, B, G).
- Internet connectivity and platform are available (A B. D, G).
- Necessary resources are available (hardware, software) (A, B).
- Institutional priorities align with planned changes (A, B, F).
- Peers/colleagues are supportive of changed practice (A, B, D).
- ICT support is available (A, C, D).
- Educators feel safe and confident networking online (G).
- Networking is culturally acceptable (e.g., for women) (G).
- Learning is facilitated through networks (connectivism) (G).
- Language problems are not encountered (G).
- Channels for influencing institution leaders are available (F).
- Literacy levels are sufficient to allow the implementation of TEL.
- Parents allow their children (especially girls) to use online resources and sites.

Assumptions 3

- Assumptions in 2 are true for participants' colleagues (H, K).
- Colleagues have the desire to make changes.
- Institutions have the autonomy to make changes (I).

- Institutions have the capacity to support policy changes (I).

Assumptions 4

- Implementation of TEL techniques will improve retention and engagement and improve student grades.

- Implementation of TEL techniques will improve access to education.

- Implementation of TEL in A and K is appropriate to students' skills and preferences.

Appropriate Methods for a ToC-based MOOC Evaluation

As already noted, quantitative, cohort-wide studies tend to dominate the field of MOOC evaluations (Zhu, 2017). However, a solely quantitative approach is insufficient for supporting a ToC-based long-term impact study. Veletsianos et al. (2015), Veletsianos and Shepherdson (2015) and Pickering and Swinnerton (2017) have argued that MOOC evaluations need to focus on individual learners' outcomes, rather than the apparent success (or otherwise) of MOOCs across broad cohorts of learners. Hood et al. (2015) concur that "the openness of MOOCs and the resultant potential diversity of learners . . . makes the investigation of individual learners particularly important" (p. 84).

A ToC-based approach to MOOC impact evaluation allows for this but necessitates collecting rich data about individual learners' experiences. An explanatory, sequential mixed-methods design (Creswell, 2007), whereby an initial phase of quantitative research is followed by a phase of qualitative research intended to explain and further explore the quantitative findings, is one way of ensuring sufficiently rich data are available to support the development of a ToC, and this design was used when piloting the approach (see Perryman, 2020). Case study research, with individual MOOC participants featuring as cases and data collected through qualitative interviewing, focus groups and other qualitative methods, offers an appropriate overall approach for the qualitative phase, being particularly appropriate for investigating "complex situations" (Timmons & Cairns, 2010, p. 102), especially the relationship between individual and context (Elger, 2010).

Conclusion

A ToC-based model for long-term MOOC impact evaluation, adapted to fit with the principles of contribution analysis and supported by case study-based mixed-methods research, should allow the following areas to be investigated:

- The difference a MOOC has made to participants' lives, especially their professional practice.

- What works, why, how, for whom and under what circumstances.

- How a MOOC works in combination with other interventions or factors to make a difference.

The format and content of individual ToCs will vary, informed by the discipline covered in the evaluated MOOC, and literature suggesting possible explanations for the impact mechanisms covered (e.g., the factors that can limit changes in practice for a specific profession). It is hoped that future application of the ToC

model will allow the approach to be further developed and discipline-specific guidance to be made available to interested evaluators, with the overall aim of increasing MOOCs' efficacy as a means of helping to achieve educational equity and social justice, especially in the developing world.

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12

Becoming Digital Education Leaders: Teacher Stories from Sri Lanka

Shironica P. Karunanayaka

Introduction

The current era of digitalisation demands the development of manifold digital competencies in individuals. Fostering digital education thus becomes a vital need, which also requires digital education leadership development (Lynch, 2018; McLeod, 2015; Sheninger, 2014). Digital education leaders are people who will demonstrate effective use of information and communication technology (ICT) for teaching, and who will also advocate for, influence and build the digital learning capacities of others. Children in the 21st century use digital devices with ease and actively engage with digital learning technologies. In order to cater to the needs of such "digital-age learners" (Collier et al., 2013), today's teachers have a crucial role to play as digital education leaders.

The Commonwealth Digital Education Leadership Training in Action (C-DELTA) programme of the Commonwealth of Learning (COL) provides a framework for fostering the digital competencies of individuals to become skilled citizens for lifelong learning (https://cdelta.col.org/). The Faculty of Education of the Open University of Sri Lanka (OUSL), with support from COL, implemented a research project to promote the adoption of the C-DELTA programme at the secondary school level in Sri Lanka. The key aim of this project was to develop capacity and enhance digital education leadership skills among school teachers to encourage digital education environments in their schools. This chapter explores how and in what ways the adoption of C-DELTA had an impact on the participant teachers becoming digital education leaders, by unfolding and analysing their inspiring stories.

Review of the Literature and the Conceptual Framework

Growing trends in the digitalisation of education in a 21st-century knowledge-based society require the development of digital competence among individuals, including a wide range of new technological and pedagogical skills (Beetham et al., 2009). Digital competence, which is the confident, critical and responsible use of and engagement with digital technologies for learning, work and participation in society (European Commission, 2019), allows rapid access to and effective use of information by teachers and learners, and it will thus improve lifelong learning opportunities (UNESCO, 2014). Contemporary teachers in this digital era are confronted with a massive challenge of "change" in terms of technological as well as pedagogical aspects (Bates, 2015; Selwyn, 2014). Teachers as "change agents" are required to develop four core capacities for building greater change capacity: personal vision building, inquiry, mastery and collaboration (Fullan, 1993). Thus, they need to be supported in capacity development, and empowered to become change agents in fostering digital education within their contexts as "digital education leaders."

The need for and significance of leadership development in digital education has been widely discussed. Educators as leaders should harness the power of digital technology to change professional practice and initiate sustainable change (Sheninger, 2014). Common issues and challenges faced by educational institutions during digital transformation can be addressed and managed through visionary leadership (McLeod, 2015), and the nurturing of a digital education culture in an institution will depend on such proactive leadership.

Several models and frameworks that conceptualise the characteristics, roles, responsibilities, competencies and strategies related to digital leadership development provide useful insights to consider when planning professional-development and capacity-enhancement programmes for teachers on becoming digital education leaders (Bennett, 2014; EDUCAUSE & JISC, 2015; Jameson, 2013; Khan, 2015; Sheninger, 2014). For instance, the Digital Practitioner Framework (Bennett, 2014) provides a comprehensive perspective on how digital education leadership competencies can be developed in terms of access, skills, practices and attributes. Pointing out that just having access to technology will not guarantee its use, this framework stresses the need for digital education literacy, skill development and practice, which will result in confidence building and identity development as people become "digital education practitioners." This affirms that digital leadership development is not just about access to tools but includes a strategic mindset to bring about "change" (Sheninger, 2014). Since digital education leadership is more than a set of digital skills, and is a set of processes for doing and thinking about digital education, it is essential that the required capabilities be developed in educators, so that they can lead others in this regard (Brown et al., 2016b).

The C-DELTA programme was developed based on the concept of a holistic approach to digital education leadership. It presents the argument that digital education leadership is grounded in the practice that it seeks to foster — i.e., digital literacy practice — and the processes involved in teaching that practice, that is, digital education (Brown et al., 2016a) (see Figure 12.1).
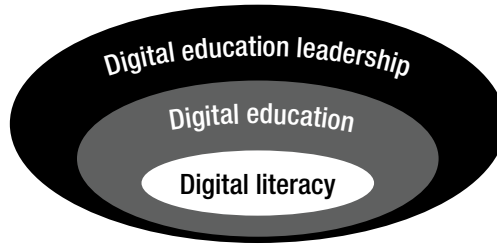
Figure 12.1. A holistic view of digital education leadership. (Source: Brown et al., 2016)

C-DELTA's perspective on the relationship between digital literacy, digital education and digital education leadership, presented in Figure 12.1, is explained as follows (Brown et al., 2016a, p. 10):

- Digital literacy, as a social practice, is understood to be the core, as it is the outcome, the destination of digital education and digital education leadership. It is the purpose of digital education.

- Digital education is the pedagogical intervention that goes into fostering digital literacies. It is the "how" of getting to digital literacy.

- Digital education leadership is concerned with providing direction in terms of digital education by enhancing access, capacitating peers, making informed decisions and cultivating innovation, to achieve the learning goal (digital literacy).

- Digital education leadership must be grounded in the practice that it seeks to foster (digital literacy practice) and the processes involved in teaching that practice (digital education).

Accordingly, in the context of C-DELTA, digital education is a process of teaching and learning involved in fostering the capabilities that are needed for an individual to live, learn and work in an evolving digitally mediated society. This emphasises the enhancement of capacity building in context-based digital literacy practices. There is a crucial need for digital education leaders who can take leadership in fostering digital literacies relevant to their contexts. These leaders should be able to foster digital literacies via several means, such as creating awareness of and enhancing access to available resources, developing capacity in individuals, curricula and organisations, making informed decisions, and cultivating innovation. Such digital education leaders will be change agents in their own contexts (Brown et al. 2016b).

Methodology

Research Design

The overall project adopted an action research approach, which is a self-reflective inquiry undertaken by individuals in social situations to improve their practices. It is an iterative process comprising four stages: plan, act, observe and reflect (Carr & Kemmis, 1986; Masters, 1995). A systematic process of design, development,

implementation and evaluation of an intervention programme was conducted within this methodological framework.

The intervention programme for participant teachers comprised specific activities designed to develop their capacity to promote the adoption of the C-DELTA programme in their schools via small-scale interventions. It was envisaged that by taking such an active investigative approach, the participant teachers would develop their leadership skills in fostering digital education in their contexts, and be motivated to self-assess and reflect on their actions to enhance the teaching–learning process. In this context, the action research approach was found to be a useful methodological framework, especially to improve educational practices in the real-life situations of teachers.

Research Question

The research question addressed in this study was: "How and to what extent has the adoption of the C-DELTA programme had an impact on Sri Lankan school teachers to become digital education leaders?"

Participants

The participants in this study were 21 graduate teachers who successfully completed implementation of the C-DELTA programme in their schools (see Table 12.1).

Table 12.1. Participant teachers.

Province	No. of Teachers	Gender	
		Male	Female
Central	03	01	02
Eastern	02	02	00
Northern	-	-	-
North Central	02	02	00
North Western	03	01	02
Sabaragamuwa	01	00	01
Southern	02	01	01
Uva	02	01	01
Western	06	-	06
Total	**21**	**08**	**13**
Percentage	**100%**	**38%**	**62%**

The Process

The intervention process was conducted in several steps, according to the four stages of the action research cycle (see Table 12.2).

Table 12.2. Activities conducted during the intervention.

Stage	Activities
Plan	1. Review of the existing levels of digital education practices among the participant teachers
	2. Design of an intervention, including different strategies and tools to promote the adoption of C-DELTA in the schools
Act	3. Implementation of the intervention through a capacity-development process for the participant teachers
Observe	4. Monitor and facilitate the implementation of interventions in the schools (online monitoring, school observation visits, focus group interviews, teachers' interim reports)
Reflect	5. Ascertaining impacts of the intervention through participant reflections (evaluation workshops, writing workshops, teachers' final reports, reflective narratives)
	6. Open sharing of experiences as a basis for promoting further interventions; website of "teachers' stories"

This chapter's key focus is on the "reflections" of teachers on the whole process.

Collection and Analysis of Data

At various stages during the intervention process, the teachers were asked to continuously "reflect in," "reflect on" and "reflect for" action, based on their experiences. Reflection-in-action takes place during an action, and reflection-on-action takes place after an event has occurred (Schön, 1983), while reflection-for-action enables thinking about future actions with the intention of improving or changing a practice (Grushka et al., 2005).

Teachers reflected at three stages: during the training-of-trainers workshop at the beginning of the intervention, during the focus group discussions at mid-intervention, and during the final evaluation workshops at the end of the intervention. Teachers reflected in responses to three key questions — what? so what? now what? — based on a specific framework for reflective practice (Rolfe et al., 2001). The format presented in Table 12.3 guided the teachers in recording their reflections.

Table 12.3. Guide to record teacher reflections.

Focus Question	Reflection
What…?	A brief description of what happened and of the experience you would like to analyse regarding your own learning. • What were my first impressions of the experience? • What were the challenges/frustrations I faced? • What were my achievements/successes?
So What…?	An analysis of what the experience and situation meant to you. • How did I manage to overcome the challenges? • What supportive factors did I experience? • What good practices did I experience?
Now What…?	An explanation of the steps that you plan to take in order to improve your practice and learn from the initial experience. • What did I learn from this experience? • How has this experience changed my thinking and practices? • What are my plans to improve my teaching–learning process, based on this experience?
Any other comments	

Further, during the final evaluation workshops conducted at the end of the intervention, the participant teachers submitted their final reports and made reflective presentations based on their overall experiences of the C-DELTA implementation and adaptation process in their schools. Focus group discussions were also held, based on the following key questions:

- What were your insights during the process? What did you learn during the adaptation, intervention and implementation process?

- How did you gain those insights? From what activities?

- How did you adopt the C-DELTA programme and its concepts? What are the different ways in which you integrated those concepts and practices with your pedagogy (teaching–learning process)?

- What were the supportive factors and what were the hindering factors you experienced during the overall process?

- What were the challenges/frustrations you faced? How did you manage to overcome them?

- What were your achievements/successes?

- What good practices can you share with the students and other teachers?

- What are your future plans/suggestions? How do you plan to improve your teaching–learning process with the adoption of the C-DELTA programme and its concepts?

Based on all the above data, the 21 teachers who successfully completed the whole process reflected on their journeys and wrote their "stories" at a "Writing Workshop" held at the end. These stories were compiled and published online as "Digital Education Leaders in Action" (see https://cdeltaousl.wordpress.com/).

An in-depth content analysis of these stories was conducted using thematic coding and categorising, to find out how and to what extent the adoption of the C-DELTA programme has had an impact on Sri Lankan schoolteachers to become digital education leaders.

Findings and Discussion

The content analysis of the 21 teacher stories extracted the key ideas that emerged. These findings are organised and discussed under five themes: motivational drivers; overcoming challenges; insights gained; impacts; and becoming change agents.

Motivational Drivers

Analysis of the data helped with understanding the unique drivers that motivated the teachers to engage in the intervention process. These are presented with some supportive quotes in Table 12.4.

Table 12.4. Motivational drivers for teachers to adopt C-DELTA.

Codes	Supportive Quotes
First impressions	My first impression of the experience was "Where am I in the digital world?"
Novel experience	It was a novel experience for me to develop my ICT knowledge and research skills in the teaching–learning process.
Interactive workshop	. . . this interactive session made a positive impression on our minds and it helped us to change our day-to-day teaching environment at the school.
New insights	The concepts of digital identity and digital footprint gave me new insights.
International experience	It provided me with an international research experience and motivation to develop innovative learning experiences.
A valuable opportunity	We were able to develop knowledge on digital literacy and skills for applying new technology such as creating concept maps for digital literacy, digital network and digital footprint.
Self-satisfaction	The principal, teachers and students were willing to know about C-DELTA in practice . . . and the practical lesson given by me was appreciated . . . which gave me great satisfaction.
A sense of achievement	The school was able to participate in an international research work and it was an achievement.
Positive changes	Introducing the concepts of digital footprint and digital identity made a positive impact on changing our attitudes towards the Internet.

As revealed by the quotes, the first impressions of this novel experience gained at the interactive workshop provided new insights and activated the participant teachers to engage with the intervention. They were motivated to move forward with self-satisfaction and a sense of achievement through various activities, resulting in positive changes. Teachers also considered that gaining an international experience was a valuable opportunity, which further inspired them.

It was interesting to note that intrinsic motivators had played a major role in the teachers' participation in the project, more than extrinsic motivators. An extrinsically motivated individual may perform the activity in order to obtain some reward, whereas an individual who is intrinsically motivated undertakes a task for the satisfaction it provides or for the feeling of accomplishment and self-actualisation (Ryan & Deci, 2000). While the participants' intrinsic motivation was apparent by the quotes expressing their personal enjoyment, satisfaction and underlying reasons for their behaviour, they also revealed certain extrinsic motivators, such as gaining an international experience and a valuable opportunity, which could be considered reinforcements and rewards.

Overcoming Challenges

Teachers had to face various challenges during the implementation of the C-DELTA project in their schools, such as lack of ICT facilities, limited ICT and English proficiency, and time constraints. However, many teachers managed to proceed, using certain strategies and supports to overcome these challenges. Table 12.5 presents how teachers overcame challenges faced in schools, supported with their quotes.

Table 12.5. Overcoming challenges faced in the adoption of C-DELTA in schools.

Codes	Supportive Quotes
Access to computers and the Internet	• School management was unable to provide necessary facilities . . . computers were not in good condition, no Internet. . . . It was compulsory to get permission for students to bring their own laptops . . . a big, time-consuming process! • Due to lack of computers and Internet facilities . . . Principal permitted to use mobile phones, even though it was prohibited in the school premises. • There were only three computers working in the computer laboratory. . . . Internet facility was not in my school. Due to implementation of C-DELTA programme, Internet facility was obtained to the school by the principal.
ICT support	• It was difficult to enter to the C-DELTA platform because children and teachers didn't have email addresses . . . I had to create email accounts. • First, I provided a special training on ICT practical skills to students. Then I selected students . . . and guided them to become initial ICT literate students.
English language support	• Completing the pre-test was a big challenge for me due to the English language difficulties. However, I was able to solve this issue with the support from my peers and resource persons. • Both teachers and students are poor with English language skills. . . . I tried to reduce their fear of English with lots of motivational activities. • To overcome English language skill barrier, teachers and students used dictionaries and Google translator.
Time constraints	• The biggest challenge was the time. Students had to engage in the programme during the ICT periods or during free periods. • I used time in the evenings to complete activities of the programme. • Many teachers couldn't get involved . . . because they had a full timetable. . . . I always motivated them to come during their free periods.
Changing mindsets	Teachers were reluctant to use ICT in their teaching–learning process. Therefore, I had to spend more time to help them. Some students as well as teachers were not willing to use and work with new technologies and they were anxious [about dealing] with new technology.

All teachers had faced very similar challenges during the implementation process of C-DELTA. A key issue was having limited or no access to computers and Internet in their schools. Most of the teachers and students essentially needed ICT support and English language support to engage in the project activities. Further, time constraints due to various activities in schools also hindered successful implementation of the C-DELTA project. In addition, changing mindsets, especially teachers', was another challenge faced by the coordinating teachers. Despite all these issues, it was quite encouraging to observe how the coordinating teachers used various strategies to manage and overcome the challenges through their personal efforts, along with obtaining cooperation and support from peer teachers and the school administration, as expressed by their quotes in Table 12.5.

Being non-native speakers of English, both teachers and students faced a major challenge in understanding the content and terminology used, and faced difficulties in doing the pre-test, post-test and C-DELTA modules. While this deterred some of them from continuing with the course, it was heartening to observe the conscious attempts taken by several others to overcome this challenge by using digital facilities such as Google Translate and online dictionaries. Hence, this digital learning experience inadvertently enabled teachers and learners to enhance their English language usage to some extent, thus turning the challenge into an opportunity.

The challenges revealed above are frequently observed in schools when implementing ICT-related initiatives, especially in developing countries (UNESCO, 2003). These include external barriers such as inadequate computer facilities, lack of Internet connectivity and tight activity schedules in schools, as well as internal barriers among both teachers and students, such as limitations in ICT literacy and English language competencies, lack of interest, and unwillingness to deviate from existing practices and mindsets. The coordinating teachers had to play a significant role as leaders and change-agents in their schools to overcome and minimise the effects of these barriers.

Insights Gained

Gaining an insight occurs when individuals experience a feeling or a thought that helps them recognise relationships between various concepts, objects or actions, which will help them with future problem solving. The C-DELTA experience provided an opportunity for the participant teachers to gain a wide range of insights into several aspects relevant to their teaching profession. These are presented with some supportive quotes in Table 12.6.

Table 12.6. Insights gained by teachers.

Codes	Supportive Quotes
Digital learning concepts	• I got a comprehensive awareness on following aspects of the C-DELTA concept: what C-DELTA is, its unique characteristics, importance of maintaining a healthy digital identity, digital footprint, good digital practices. • I understood the meaning of digital footprint and how we can safely search information on the Internet without affecting our privacy as well as future careers. • I got the real experience of a digital certificate and digital badges.
OER and OEP	• We learnt the importance of open educational resources (OER) and how to adopt open educational practices (OEP) as teachers. It was a new concept and we thought of teaching this concept to our students as well as teachers in our school.
Internet use	• C-DELTA project was a great support to avoid misunderstandings and misguidance used in the Internet. • Usually we find information from the Internet, but I understood that there was a learning tool to find information by using a literacy framework and the information used are subjected to copyrights.
Ethical practices	• I learnt to use Internet in an ethical way, and I practiced it. Furthermore, I got awareness to guide teachers and students to use Internet in an ethical way. • By engaging with networks, it made me aware of digital etiquettes, which were meaningful and purposeful.
Reflective practices	• The concept map created by me at the workshop gave me another imprint on digital education. I was able to conceptualise the insights I gained. . . . I was able to improve my overview about the digital education environment thoroughly and reflect on its advantage to improve 21st-century learning skills among teachers and students.
Collaborative practices	• I was able to work in a team and improve my online learning skills. Furthermore, I experienced collaborative learning experiences while developing good practices such as sharing and peer learning.

For all teachers, the key digital learning concepts introduced in the C-DELTA modules were novel and advantageous. In particular, the insights gained around concepts such as maintaining a positive digital identity, preserving a healthy digital footprint and enhancing digital literacy were identified as valuable to instil good digital practices among themselves, their peer teachers and their students. Similarly, they found open educational resources and open educational practices to be very useful concepts to adopt in their teaching–learning process.

Teachers also gained a good understanding of effective Internet use via advanced search techniques, and an appreciation for maintaining ethical practices when navigating in the digital world via networks, which they could readily transfer to their peer teachers and students. Further, the concept-mapping exercise and writing reflections enhanced their reflective practices, while teamwork enabled them to enhance their collaborative practices, both of which encouraged teachers to apply such practices in their profession.

Impacts of the Intervention

Impacts are tangible and intangible effects of one entity's action or influence upon another, which can be measured in terms of changes that happen over time due to an intervention (OECD, 2012). The C-DELTA intervention had several significant impacts on the teachers, students and schools, as revealed by data presented in Table 12.7.

Table 12.7. Impacts of the C-DELTA experience.

Codes	Supportive Quotes
Personal development	• Personally, this project gave me lots of knowledge and experience on working as a team and implementing new ideas. • Through this activity we received lot of experience which improved our leadership skills such as planning, organising, acting, sharing etc. • I was competent to conduct a small action research project. • This project gave me recognition among the management committee and the staff members. They understood my capabilities.
Pedagogical practices	• C-DELTA programme has created new teaching and learning styles in our school among the teachers and students. • Our usual practice of using teaching learning resources in the form of blackboard and whiteboard . . . were shifted to multimedia materials and online activities. • Teachers become more creative and practical when they do presentations, videos, audios, short films and using different types of OERs. • We trained the students to look at Internet as an effective learning resource rather than an entertainment media.
Online learning	• The experiences . . . provided rural students an opportunity to improve their online learning skills and to take first steps into the digital world. • Due to engaging in the C-DELTA project, teachers were motivated to use Internet facility in their learning.
Online examination	• This project motivated students to get the first online examination experience in their life. • It helped students to confidently face the General Information Technology (GIT) online examination which is held as an online examination.
English language competency	• As a plus point, teachers and students improved their English knowledge in leaps and bounds. • Teachers and students improved their English language and ICT literacy.
Internet connectivity	• I am happy to say that because of the C-DELTA programme we had the hope and opportunity to ask for high speed Internet connection and we got it.
Attitudinal changes	• It motivated students to use Internet safely, effectively and in a responsible manner. • The teachers and students learnt to use educational resources in an ethical way. . . . They learnt to use social media properly and be productive. • Through this project students developed positive attitudes on ICT and English language.

All teachers reflected in detail on how this experience had affected them, their students and their school. First and foremost, being part of a selected group of digital education leaders in an international research project, had a profound impact on each individual coordinating teacher in their personal development. For instance, they claimed the development of new knowledge, skills and attitudes, which made them competent and confident in implementing digitally enhanced teaching and learning. Most importantly, taking charge of implementing the C-DELTA project in their schools enabled the teachers to develop their leadership skills and gain recognition in their institutions. Additionally, these teachers developed research skills through executing a small-scale action research intervention by themselves.

The teachers' interventions in schools had short-term impacts as well as long-term impacts on crucial aspects, including changes in pedagogical practices, resource usage, programme plans and school management decisions. Changes in pedagogical practices comprised teachers applying more student-centred and interactive teaching methods, letting students explore, discover and find information using advanced search tools and techniques, and using OER. Increased ICT integration in teaching and learning helped students develop their self-learning skills. In particular, an interest in online learning increased among both teachers and students. Special mention was made by all ICT teachers that this experience had been a great opportunity for students to get familiar with an online examination for the first time. Further, improvement of English language competency was considered an additional advantage gained through the project. Most importantly, positive attitudinal changes were observed among both teachers and students in terms of safe Internet use and ethical resource use. Due to the C-DELTA project implementation, some schools were able to get Internet connectivity by convincing management and authorities, which was also considered a significant achievement.

Becoming Change Agents

A change agent will promote and enable change to happen within any group or organisation. Teachers play a key role as change agents who can bring about positive changes within their classrooms, schools and society as a whole. To achieve this, teachers need four capacities for change, which are intimately interrelated and mutually reinforcing: personal vision building; inquiry; mastery; and collaboration (Fullan, 1993). The findings of this study revealed how these capacities had been developed among the participating teachers, enabling them to become change agents, as presented in Table 12.8.

Table 12.8. Teachers becoming change agents.

Codes	Supportive Quotes
Personal vision building	• Though as ICT teachers, we teach subject knowledge in our day to day teaching activities, introducing the concepts of digital footprint and digital identity made a positive impact on our attitudes towards Internet. . . . C-DELTA project was a great support to avoid misunderstandings and misguidance used in the Internet. • Now I am certain to maintain my digital footprint and digital identity well. Further, it will be more beneficial to maintain this to be successful in our teaching learning process in the classroom.
Inquiry	• This interactive session made a positive impression on our minds and it helped us to change our day to day teaching environment at the school. • Personally, I gained lot of knowledge about online education and it gave me a lot of experience about new digital objects.
Mastery	• I did hard work and followed all the modules, read more and more, watched new educational documents to complete my course and I am happy to say that I have completed all seven modules successfully, also got badges for all modules.
Collaboration	• We did activities as a group. Our collaboration skills and communication skills improved through this project. • At the capacity-building workshop, I was able to work in a team and improve my online learning skills furthermore. I experienced collaborative learning experiences while developing good practices such as sharing and peer learning.

A change agent is an innovator, and the associated change process occurs along with an innovation (Badely, 1986). The C-DELTA coordinating teachers played their role as innovative agents of change by implementing the C-DELTA project as a new initiative in their schools.

Personal vision building was crucial in this process. Creating such a vision with positive attitudes toward digital education concepts helped these teachers achieve their goals with determination. Further, the inquiry-oriented interactive approach adopted throughout the intervention process supported the teachers in developing the required competencies and their own mastery through personal practice, so they could effectively function as change agents. Obtaining certificates and badges in each of the modules in C-DELTA was an indication of their mastery in different areas, which was motivating for them. In addition, the opportunity for collaboration with other teachers in different schools enabled enhancement of collaborative learning, sharing ideas and resources, peer learning and teamwork.

Concluding Remarks

The introduction and implementation of the C-DELTA initiative in Sri Lankan secondary schools resulted in the development of capacity and leadership skills among the group of coordinating teachers. Amid various challenges, these teachers attempted to enact positive changes in thinking and practices in digital behaviour among students and peer teachers. This occurred mainly by them improving their digital literacy and digital learning skills. In particular, the novel concepts of "digital footprint" and "digital identity" provided very useful insights for them to enact change.

C-DELTA emphasises enhancing capacity building in context-based digital literacy practices through digital education leaders who can make leadership in fostering digital literacies relevant to their contexts, by becoming change agents (Brown et al., 2016a). The group of teachers in this study were clearly quite motivated and competent to function as change agents and digital education leaders to promote digital education environments in their schools. However, educational change is a complex process comprising four phases: initiation, implementation, continuation and outcome (Fullan, 2007). To successfully manage this process, teachers inevitably will need to be continuous change agents. It is anticipated that these teachers, with their enhanced digital education leadership skills, will take future innovative actions to continue enacting change in their own educational environments.

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Developing Digital Education Leadership in the Commonwealth

Cheryl Brown

Introduction

The Commonwealth of Learning (COL) Digital Education Leadership Training in Action (C-DELTA) programme aims to develop participants' digital literacy, knowledge of digital education and ability to lead and implement digital education initiatives in their various contexts. The programme comprises curriculum resources (seven modules), available as open educational resources and offered as downloadable print resources and through an online platform, which includes module content and pre- and post-test assessment.

By mid-2019, a total of 3,155 people had registered on the C-DELTA platform, with 2,273 logging into the online platform; 1,877 completed the pre-test assessment and 594 the post-test assessment. These participants were from 28 countries, of equal gender distribution, and were diverse in age (although 57% were under 20 years old).

The intention of the programme is to provide a holistic view of digital education leadership. To achieve this, the programme endeavours to be accessible and applicable to a diverse group of participants across the Commonwealth, with the overall goal of assisting people to become lifelong learners.

The first three modules focus on creating awareness about digital footprints and digital identity (and are primarily aimed at learners); the latter four focus on creating and using digital resources with open licences and using open educational resources, and on developing personal learning networks as well as critical perspectives on global developments in digital technology and education (and are positioned more for teachers).

Digital Education Leadership

Whilst the term "digital education leadership" might not be commonly used, the growing importance of digital literacy in educational agendas worldwide demonstrates the need for leadership development in digital education (Brown et al., 2016). Digital education leaders are people who can demonstrate the effective use of information and communication technologies (ICT) in their respective educational contexts and who can advocate for, influence and foster such capabilities amongst others in their communities.

A desktop review of existing programmes in the field, conducted as part of the evaluation, demonstrated that the expression "digital education leadership" was not commonly used. This was acknowledged by Arnold and Sangrà (2018), whose 2013–2017 literature review on leadership for technology-enhanced learning (TEL) in higher education indicated that the expressions "digital education leadership" and "higher education" yielded no results.

Formal postgraduate qualifications that span Australia, New Zealand, the UK and the USA tend to focus on digital leadership and education leadership, but few combine all three (Brown, 2019). The US programmes emphasise instructional design and successful strategies for educational technology in the classroom. In the UK context, the focus is at a more macro level, describing itself as providing insight into "educational policy issues of current global significance and their implications for the effective leadership of educational institution," and in New Zealand, programmes are aimed at "aspiring or current educational leaders who are passionate about leading improvements that serve diverse communities and learners" but are very much positioned in the New Zealand context. None of these offerings are particularly relevant to learners across the Commonwealth and those wanting to develop their skills in leading practice in the use and implementation of educational technologies

In terms of free online courses available, there are a variety of training programmes originating from a range of providers, including some with commercial affiliations. Some either aim to assist school leaders with navigating the challenges and opportunities of education transformation or are focused on helping teachers develop confidence in using digital tools in the classroom. Google Education and the Online Learning Consortium offer resources and opportunities for organisations or individuals to formulate or join a programme.

The only training programme that exists in a developing-country context is Universiti Sains Islam Malaysia's (USIM) Digital Education Leadership Action Training in Malaysia. This course is particularly focused at the tertiary level and offers a blend of face-to-face workshops and online resources, with a focus on online and distance learning and management.

All the training programmes reviewed involve costs to obtain certification, are mostly closed (and formal) qualifications (although some offer limited free resources online) and are usually country specific.

C-DELTA, through its free, open and online approach, is unique in its endeavour to develop the digital education leadership capacity of global populations.

Motivations for Using C-DELTA

An exploration of participants' motivations for undertaking the programme demonstrated that the predominant reasons for registering were learning about digital education leadership, gaining knowledge and/or experience through doing an online course, and acquiring particular competencies and skills. A smaller group of respondents indicated that it was a requirement (12) or that they were motivated to undertake the programme to obtain the certificate (three).

Table 13.1. Thematic analysis of motivations for C-DELTA participation.
Adapted from evaluation survey (Brown, 2019) (n = 113).

Code	Example of Response	Total
Learning	• I acquire some knowledge for the future and it also helps me in my studies. • I want to know more about technology and also to change old system of teaching and learning, to make teaching and learning exciting, easy, interesting and save time too.	26
Knowledge/experience	• To increase knowledge and experience that I may use for personal purposes and in my classrooms. • It's a great way to increase my chances of being a great IT specialist and also a great platform to learn new skills, challenge my knowledge about ICT and be exposed to new information.	25
Competence/skill	• I want to improve my ability in the field of information and communication technology.	25
Fun/interest	• To know more about digital technology, to make teaching and learning more interesting, exciting and easy, and also to teach other colleagues to prepare for the fourth industrial revolution.	15
Self/professional development	• I decided to register for C-DELTA because I wanted to learn from it. I always find any learning site. When I heard Commonwealth give change into us for learning, I was registered on C-DELTA. Now I am willing to learn more from here. Though our family is very poor, I want to go outside of my country to get Learner. Thanks to the Commonwealth.	14
Requirement	• It is part of our organisation project. • What was referred to me from a teacher.	12
Recommended	• My boss recommended it.	9
Help others	• It is best for the digital person who has acted in online activity and works with students and teaching profession.	7
Relevant	• I like to use technology in my classroom. so i always seeking new things in this area. Moreover it is an international platform where i can know about other peoples view.	6
Role	• It was interesting and looked like it would help aid my teaching practices.	5
Certificate	• To face new challenge as proposed by our teacher Mrs G and hence obtain additional knowledge and obtain certificates to face the new challenges of tomorrow.	3

Patterns of Engagement with C-DELTA

As mentioned earlier, there are a variety of ways to interact with the C-DELTA content. Interaction with the modules through the online platform required participants to undertake a multiple-choice quiz, to explore their knowledge of the content and concepts covered within the modules. For example, whilst 1,877 participants undertook the pre-test, fewer (595 participants) completed the post-test (Table 13.2). We know from MOOC research that online learners are motivated differently, and the notion of participation and completion needs to be thought of differently (Ho et al., 2014).

The majority of pre-test respondents (58%) had either not completed or only browsed through modules. Some participants' pre-test scores (for example, the lowest ones under 38) suggest a strategic compliance-type behaviour (Kahan et al., 2017) of clicking through the MCQ merely to obtain access to the modules (Brown, 2019).

However, for other learners, assessment and certification was important. Although only a small number of participants indicated they were motivated by certification, 31% (595 participants) completed the post-test (see Table 13.2). The average score of the post-test was 48, an average increase of ten points from the pre-test, with 89 participants scoring above 90 in the post-test. The improvement in post-test scores is, however, somewhat skewed, as some participants (151) had already obtained a certificate based on their pre-test mark and achieved a lower score for their post-test (as they had already attained the desired level and outcomes). If this group is excluded from the comparison (on the assumption that the participants were simply clicking boxes and not making a genuine, concerted effort to participate), the average increase in pre- and post-test scores is 19 points (see Table 13.2).

Table 13.2. Overview of pre- and post-test data.

	Pre-test Score (*n* = 1,877)	Post-test Score (*n* = 595)	Difference between Pre- and Post-test	Difference (excluding negative results)
Average	38	48	+11	+19
Min	12	15	−43	0
Max	100	102	77	77
Std dev	20	30		

The way post-test respondents indicated they engaged with C-DELTA was also different. The majority of post-test participants indicated they had completed Module 1 (68%), and 35% went as far as to complete Module 7, thus undertaking all of the C-DELTA modules.

Overall, this demonstrates the flexibility of the learning design of C-DELTA, as the varied pathways and options enabled participants to determine how they would engage with the content and the platform.

Value of C-DELTA: Participants' Perspectives

In an effort to explore C-DELTA's value, survey respondents were asked what they felt to be the most valuable aspect of C-DELTA for them. Half (76) answered this question: 30 offered rather general responses, saying they learned new things and all of C-DELTA was valuable or useful. Where respondents highlighted specific aspects, the concepts of digital identity (13 mentions) and information literacy (11 mentions) were foregrounded. Other areas singled out were digital footprint and copyright/Creative Commons (six mentions). The platform and process of learning (seven mentions) and certificate and quiz process (four mentions) were also mentioned specifically, which demonstrates that C-DELTA is not just about the content but also about the process of learning online. This is a valuable outcome, as 40% indicated in the survey that they had never used a learning management system like C-DELTA's online platform before they embarked on the programme. In addition, when it came to their ability to use technology for educational purposes, post-test participants also rated their ability more highly, with 76% indicating they felt they were good to excellent.

When asked what they had learned that was new to them, there was quite a wide range of answers, including copyright/OER, privacy, safety, footprint, platform, responsibility, information literacy, identity, digital education innovations, digital leadership, and terminology.

Survey respondents also had the opportunity to provide feedback on the programme. Questions about respondents' experiences using C-DELTA were measured on a 5-point Likert scale, with 3 being neutral and 5 being strongly agree.

Table 13.3 shows that respondents were very positive about the overall experience, with the majority agreeing or strongly agreeing that C-DELTA had had a positive impact on their learning and that they would encourage others to use it.

Table 13.3. Overall experience with C-DELTA, organised by pre- and post-test participants.

	Type	N	Mean	Std Deviation	Std Error Mean
C-DELTA has a positive impact on my learning.	Pre	58	4.09	.732	.096
	Post	62	4.40	.527	.067
I am willing to encourage other people to use C-DELTA.	Pre	58	3.95	1.033	.136
	Post	62	4.45	.670	.085

How is C-DELTA Changing Practice?

Respondents were also in agreement that C-DELTA had helped them to identify the changes they could make in digital education.

Table 13.4. Changes in practice, organised by pre- and post-test participants.

	Type	*N*	Mean	Std Deviation	Std Error Mean
C-DELTA has helped me to identify the changes I can make in digital education.	Pre	58	4.00	.898	.118
	Post	62	4.39	.710	.090

Fewer respondents (52) were specific about ideas or plans as to how they would use technology-enhanced teaching/learning in the future. Six were not specific about their plans and simply indicated in the affirmative. However, of the 46 who were specific, some general themes emerged. Some respondents had more than one idea about the way they would use TEL in the future, and those were coded into more than one category. Professional development was mentioned by ten people (Table 13.4). As one respondent noted, *"Most of our teacher[s] are afraid of using technology. Based on the learning in c-delta most of our veteran teachers can learn from the c delta programme so that they can also be up to date."* Increasing use of TEL also featured strongly. While some respondents said they would change the way they taught, others said they would change the way students learned: *"We now teach 21st-century learners and as a result I need to step up as a teacher and use the technology available in the classroom. students are now greatly acquainted with smartphones, tablets, computers and surfing the internet. Therefore, I will ensure that I make use of these resources to make learning exciting, engaging and relevant."*

Table 13.5. C-DELTA changing practice.

Theme	Number of Mentions
Working with colleagues to change practice through professional development or establishing communities of practice	10
Online/blended/technology-enhanced teaching	9
Use virtual or artificial reality or video in some way	7
Online/blended/technology enhanced learning	6
Personal development	6
Mobile learning/increasing access to learning	6
Learner motivation/engagement with ICT	5
Set up a learning management system or digital classroom in their school	2
Content, not platform	1

Country Implementations

One of C-DELTA's key objectives was to be applicable to people in all education sectors in all countries of the Commonwealth. Consequently, COL developed and ran a variety of workshops to support interested people in becoming familiar with the programme in order to implement it within their country. The evaluation reported on implementations in nine countries.

The programme has been adopted by schools, universities, colleges and centres, so it clearly has relevance in a wide range of sectors. Reception has been positive, but logistics — time, technology and language — have been reported as posing challenges for usability and implementation. Different countries have adopted different approaches to the implementation of C-DELTA. More in-depth and reflective feedback has been obtained as a result of the TEL partners workshop held in Edinburgh prior to PCF9 and the subsequent papers that have been presented about C-DELTA in Sri Lanka (Karunanayaka et al. 2019 and Chapter 12 in this book), Bangladesh (Khan, 2019), Uganda (Kabugo & Kakeeto, 2019) and Mauritius (Kuppan, 2019).

Institutional adoption of C-DELTA is occurring in two countries. In Kenya, Kaimosi Friends University College and Jaramogi Oginga Odinga University of Science and Technology will adopt it as a non-credit course. In India, Odisha State Open University is also adopting C-DELTA as a non-credit course; in addition, completion of the programme will be noted on students' academic transcripts.

C-DELTA is an openly licensed CC BY-SA resource. It has been adapted by USIM in Malaysia in their Digital Education Leadership Action Training in Malaysia programme. Another two examples of adaptation are found in New Zealand, where Brown and Lim (2019) have integrated particular activities from the C-DELTA modules into six weeks of pre-service teacher courses, and in Saint Lucia, where Fongkong-Munga and Royston (2019) have included C-DELTA content in their Master of Education course.

Some components and activities from C-DELTA have also been included in an open textbook, *Digital Citizenship Toolkit,*[1] published by Ryerson University Pressbooks, and C-DELTA also is a resource in the "Unbundled University" FutureLearn MOOC.[2]

During a TEL partners meeting in Edinburgh in September 2019, a C-DELTA focus group with representatives from seven countries discussed their varied approaches to implementation. The focus group also noted some additional strategies that could increase adoption of C-DELTA:

- Align the programme with teacher professional development points.

- Offer a certificate for voluntary participation that could be added to a university transcript.

- Offer it as partial credit towards a university programme.

- Increase its visibility and status through more public ceremonies for awarding certificates.

Discussion

While there are plenty of formal (usually postgraduate) courses on digital education and digital literacy, C-DELTA is unique in its open content (CC BY-SA licensing), range of levels of complexity, and accessibility and use. Uptake has, to date, has been concentrated in countries where focused training of teachers has occurred through facilitated workshops, but the programme has been undertaken

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1 https://pressbooks.library.ryerson.ca/digcit/front-matter/introduction/
2 https://www.futurelearn.com/courses/the-unbundled-university

by people across the world. Additionally, course materials have already been adapted and reused to meet the needs of learners in a variety of contexts.

When it was initially established, the programme set out to encourage the participation of people with a wide and diverse range of digital experiences from different countries with different approaches to education. This aim was clearly achieved, as the evaluation showed that participants came from 28 countries and ranged in age from 11 to 72 (although the majority were aged 12–20). More than half the survey respondents reported never or seldom having used an LMS before, which demonstrated the diversity of experience in structured online learning, but the majority rated their online learning skills as good to excellent after their C-DELTA participation. While this latter point cannot be definitively linked to their C-DELTA experience, the survey results indicate that it had made a positive impact on students' learning, and qualitative data specifically supported the value of C-DELTA in developing digital literacy and digital education leadership.

The platform data show that participants used C-DELTA in different ways, which demonstrates how the programme can be adapted for different educational approaches and learning needs. This is not unlike participant behaviour in MOOCs, where researchers have described different approaches to engaging with content (Kahan et al., 2017). C-DELTA had participants who registered but never actually accessed the courseware — a category noted by Ho et al. (2014) as "only registered," which accounted for 34% of the registrations. The next category of participants could be referred to as "samplers" (Kizilcec & Schneider, 2015) or "tasters" (Kahan et al., 2017). These participants are not interested in the outcome of the assessment or systematically working through the curriculum materials. They appeared to be intrinsically motivated, as they undertook the pre-test as a means of accessing the course content and reported browsing content but did not complete modules. The next group undertook the pre-test and engaged particularly with Part 1 of the C-DELTA curriculum. These participants definitely engaged with the content and had most in common with Ho's category of "explorers," who are described as non-certified registrants who accessed more than half of the available content (2014). Kahan et al. (2017) delved deeper into the difference amongst the groups they called "engagers," noting differences in online and offline behaviour and those who participated in activities (such as quizzes) and discussions. The last group are those certified participants who completed the post-test and earned a certificate.

However, even though participants engaged with C-DELTA in a range of ways, the evaluation has shown that the pre- and post-test quizzes can be used to differentiate participants' knowledge of digital education leadership across different country contexts. The increase in knowledge of digital literacy among students and in digital education leadership among teachers between the pre- and post-tests is statistically significant.

Overall, the feedback from participants was very positive, and the success stories that were captured demonstrate the very real influence C-DELTA has had on students, particularly in increasing their confidence in the use of ICT for learning. Teachers are making an impact in their schools and among their learners, despite limited resources and opportunities. In addition, C-DELTA's relevance is evidenced in its use in and adaption for other programmes and publications.

Specific feedback from both participants and implementation reports indicated that some challenges were experienced with regards to language in terms of both the terminology of the content and it not being in participants' mother tongues. A contradiction emerged through the feedback as well. Some participants' feedback provided clear indications that lack of access was an issue for some people, whilst others found the text-heavy content design and lack of interactivity and multiple modalities limiting. The reality is that it is hard to design a programme that meets everyone's needs in terms of diversity of conditions of access, skills and experiences. This is a crucial point to keep in mind for future developments and illustrates the dilemma of providing innovative and accessible programmes across a diversity of contexts.

Conclusion

This chapter foregrounds how C-DELTA has achieved its aim of developing an accessible programme to advance digital education leadership in a manner that meets the needs of a diverse audience. The unique open-licence (CC BY-SA) nature of the course means it is available for anyone to join, free of cost. This has facilitated diffusion beyond the C-DELTA platform. The programme has reached a diverse audience with growing implementation, including intensive implementations in seven countries (at the time of the evaluation) through a range of different partners. The design offers flexibility for learners to draw on content that is most relevant to them and choose whether to engage in exploratory learning or to undertake assessment leading to certification. There is also evidence of the development of personal digital literacy as participants engage in self-directed learning online, and of impact amongst a broader community of learners and educators. Recommendations went beyond the original scope of C-DELTA and demonstrate that participants see benefit in such a programme expanding, as well as the development of a C-DELTA community of practice.

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Changing Access to Learning Resources

Michael Paskevicius

Introduction

There is a growing global demand for access to education and, as a result, a greater need for access to educational materials. Textbooks, lesson plans, presentations, simulations and other educational materials are typically used to support student learning and provide resources for learning activities that help mediate learners' understanding of concepts and knowledge. In the context of higher education, educators are usually responsible for selecting educational materials, and learners are responsible for gaining access to them. Some have argued that this is highly problematic, as those responsible for selecting resources are not the ones required to pay the price for access. The implication is that considerations around how learners access materials and at what cost are not front of mind for the decision maker (Richardson, 2015). This has led to a drastic increase in the cost of learning materials that are made available from publishers (Ashby, 2005). In developing countries, the situation is compounded, as educators and learners remain heavily dependent on imported textbooks and reference books, and in many cases, these resources are exceptionally expensive and sometimes not current (Barton et al., 2002).

This chapter explores the various types of educational materials available to educators today: educational materials from traditional publishers, online educational materials, and open educational resources.

Commercial Educational Materials

Traditionally, educational publishers have offered printed copies of educational materials, usually at a cost, to schools and learners. Textbooks are among the most commonly used educational resources within formal higher education. In some cases, the textbook forms the central resource that guides activities and discussion in the course; in others, the textbook may play a more peripheral role,

accompanying other discussions and resources selected by the facilitator. In both cases, access to the textbook and learning resources plays an essential role in supporting learning, and students are therefore encouraged to make sure they can easily access the materials. As textbooks are selected and prescribed by educators, students often have little choice over which to purchase (Ashby, 2005). This has resulted in students having to make challenging choices about which courses to take and which resources to purchase, based on textbook costs. Consequently, many learners now access used textbook marketplaces, and in some cases, engage in the illegal copying of educational materials in order to gain access.

Nevertheless, educational publishers continue to produce textbooks, and they have further expanded their offerings by developing digital versions of textbooks, ancillary or supplementary materials, applications, games, and learning environments that may be used to complement traditional materials. These materials may be included with the textbook on a compact disc, or offered online either at a cost through user registration, or openly. Often, access to these resources requires that a learner have access to a computer or mobile device or the ability to print online resources for use as needed. Worth noting is that many of these online resources will not be suitable for printing (for example, online interactive software, games, videos, etc.). Many of these online resources also include technical restrictions known as digital rights management (DRM). These restrictions, commonly known as digital locks, technically limit the user from freely accessing, printing, copying, marking up, and highlighting the resource and often require that it be accessed only while connected to the Internet (McGreal, 2017). The ways in which these resources are made available to learners by publishers should be carefully considered, as they may include limitations on the duration of access, require specific methods and tools in order to access them, and prompt considerations around ownership and the use of learner data provided through their usage.

Academic publishers have also started evolving their business models, with the introduction of inclusive access subscriptions. These involve educational institutions partnering with publishers to make online educational materials available to learners, rather than having each student individually purchase their learning materials. The cost of these learning materials is bundled with the course fees and applied when learners enrol for a course (McKenzie, 2017). Publishers claim they can offer these resources at significant discounts by providing them to many learners (Pearson, 2017; VitalSource, n.d.). While these types of resources are increasingly being adopted by educators, they often still come at a cost to learners, who then also may have fewer options around retaining access or selling their used copy to recover some of the initial cost. Essentially, in the inclusive access model, learners pay a fee to access their educational materials for the duration of a course, rather than owning the material and then being able either to sell it to recover some of the cost or to retain it for future reference (McKenzie, 2017).

Online and Open Educational Materials

An alternative to sourcing materials from publishers is to use educational resources that are freely available online. Increasingly, educators and organisations are sharing the educational materials they create online so these can be accessed by educators and learners using the Internet. Some, but not all, of these resources are shared using open copyright licences that allow their reuse,

adaptation and resharing by others. The distinction between "online" and "open" resources is important and has implications for those accessing educational materials online. When resources are simply placed online without an explicit statement around copyright, by default the right to copy or adapt rests with the author. Without a statement around reuse or modification, these materials have more ambiguous terms of reuse. Open licensing models support the legal copying, adaptation and resharing of educational materials but are not applied uniformly across the Internet.

Many educators and organisations are sharing digital educational materials as open educational resources (OER). The emergence of OER was largely a result of advances in technology and a commitment on the part of various institutions around the world to support education for all. Repositories of OER are now available from organisations around the world for various subject areas and curricula. In addition to institutional repositories, content-specific repositories have emerged for specialised media, such as images, lesson plans, learning activities, textbooks, videos and audio. These open repositories of OER offer learners and educators a place to source learning resources. Educators are increasingly recognising OER as a potential source for finding and adapting educational materials to meet their pedagogical needs.

The Promise and Perils of OER

The goal of OER was to provide resources that were free of encumbrances to be used, adapted and reshared by educators and learners. It has been proposed that OER can ideally include several key attributes of openness: technical openness refers to the accessibility of the resource itself and the ability to easily adapt or remix the educational material (this may include file formats and interoperability standards); legal openness refers to the copyright licence applied to the materials, enabling legal reuse and modification; social openness includes the willingness of the author of the material to make their work available and relevant beyond traditional contexts (for example, their own classroom or university); and financial openness, which means the resource comes with no additional costs to use or adapt (Hodgkinson-Williams & Gray, 2009). Figure 14.1 provides a visual of Hodgkinson-Williams and Gray's model articulating the key attributes of openness, with examples.
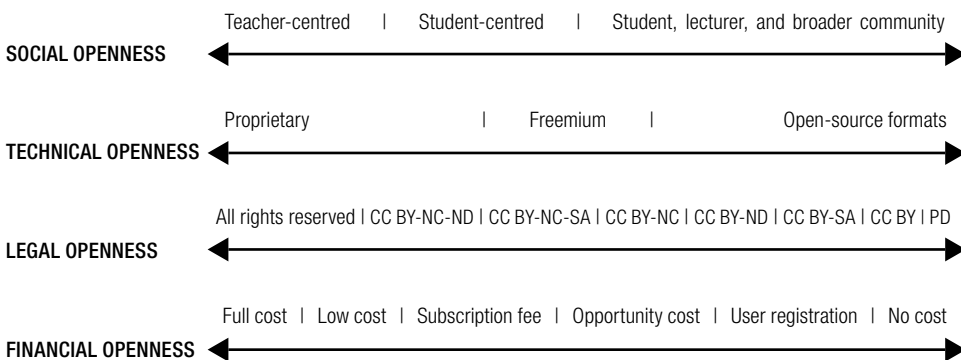

Figure 14.1. Key attributes of openness. (Adapted from Hodgkinson-Williams & Gray, 2009.)

Many OER will contain some of these elements but not necessarily all, which may result in implications for those looking to reuse these resources. Consider, for example, an OER that an educator wants to adapt that has been shared as a PDF file, making it harder to modify without an editable source file (technical openness). Or an OER shared with a licence that does not allow derivative works, which an educator wants to adapt to make more relevant for their learners (legal openness). Lastly, consider an OER that is shared online but requires each user to create an account with a website in order to access, download or adapt the resource. This final example encompasses both technical and financial openness, because if the user creates an account on a website, there will be an exchange of data that may have financial implications (for example unsolicited email, upselling, etc.). On the other hand, propriety resources could be characterised as having low social, technical, legal and financial openness due to how they are designed, created, licensed and sold. Hodgkinson-Williams and Gray's (2009) model of technical, legal, social and financial openness offers an important heuristic for thinking about access in the context of OER, and provides significant guidance to those wanting to share their work in the most accessible way.

Methodology

The purpose of this chapter is to report an assessment of students' access to educational materials in select institutions within the Commonwealth countries. A questionnaire consisting of 32 questions was distributed in select Commonwealth countries where the Commonwealth of Learning's (COL) Technology-Enabled Learning initiative had existing partnerships. As such, the questionnaire was distributed to contact persons in Bangladesh, Fiji, India, Kenya, Malaysia, Papua New Guinea, Samoa, Saint Lucia and Uganda. Contact persons in these countries distributed the survey instrument in their respective institutions. The majority of survey respondents resided in Bangladesh (583), with a minority of respondents representing other Commonwealth counties, including Barbados (1), Fiji (12), India (43), Kenya (47), Malaysia (11), Papua New Guinea (37), Saint Lucia (53) and Uganda (43). Considering the low numbers of responses from some of the countries, it was decided to analyse only the data from countries with more than 30 responses.

As noted above, the purpose of this chapter, which is based on an earlier study (Paskevicius, 2019), is to assess students' perceptions of and reflections on how they have been accessing educational materials, their experiences with the costs and availability of these resources, and their awareness and understanding of OER. The following discussion distils the main findings that emerged as part of the research.

Student Access to and Use of Information and Communication Technologies Relative to Educational Materials

The first research question was: How do learners report their access to and use of information and communication technologies, and how does this impact their access to educational materials? One significant finding was that learners

were increasingly accessing and expecting to be able to access educational materials while mobile. Furthermore, nearly all respondents reported having access to a smartphone and using this device actively to support their learning. A complicating factor in terms of smartphone use for accessing learning materials was the increasing diversity of learning resources they were being assigned during their studies. These included printed texts, digital texts, web resources, online learning environments and publishers' learning environments, creating a complex landscape for access and use. Given this increase in diversity, it is important for educators to consider accessibility when assigning learning resources as part of a course. This may also include considering the use of captions and transcript files for audio and video resources to ensure the materials are accessible to all learners.

The increasing diversity of learning resources also creates complexity for learners in that resources may not all be shared in a single location. This emphasises the need for learners to explicitly curate their educational materials, whether these are online, print based, password protected or limited by DRM. Educational institutions have sought to mitigate this issue through the use of learning management systems (LMSs). However, the LMS environment is not always able to accommodate all types of resources and is typically only available to students while they are actively enrolled in a course. Thus, self-curation of educational materials by learners becomes a critical facet of knowledge-management literacy for students who expect to be able to access their learning materials in an ongoing way.

In addition to the materials assigned as part of their study, learners reported seeking out a variety of other resources to support their learning. Many of these included emergent forms of media, such as educational applications, videos, Wikipedia entries and a variety of multimedia sources. These resources also need to be curated by learners so that they can be accessed and reviewed when needed. Educators should consider ways for learners to contribute these resources back to the class community to enhance the learning of others and provide resources for discussion.

As learners move to increasingly ubiquitous access to the Internet and mobile devices, they are seeking more interactive content in the form of interactive applications. Yet learners in this study reported that interactive educational materials were more difficult to find when compared with resources such as videos, dictionaries, Wikipedia entries and books. For those who reported preferring printed materials to support their learning, the diversity of increasingly online learning materials, including those not suitable for print, may serve as a barrier to their learning.

Participants in this study reported significantly high access to smartphones, so creating mobile-friendly interactive learning materials is a promising area for future development. However, these resources must be designed with accessibility in mind, and they must allow learners to curate and control access to the needed learning materials, use these while they are mobile, and in some cases work without an Internet connection. The incremental movement towards storing resources within an LMS that are difficult to download, or even more recently within LMSs controlled by publishers and made available for a short duration,

presents a challenge for learners, who should be able to download, annotate, remix and combine their resources offline and into the future.

Cost and Availability of Educational Materials

In exploring respondents' perceptions about the cost and availability of textbooks and how this impacts their access to educational materials, it was evident that the increased availability of free online alternatives to purchased textbooks were of interest to learners. While the cost of a textbook for a particular course did not have a significant impact on their decision to enrol in that course, it was interesting to find that learners do look closely at the total cost of learning materials for an academic programme of study. This is positive news for new OER-based programmes such as z-cred or zero-cost programmes, which aim to have zero additional costs associated with learning materials.

Remarkably, learners indicated they were more likely to avoid programmes where the total cost was high but less likely to avoid individual courses with high resource costs. Participants reported that the average cost for learning materials for an individual course was USD 164 and expressed that this cost did not represent a significant barrier to their learning. Learners did express a preference for course material costs to be made more explicit during enrolment and to be included within the course/programme fee. In many cases, learners discover the total cost of the learning materials for their courses during the first week of class, and the total cost can quickly escalate, leaving learners to make very challenging decisions about which resources to buy, rent, share, borrow, copy or go without. Respondents who chose not to purchase a required learning resource recognised that this could put them at a disadvantage and at risk of failure.

Awareness of Open Educational Resources

Overall, this research found that learners are increasingly being assigned online learning resources, as well as seeking out and finding resources on their own to support their learning. How many of these online resources are actually OER is not entirely clear, as the difference between an online and openly licensed resource does not impact their general availability. While an open licence and open technical formats would enable learners to do even more with their learning materials, it appeared that resources without explicit open licences were also considered downloadable and useable in various ways. The ways in which respondents reported wanting to interact with their learning resources aligned well with the technical and legal affordances of OER. Respondents reported wanting the ability to annotate, search, copy and maintain copies of the source files of their learning resources for ongoing access. Despite the alignment with the affordances of OER, respondents did not seem to delineate between OER and non-OER (i.e., those resources that are not openly licensed).

In terms of OER awareness, based on the results of this questionnaire, it is clear that much work still needs to be done to draw attention to OER and how to recognise them online. While awareness of the term OER was reported by 37% of the respondents, far fewer provided examples of actual OER they most frequently used. Of those who did provide examples, only a small number demonstrated an understating of OER, based on the answers provided in the questionnaire.

Awareness of what constitutes an OER is abysmally low, and consequently, several of the affordances made possible by OER are not being realised.

Conclusion

The purpose of this chapter was to discuss the current landscape of learning resources and present the findings from a study with learners, facilitated by the Commonwealth of Learning in 2019. The results demonstrate that our learners are working in a complex ecosystem of learning resources, some of which are prescribed by their teachers and some of which they may independently seek out to supplement and enhance their learning. In light of this, attention should be given to always ensuring the quality of assigned resources. As well, learners should be encouraged to carefully review any additional resources they find to support their studies to ensure they are also of high quality. Thoughtful attention should also be paid when considering the accessibility of the learning materials educators prescribe, especially in light of changes to the commercial publishing business models, which have implications for learners' sustained access. Furthermore, educators should be mindful of what data our learners are required to provide when registering for these services and how data are generated and used by publishers through their ongoing use. Considering the growth of available OER and their increasing adoption across higher education, learners should be made aware of what is possible with openly licensed materials. As well, when educators consider the accessibility of the resources they create and access, they may find it helpful to use the lens of technical, legal, social and financial openness thoughtfully provided by Hodgkinson-Williams and Gray (2009). These considerations can guide the creation of OER that are, in most cases, intended to be reused and adapted without encumbrances for users.

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Return on Investment from an Open Online Course on Open Educational Resources

Santosh Panda

Introduction

While it has been objectively authenticated that textbooks and associated assignments have for years significantly contributed to increasing student engagement and enhancing student academic performance (Darwin, 2011; Skinner & Howes, 2013), at the same time, the undisputed supremacy of textbooks as the main source of learning has in the recent past been challenged due to high cost, the availability of free-of-cost open educational resources, and developments in social technologies and social networks. The high cost of textbooks has been reported to be an impediment to student access to higher education (Seaman & Seaman, 2018), and it can considerably influence student withdrawal from courses (Broton & Goldrick-Rab, 2016; Butcher & Hoosen, 2012; Colvard et al., 2018; Hilton III & Wiley, 2011). In some instances, students decide against buying textbooks even if this will have an adverse impact on their course grade (Jhangiani & Jhangiani, 2017). In the community college context, a study by Bliss et al. (2013) on the cost and quality of open textbooks suggested that both faculty and students found them to be low cost and high quality. Similar findings were also reported by Brandle et al. (2019), where students of a premier university in the USA reported both cost savings and ease of access with respect to zero-textbook-cost courses.

Open textbooks and open publishing have gained currency in the past decade, and openly licensed textbooks and digital/e-books have emerged as alternatives to traditional textbooks. An increasing number of initiatives by organisations and educational institutions offer zero-cost digital textbooks to teachers and students, including Athabasca University (McGreal & Chen, 2011), MERLOT, MIT, the Hewlett Foundation, the Commonwealth of Learning and UNESCO. Open educational resources (OER), a term coined at the 2002 UNESCO Forum on the Impact of Open Courseware for Higher Education in Developing Countries, are now being viewed by many national governments, schools and

higher education teachers as both alternatives and complements to traditional proprietary teaching–learning resources. These open resources comprise courses, textbooks, audio and video files, journal papers and other materials generally available online, along with open licensing for use and adaptation for non-commercial purposes only. Creative Commons has upheld the principle of the 5Rs — retain, reuse, revise, remix and redistribute for free — originally formulated by David Wiley (Jhangiani & Biswas-Diener, 2017). However, the CC BY-ND (non-derivative) licence imposes restrictions on creating derivatives and therefore has to some extent limited the large-scale use of OER (Green, 2017).

Even as OER have come a long way in both policy and development, in many instances, both faculty and students have been reported to have very low awareness about their availability and potential use (Bliss & Smith, 2017; Freed et al., 2018). There is now a growing number of research studies on OER, though studies on costing are very rare. It has been reported that students at various levels and in diverse fields have had positive experiences with OER, especially from the point of view of access and quality (Cooney, 2017), though concerns about the quality of OER have been expressed by faculty (Belikov & Bodily, 2016; Hassall & Lewis, 2017). In a recent study, Clinton and Khan (2019) reported no difference in learning efficacy between open and commercial textbooks, and noted that student withdrawal when open textbooks were used was lower than with commercial textbooks.

In a study on undergraduate students' self-reporting on cost of education, Clinton (2018) reported that students had to spend almost 42 times more money on commercial textbooks than on open textbooks. In another study, Hilton III et al. (2014) found that in the context of community colleges and state colleges in the USA, students had saved nearly USD 900 on textbooks each year, and that the adoption of OER reduced the cost to zero. The latest study at hand is that by Clinton (2019), who reviewed nine research studies on cost, outcome and perception of OER and found the same picture as described.

What emerges distinctly from the above analysis is that awareness and capacity building are two important prerequisites for the appropriate, gainful and sustainable use of OER in teaching, learning and training. In a recent review, Bossu and Willems (2017) analysed and highlighted the OER-based capacity building undertaken by the Commonwealth of Learning (COL), the Joint Information Systems Committee, the OER Hub and the OER Universitas. For the further mainstreaming of OER, Bossu et al. (2014) raised four important concerns that need to be addressed: (i) the willingness of academics to share their work as OER, (ii) academics' concern about the quality of OER, (iii) perceived constraints on OER and (iv) mapping of the knowledge and skills required to take advantage of open educational practices. The UNESCO recommendation on OER emphasised five important interventions by national governments, including capacity building in stakeholders for creating, accessing, using, adapting and redistributing OER (UNESCO, 2019).

COL has been promoting OER in the form of policy formulations and capacity building in Commonwealth countries. In addition to its many technology-enabled learning (TEL) initiatives, it has been offering a short online course on OER, initially in 2015 as an open course without login and password requirements on the Moodle learning management system (LMS), and subsequently on a

dedicated platform launched in August 2018. The findings reported in this chapter are based on a post-facto evaluative research study of this course (hereafter, LearnOER) offered through the dedicated platform, specifically from the point of view of return on investment/return on expectations (ROI/ROE).

Research Objectives

The evaluation was concerned with three distinct but interrelated dimensions of online learning, OER and ROI/ROE. The study attempted to determine the status of the following four variables:

1. Reactions of participants to the quality of the online course.

2. Reactions of participants to the course based on OER.

3. Participants' empowerment by the course, and the extent of their actual or proposed use of knowledge and skills on OER in their own organisation.

4. Institutional and private costs involved in COL offering the course and in participants taking the course — in other words, the benefits/returns derived in comparison to the costs involved.

Conceptual Framework

The online course was evaluated from both graduate and institutional perspectives, particularly within the ROI/ROE framework. As reported by Bramble and Panda (2008), and based on the established studies by Siakwan and Wright (2001) on the cost of remote-access distance learning (RADL) and by Baker (2002) on return on training investment, Kirkpatrick's four-level model — comprising research, learning, behaviour and results — was considered, with the addition of a fifth variable (i.e., ROI as also ROE) (Kruse, 2006; Phillips, 2007). The following were the five levels of analysis:

1. Reaction and planned action (including satisfaction)

2. Learning and confidence (knowledge, attitude, skills)

3. Behaviour (the implementation process and the impact on workplace behaviour)

4. Results (the impact on business/institutional operations)

5. Return on investment (assessment of benefits in relation to costs)

Though ROI takes into consideration accrued benefits in terms of monetary values, there are intangible benefits that facilitate the transfer of learning to similar organisational activities. Therefore, ROI was updated to include ROE, "which captures the congruence of institutional strategic objectives, the expectations of the outcomes of education/training, and evaluation of expectations/objectives and outcomes" (Panda, 2019, p. 10). ROI is usually calculated using the established formula:

$$\text{ROI} = \frac{\text{Net project benefits}}{\text{Project costs}} \times 100$$

The ROI/ROE framework within which the present study was conducted is captured as follows (Figure 15.1).

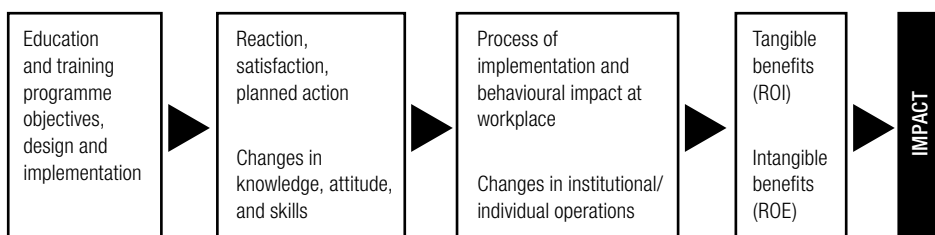| Education and training programme objectives, design and implementation | → | Reaction, satisfaction, planned action

Changes in knowledge, attitude, and skills | → | Process of implementation and behavioural impact at workplace

Changes in institutional/individual operations | → | Tangible benefits (ROI)

Intangible benefits (ROE) | → | IMPACT |

Figure 15.1. Impact analysis vis-à-vis ROI and ROE.

The framework includes evaluation of the course offered online, based on OER, and from the points of view of participant cost, value, satisfaction, productivity (i.e., benefits accrued in comparison to time and cost put in), institutional cost and ROI.

Methodology

The present post-facto evaluative study was based on: an online survey of graduate reactions to online and OER aspects of the course; actual expenses incurred; the perceived value of the course if offered as a paid course and whether it contributed to the economic value of the current and future activities of the graduates; and the institutional cost involved (and ROI accrued) in the design and delivery of this online course on capacity building in OER.

Population and Sample

Of the 4,079 registered users from 64 countries between 2018 and 2019, it was reported that 1,419 users had graduated from the course, only 10% failed the course, and the rest were at various stages in their study of the materials. Of the registered participants from higher education institutions (64.8%), schools (16.01%) and other business and non-governmental organisations, there were more females (53%) than males, more from the 21–30 age group (37%) and 31–40 age group (35%), and the distribution of prior educational qualifications was: master's (56%), bachelor's (24%), doctorate (20%). All 1,419 graduated participants were sent the research instruments through an online survey to fill in online; 127 responses (9% response rate) were received, and 118 completed responses were analysed. Of these respondents from 12 countries, 52% were females, largely from the 31–40 age group (41%), with a master's degree (50%), and largely from higher education institutions (74%).

Instruments

To meet the objectives of the study, the online survey was conducted through a questionnaire comprising items on: (i) individual variables, (ii) questions about various aspects of the online course and experiences with OER, (iii) variables

relating to ROI/ROE — reactions, learning, behaviour and impact, and (iv) individual and institutional costs, dollar value assigned for doing such an online course on OER, and time and cost savings in their own organisation due to the use of OER. To assess the value of the online course, 18 statements with five response categories — ranging from 5 = "strongly agree" to 1 = "strongly disagree" — were finalised, based on a review of the literature as well as comments received from ten experts engaged in online course design and delivery and OER. The matrix used in the analysis of participant responses is represented in Figure 15.2.
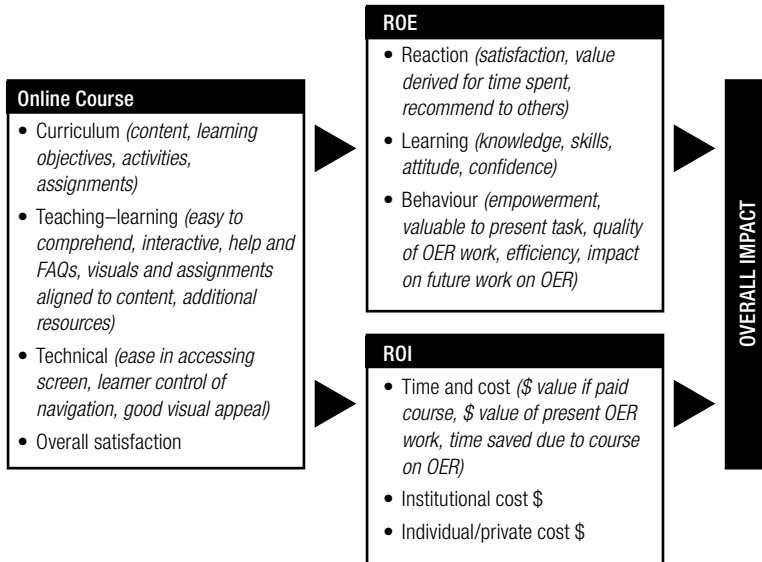
Figure 15.2. Matrix for course evaluation and ROI/ROE.

Procedure

Before developing and administering the questionnaire, the online course on OER (LearnOER) was thoroughly studied by the researcher, and discussions were undertaken with the programme designer and administrators. Related literature was thoroughly reviewed to determine variables relating to online learning, OER and ROI/ROE. The prominent ones were the eight dimensions given by Stamenka and Daniel (n.d.) based on Quality Matters™ Rubric Standards for online learning, including eight factors on learners' quality perceptions; variables used by "TalentLMS" (Andriotis, 2018); the six ASSETT criteria for hybrid and online courses (University of Colorado, n.d.); the official, authentic work by the US Department of Education (2008); online learning through online networking, by Salmon (2002); the comprehensive 58 indicators developed by UW-La Crosse (2014); best practices on online assessment as reviewed by Wang (2006); the deep learning variables suggested by Holzweiss et al. (2014); the 11 quality indices given by Gomez-Rey et al. (2016); the five pillars of online learning outlined by Sloan-C; and the guides on evaluating OER, developed by BCcampus (Canada) and Austin Community College (USA).

The finalised indicators on online learning and OER were interwoven with the five variables of ROI/ROE to arrive at the evaluation framework. Data collected through the online survey were tabulated, and percentages of responses were calculated from the analysis. The ROI was calculated using the formula given earlier in this chapter. As a note of clarification, an attempt was made to convert the data into quantitative terms and, as much as possible, into dollar value; however, ROE was predominantly determined from individual expressions of satisfaction, comments on development and possible transfer of learning, as well as cost-effectiveness and ROI.

Results

As specified in the objectives of the study noted earlier, the results are presented in five sub-section: reactions to the online course, reactions to the course based on OER, empowerment of participants, private and institutional costs, and ROI/ROE.

Online Course

The following are the findings on the online course on OER.

- LearnOER was designed such that it could be completed in a continuous two-hour session, though many took days and months but still could not complete the course, since a score of 80% at one go was the minimum to pass the course. The average time taken by the participants was 135 minutes, with almost 29% of participants taking more than 180 minutes to complete the course. About 14% completed the course in ten sittings.

- The responses to the 18 statements on various aspects of the online course are given in Table 15.1. They suggest very positive perceptions relating to course objectives, learning activities, assignments, easy understanding of content, ease of on-screen reading and viewing, and learner control over navigation.

- The average score of 4.54 (out of 5) indicated very high satisfaction with the course. A high level of symmetry among all respondents across all 18 statements was indicated by standard deviations ranging from 0.05 to 0.06.

- Over 73% of participants suggested course completion had significantly contributed to the current tasks they performed.

- The best aspects of the course included: usefulness of content on licensing and intellectual property; interactive tutorials; application of learning; flexibility of moving at own pace; types of assignments; easy navigation of the online LMS; effective course design and course structuring; development of skills on OER design and adoption; video lectures; planning and execution of the online course; additional useful resources on OER; and certification by a reputable international organisation.

- The participants provided suggestions for possible improvement of the course in future: varied examples of OER; clarification on games; more links to resources for the appropriate course section; easing the minimum 80% score for a pass; more linkages between course content, assignments and final examination; and subtitles and transcripts for videos.

Table 15.1. Average values for 18 statements on perceptions of the online course.

Sl. No.	Statements	Average	Standard Deviation
1	Description of course objectives, learning activities and assignments in the online course was "appropriate."	4.58	0.056
2	The online course on OER enabled me to understand the topic well and easily.	4.51	0.056
3	Reading and/or viewing the contents on screen was easy and efficient.	4.49	0.059
4	The amount of content on screen was adequate and not overloaded with information.	4.29	0.061
5	The learning contents on screen were presented logically and were connected to each other sequentially. The instructional design was appropriate for this course.	4.38	0.062
6	The technology design provided me with enough freedom to handle the content and navigation on my own.	4.43	0.057
7	After reading through the online course, I am satisfied that I have gained sufficient knowledge about OER.	4.34	0.061
8	The way the content was presented helped me to perform better in the final assessment.	4.35	0.056
9	The visual appeal of the LMS platform was very good.	4.34	0.057
10	The assessment tasks were fully aligned to the content of the course.	4.34	0.052
11	The interactive exercises in the online course helped me to undertake practice and learn from them.	4.29	0.054
12	I quickly and easily performed the tasks on interactive screens.	4.27	0.058
13	The visual elements did not distract me from learning on screen.	4.24	0.055
14	The "Help" and "FAQs" provided in the online course were easy to locate and understand.	4.26	0.060
15	The system gave options and alerts to rectify mistakes while navigating through the course.	4.21	0.057
16	The structure and navigation of the course was clear and easy to follow.	4.38	0.052
17	The additional resources provided were very useful for my understanding and skill development.	4.39	0.056
18	Overall, I am satisfied with this online course and will take more such courses, if available.	4.54	0.054

Open Educational Resources

Participants were asked to react to the OER dimension — i.e., the OER used in the course, and the course on OER. All respondents but one expressed great satisfaction and would recommend the course to others. Over 96% had derived more value from the course than the time spent on the course work and successful course completion. Nearly 78% were highly satisfied and 22% were moderately satisfied with LearnOER.

Empowerment

One of the important objectives of the study was to find out the extent to which participants perceived themselves to have developed knowledge, attitudes and skills; developed confidence in using OER in their current and future activities; increased their efficiency in improving the quality of OER; and been empowered to develop appropriate OER themselves. The findings were as follows:

- There was largescale increase in knowledge about OER (64%), increase in skills for using and developing OER (42%), and a positive effect on their attitude toward OER (56% to a large extent and 41% to some extent). Over 70% expressed enhancement in their level of confidence in using OER, and nearly 71% had become practically involved in adapting and/or creating OER, which broadly included: development of modules for certificate and diploma in fashion design, accountancy, teacher education; development of OER-based e-modules and assignments; design of flipped learning; integration of OER in teaching–learning in engineering and technology; development of OER repositories; development of YouTube videos; development of MOOCs and promoting OER in schools; developing awareness of OER in TVET; and conducting research studies, workshops and senior management training on OER. Over 92% reported considerable improvement in the efficiency of their current OER activities, and over 89% reported improvement in the quality of their OER work.

- The largest majority expressed feeling positive about the impact of their skill on the future work of their institution/organisation. The individual and institutional activities included: online course development and mentoring support; development of OER-based courses in Moodle; increased student registration due to quality OER; awareness of copyright issues and actions thereof by teachers and students; and promotion of organisational value and ethos toward OER and blended learning.

Private and Institutional Cost

COL did not charge participants a fee. It was thought necessary to find out the possibility, if any, of the private cost involved in course completion — i.e., whether any participant had spent money to go through the online course. Only nine of the 118 respondents had spent some money of their own, ranging from USD 10 to USD 200, specifically on items such as broadband Internet access, network prepaid cards, printing of materials, and running a generator for electricity. On the other hand, COL had spent a total of USD 33,974.10 on: course content development (CAD 5,700), platform development (CAD 12,250),

interactive components (CAD 14,175), maintenance (CAD 8,400) and staff time (CAD 4,052) (the highest spending being on the "interactive" course and the development of the platform/LMS).

ROI/ROE

Several factors were together considered as contributing to determining the ROE/ROI from the course. These included: (i) participants' estimation of the fee if LearnOER were a paid course, (ii) the difference between the dollar value of the pre-course and post-course activities on OER, (iii) time savings in current work due to OER course completion and (iv) the relationship between the dollar value of the current work and course satisfaction. The findings are summarised as follows:

- To the question "What could be the fee if this was a paid course?" 52% indicated USD 50, and nearly 10% said USD 200, with an average course fee of USD 85. This is the money that the participants were exempt from paying to go through the course (which, in other words, would have been the fee for the providing organisation).

- Second, to the question "If the value of your previous OER work was x dollars, how would you rate the value (i.e., increase/decrease) of your current OER work after completing the online course?" 22% reported 75–100% increase, 34% reported 50–75% increase, 21% suggested 25–50% increase, 16% reported up to 25% increase and 7% reported "no increase." Converted into dollar value, the total saving was USD 2,950, and the average per-graduate saving was USD 50.86.

- Third, the impact of the online course was also assessed from the viewpoint of time saved in their current work due to gaining knowledge about and skills with OER. Time saved is money saved. The participants' responses were as follows: one hour per week saving (1.2%), five hours per week (27%) and ten hours per week (5%), for an average of 5.2 hours saved per week.

- Cross-assessment of "increase in $ value of present work" on the one hand and course satisfaction on the other hand suggests that the large majority (53.45%) who were very satisfied with the online course perceived there to be an increase of at least 25% in the $ value due to the use of OER, and about 12% suggested the increase was up to 50% (Table 15.2).

Table 15.2. Those who responded to dollar value # course satisfaction ($N = 58$)

Course satisfaction	Dollar value of new OER activities undertaken				
	75–100%	50–75%	25–50%	0–25%	No
Very satisfied	2 3.45%	8 13.79%	7 12.07%	31 53.45%	0 0.00%
Somewhat satisfied	2 3.45%	2 3.45%	5 8.62%	2 3.45%	0 0.00%

* 107 responded to the satisfaction question.

- Finally, ROI was calculated based on various benefits expressed in terms of $ value. The total programme cost was USD 33,974.10, with an average graduate cost of USD 23.92. The unit $ benefit accrued to participants (if a course fee had been paid) was USD 84.78 (with a total benefit of USD 120,302). Applying the ROI formula noted earlier, this yields a ROI of 354.09%. If the accrued benefit is considered to be the increase in $ value of current OER activities (i.e., USD 50.86 per unit/graduate, or USD 72,130.34 in total), then the ROI for LearnOER stands at 212.42%.

- The ultimate outcomes of this evaluative study are represented in Figure 15.3. While the individual benefits accrued were high in terms of satisfaction and increase in knowledge, skills and attitude, as well as reasonable time/cost saving, the individual/private graduate/unit cost was quite negligible, and the institutional graduate/unit cost was quite low. With an ROI of 212.42% from the viewpoint of benefits accrued to the participants and an ROI of 254.1% based on the cost involved for the organisation, it may be concluded that the online course on OER is good value for money and justifies COL's investment.
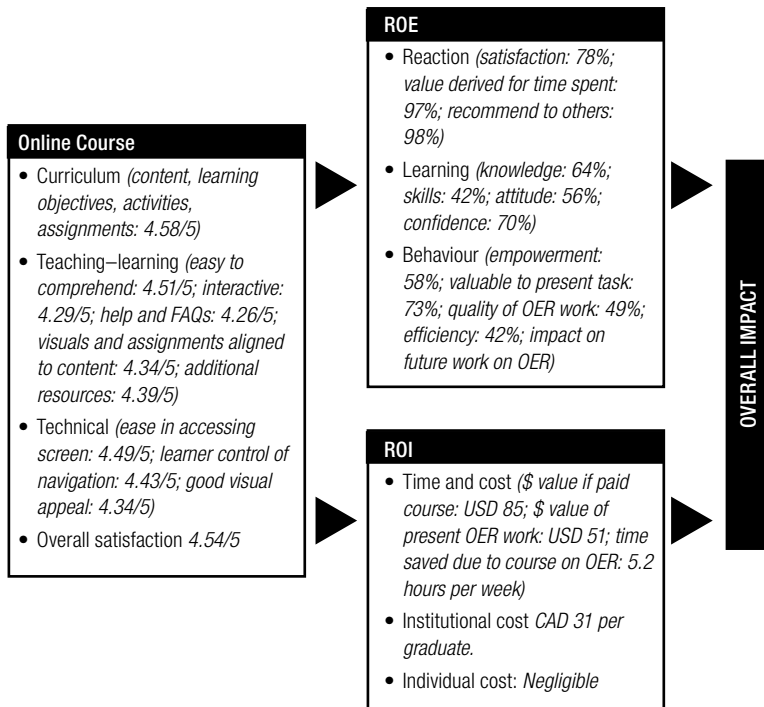
Figure 15.3. Overall results on ROI/ROE.

Implications

The evidence suggests that the online course on capacity building in OER (LearnOER) offered by COL has significantly contributed to the capacity building of a variety of people involved in education (teaching–learning), training, business and industry, social service and community development across the globe (especially in Commonwealth countries). This has been a successful component in COL's TEL support basket, and as was suggested by most of the

participants, the course could be revised and offered to many more people in a modular fashion and through a networked model. In future, the course may be revised to include more examples of remix cases and open educational practices (Ehlers, 2011), and be offered to a larger open ecosystem that supports open education and open learning (Kanwar & Uvalić-Trumbić, 2015). There is a great need today for appropriate and quality OER (Abeywardena et al., 2012; Chen & Panda, 2012; Clements & Pawloski, 2012), as well as for more institutional policy and practice with respect to recognition and open sharing (Jhangiani et al., 2016; Panda & Santosh, 2017). The crucial leaders in the process are teachers. Not long ago, Kanwar (2012) remarked that "[t]eachers felt they did not have either the time or the capacity to locate, adapt, and re-purpose OER material relevant to their work" (p. 4); hence, awareness and capacity building are of primary importance for those engaged in advocacy for the institutionalisation of open educational practices and inclusivity in education. The outcomes of regional consultations with institutions and faculty (COL, 2017a) are useful, as are the approaches to sustainability — the bottom-up approach involving institutions and faculty, and national strategic initiatives to support those bottom-up initiatives (COL, 2017b).

A collaborative culture with a networked community of those engaged in teaching, training, lifelong learning and community development is essential (Orr et al., 2015). In so far as cost is concerned, the initial cost of developing OER may be high, but the unit cost will invariably drop below the break-even point with increasing use of OER. Now and in post-COVID times, across the globe, we should move toward more resource-based, networked, culture- and gender-sensitive, collaborative open learning — and OER and open educational practices are critical for developing such a culture of openness.

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Benchmarking for Technology-Enabled Learning

Michael D. Sankey

Introduction

The practice of institutions adopting technology-enabled learning (TEL) has been steadily increasing in momentum for a good two decades now. Although there are many similarities in the way institutions implement TEL, there are also many inconsistencies (Anthony, 2012). In many cases, these inconsistencies are brought to an institution's attention when students comment on the irregularities they experience in the varied approaches taken to teaching with TEL. A number of institutions, professional bodies and associations have recognised this and have begun to establish a range of quality assurance mechanisms to assist higher education (HE) institutions in aspiring to a greater level of consistency in their TEL practice, at both the macro level (across the whole institution) and the micro level (at the individual course/unit level).

One of the practices that has gained significant momentum is that of institutions benchmarking their TEL practices against an established suite of performance indicators. This involves HE institutions formally self-assessing their current practices across these indicators and then comparing the outcomes of this assessment with those from one or more other institutions who have undergone a similar activity against the same indicators.

Very recently, the Commonwealth of Learning (COL) published a new *Benchmarking Toolkit for Technology-Enabled Learning* that institutions can apply to their current practice, with the aim of making improvements across a range of performance areas (Sankey & Mishra, 2019). Although this particular tool is new, the concept of benchmarking, and more particularly the methodology of benchmarking TEL practices used in this tool, is not new, and there is now significant evidence for the value of undertaking formal and regular benchmarking activities.

This chapter will first define the benchmarking paradigm to which this tool relates and discuss how this paradigm may be applied in practice. It will then report on the benefits that have been realised by some 58 institutions from five Commonwealth countries that have undertaken similar benchmarking activities over the last six years. It will also demonstrate that the value of benchmarking is seen across multiple levels within an institution, from the macro to the micro levels. The reassurance this can bring to an institution cannot be understated, and this chapter will look to provide some keys principles that, when applied, will help an institution realise similar levels of assurance.

Benchmarking and Benchmarks

Benchmarking

Benchmarking in HE has been evolving for some time across many levels of practice, at both the discipline level and the business or practice level (for example, the application of TEL). Earlier efforts focused on reputation, but now, benchmarking has become a required component of HE quality assurance, or regulatory compliance schemes (Bridgland & Goodacre, 2005). This is seen quite starkly in Australia, where the quality agency TEQSA (the Tertiary Education Quality and Standards Agency) has developed the *Guidance Note: External Referencing* (including benchmarking), which provides the sector with clear directions about what is expected of institutions in their "monitoring, review and improvement processes" (TEQSA, 2019). In this document, TEQSA defines benchmarking as:

> A structured, collaborative learning process for comparing practices, processes or performance outcomes. Its purpose is to identify comparative strengths and weaknesses, as a basis for developing improvements in academic quality or performance. Benchmarking can also be defined as a quality process used to evaluate performance by comparing institutional practices with identified good practices across the sector. (TEQSA, 2019)

Generally speaking, benchmarking can be either a formal or an informal knowledge-sharing process based on the comparative analysis of practices for improvement purposes beyond that of evaluation (Ronco, 2012; Tomlinson & Lundvall, 2001). Early forms of benchmarking in the HE sector were seen first in North America in the early 1990s, then in Australia, the UK and continental Europe by about 2000 (Jackson, 2001). This early use was mostly as a continuous improvement tool in response to the introduction of quality standards (Bridgland & Goodacre, 2005; Massaro, 1998).

Thinking first in terms of formal benchmarking, this commonly takes the form of a continuous, structured, data-driven evaluation based on the use of a tool (a set of benchmarks or standards) that is employed to identify, measure and understand practices. The application of such a tool leads to self-improvement and/or the setting of institutional goals towards improvement (Anand & Kodali, 2008; Ettorchi-Tardy et al., 2012).

In contrast, informal benchmarking is more a set of indicators, rather than a formal metric based on statistical precision. Meeting these indicators is usually

demonstrated by providing what is deemed meaningful evidence (Bhutta & Huq, 1999; Braadbaart & Yusnandarshah, 2008). Informal benchmarking is more than simply a comparison of performance, however. This method's value to an organisation is based on the extent to which useful organisational learning can be gained and then translated into improvements or an action plan (Mann, 2012). Furthermore, in a university situation, benchmarking may be seen as a means of "connecting up relevant stakeholders both within and outside the institution in such a way that leads to knowledge exchange about why, what, where and how improvement might occur" (Garlick & Langworthy, 2008, p. 6).

There are a number of well-rehearsed reasons why HE institutions might undertake benchmarking as a means of helping them reconcile their practice. Elmuti and Kathawala (1997) identified these as:

- continuous improvement,
- determining areas for development or growth (gap or opportunity identification),
- developing strategy,
- enhancing organisational learning and improving organisational sense-making,
- increasing productivity or improving the design of a product or service,
- performance assessment, and
- performance improvement through recalibration or setting of goals.

Importantly for HE, effective benchmarking is not simply a matter of capturing metrics (a numbers-only exercise), as this generally does not lead to an understanding of how an institution's practice has reached a particular outcome. Rather, it is commonly achieved by participating in a structured and documented process, and by using this as a means of identifying practices designed to improve one's processes and recognising what might better meet institutional aims. This is particularly important when an institution wishes to compare or contrast its practices with those of like-minded entities (which is where deep learning happens).

Benchmarks

Not surprisingly, benchmarking usually indicates the presence of "benchmarks." These are the points of reference for performance, typically in the form of setting either baseline indicators and guidelines, or standards that support evaluation activities and the framing of subsequent organisational activities. They can be set externally by a regulatory body or accreditation entity and/or internally (Hart & Northmore, 2011).

In HE, benchmarks should be sufficiently specific to be useful indicators to follow (Hart & Northmore, 2011). The process of setting benchmarks is not dissimilar to standards formation, and benchmarks are generally the result of a consensus-forming process. As with standards, benchmarks are created through consultation with subject experts in the sector and/or other stakeholders who recognise the need for a benchmark and its subsequent application to the sector (International Organization for Standardization, 2010).

The OECD defines a benchmark in HE to be: "The observed performance of a higher education system to which other higher education systems can compare themselves" (OECD, 2017, p. 58). It is this comparison against a set of defined indicators in TEL that the good-practice example provided later in this chapter will focus on.

Technology-Enabled Learning

In the context of this chapter it is important first to position the term technology-enabled learning within the broader context of the use of technology within HE to support learning and teaching (L&T). Figure 16.1 indicates (proposes) that there are, broadly speaking, three levels of TEL seen within the sector, largely dependent on the capacity of the following:

1. *The educational jurisdiction.* This refers to how technology might be used by institutions on a continuum, from used simply to provide documents to their students, through to teaching fully immersed in technology-rich spaces, either virtually or in class, using tools such as virtual reality and artificial intelligence.

2. *The national technology infrastructure and geographical constraints.* In some developing countries, there are severe limitations in relation to accessing a computer or the Internet. Again, this sits on a continuum, between a standalone computer that is not networked, through to fully 4G-enabled networks allowing multiple devices to interact and share information across national boundaries.

3. *The level of staff training.* Using technology effectively for teaching students requires certain skills that can be gained either through formal study or through years of experience. This level of skill largely determines to what extent technology is used to support L&T.
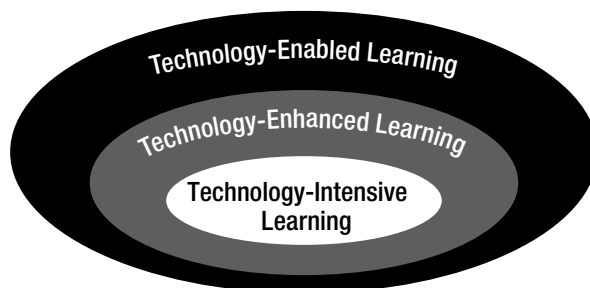
Figure 16.1. The nested model of technology use to support L&T.

However, focusing on the first level, the definition provided in COL's *Technology-Enabled Learning Implementation Handbook* (Kirkwood & Price, 2016, p. 2) is useful to frame the context of TEL for this chapter. It describes TEL as:

> the use of technology to support students' learning. . . . Technology-Enabled Learning is just about making learning possible, whether that means different ways of serving existing learners or, potentially, providing opportunities for learners who were previously regarded as being "out of reach" — that is, those learners who typically have

little to no access to educational opportunities because of a variety of circumstances.

Given this context and the framing of TEL in this way, this provides us with an opportunity to then put together a range of indicators that would help us understand what good practice or performance might look like within an institution, and one based on a collective experience of those within the HE sector.

Domains of Practice and Performance Indicators Used to Support TEL

Generally speaking, when developing quality indicators, we are looking to ensure that a base level of quality practices is present across the key domains of institutional practice. However, these domains are indicative and built on the premise that each institution is on a journey towards quality practice, and that individual institutions may be found to be at different stages on this journey. In the COL benchmarks, for instance, ten key domains of practice have been identified (Table 16.1). These domains cover what are seen to be the foundations of quality organisational TEL practice — in other words, those things that need to be in place to assure a level of quality in an institution's L&T practice using TEL (Sankey & Mishra, 2019).

Table 16.1. TEL domains of practice.

1. Policy	6. Documentation
2. Strategic Plan	7. Organisational Culture
3. IT Support	8. Leadership
4. Technology Applications	9. Human Resource Training
5. Content Development	10. Technology-Enabled Learning Champions

Simply providing the words "Policy" or "Strategic Plan" as a domain is not enough. Although they indicate that these things should be in place, in practice it is not that simple, as there is a range of associated elements (indicators) that need to be aligned with this to demonstrate that these things are actually in place. These are called performance indicators (PIs). To illustrate, let us take the first two domains of the COL benchmarks and see what PIs have been identified to evidence this practice of that domain (Figure 16.2).

DOMAIN 1: POLICY	• There is a well-documented TEL policy at this institution. • The vision and mission of the TEL policy is aligned with the mission of the organisation. • The vision and mission of the TEL policy are well understood across the organisation. • There is a commitment on the part of institutional leaders to use technology to achieve strategic academic goals.

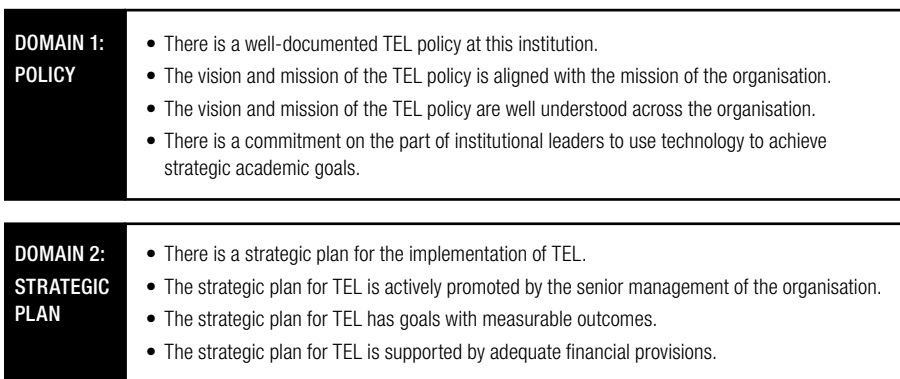| **DOMAIN 2: STRATEGIC PLAN**	• There is a strategic plan for the implementation of TEL. • The strategic plan for TEL is actively promoted by the senior management of the organisation. • The strategic plan for TEL has goals with measurable outcomes. • The strategic plan for TEL is supported by adequate financial provisions.

Figure 16.2. Example of performance indicators in domains 1 and 2.

We note in the above that having a policy in place is one thing, but this in itself is insufficient if nobody knows or applies the policy, or if the policy is not aligned to other key elements within the institution. Similarly, there may be a strategic plan, but unless it is enacted and funded accordingly, then it may as well not be there. Therefore, each of the benchmarking domains has a number of PIs in them (either four or six) to help provide a greater level of focus to the domain. Inherent within the PIs is the understanding that an institution may score well in one and not in another, but this information is then used as a stimulus to improve in those particular areas.

Evidence for the Effectiveness of Benchmarking in TEL

Although the COL benchmarks for TEL are relatively new and are the first attempt to look at quality assuring TEL, very similar tools have been developed in relation to the second level of the hierarchy shown in Figure 16.1 — technology-enhanced learning (also TEL). Examples of this are the ACODE Benchmarks for TEL, and a study of their use reveals important evidence about the value and impact of benchmarking.

Since 2014, the Australasian Council on Open, Distance and e-Learning (ACODE) has been using its Benchmarks for technology-enhanced learning (Sankey et al., 2014) to run biennial inter-institutional benchmarking activities within the Australasian sector (in 2014, 2016 and 2018) and another activity in the United Kingdom (UK) in 2017. These activities have been the subject of many papers (some of which will be cited here); this chapter will not re-rehearse all the evaluations undertaken at these activities but instead will provide a brief meta-analysis of the findings.

Over the last six years, more than 58 institutions, all from Commonwealth countries, have formally used the ACODE Benchmarks to help them quality assure their TEL practice. Of these, 34 were in Australia, 17 in the UK, six in New Zealand, and one each in Fiji and South Africa. Across all these activities, the institutions involved first undertook an internal activity to apply the lens of the benchmarks, and the PIs within them, to their practice.

Participants engaging in these benchmarking activities over this six-year period were asked whether there was sufficient scope within the current suite of PIs in the benchmarks to cover the TEL scenarios at their institution; 93.3% either agreed or strongly agreed with this proposition (Sankey & Pedro, 2019). Further, when asked about their agreement with the statement "The ACODE Benchmarks made me think twice about what we as an institution are doing in relation to TEL," 92.5% of participants agreed or strongly agreed. This response clearly demonstrates that the benchmarks are helping institutions to critically self-assess their capacity in TEL — the benchmarks' intended function. Finally, when asked whether "[t]his benchmarking self-assessment activity has provided an opportunity to stimulate a more in-depth discussion about TEL at their institution," 90% agreed or strongly agreed that the tool had provided this opportunity.

Importantly, a benchmarking activity like this should not reference the voice of just one or two people but should be representative of all those within the institution. Pleasingly, over the years these activities have been running, many people within the Australasian institutions have been involved. For example,

the data indicate that on average, ten people have been involved per institution (Marshall & Sankey, 2017; Sankey & Pedro, 2018).

In key qualitative comments made by those representing their institutions (the leads) in the surveys conducted, some tangible and interesting benefits have been identified. Typical statements about the benefits include (Sankey & Pedro, 2018):

> "It has helped us to better align our activities with the university's goals."

> "informed the formation of a new unit and teams"

> "helped develop much better cross-unit cooperation"

> "development of a new TEL strategy, new TEL advisory group"

> "It got the conversation started for the first time within the institution."

> "worked as a catalyst to address TEL at the institutional level."

As previously mentioned, the new COL Benchmarking Toolkit is built on the same underlying premise as the ACODE Benchmarks, but with a specific focus on technology-enabled learning rather than on technology-enhanced learning. Having said that, the outcomes from rigorously applying either tool would be expected to be very similar, as it is the activity of gathering key members of staff together within the institution, around a common set of indicators, and having the conversation, that builds a new sense of corporate awareness. Therefore, the lessons from the ACODE example, provided above, may well be applicable to those applying the new COL Benchmarking Toolkit.

Undertaking a Benchmarking Activity

Benchmarking is perhaps the most elaborate form of external referencing that institutions can undertake and typically consists of focused improvement through relationships with a benchmarking partner or partners (internally and externally), but it can also include comparing elements of practice against publicly available information and market intelligence (TEQSA, 2019). It is a journey that starts with a self-assessment based in evidence, not opinion.

Therefore, two critical factors need to be in place for a successful benchmarking activity. First, because HE institutions are reasonably large organisations, rarely does an in-depth knowledge of what is happening across the many and varied departments within an institution reside in just one place. That being the case, it is important that the resultant view be collectively established by having representatives from a range of departments undertake the benchmarking activity; specifically, ask those who might have knowledge, or access to the appropriate evidence, to be the ones involved.

This leads us to the second critical factor, which is that any rating of one's position, as described in the PIs, needs to be evidence based and not just based in opinion, as evidence is what will be required when the quality agency comes to your institution and asks, "Where is your proof?" For example, PI 4 in Domain 2 of the COL toolkit (as seen in Figure 16.2) states, "The strategic plan for TEL is supported by adequate financial provisions." It may be easy to agree to this in principle, but what evidence can be provided that this actually is the case?

Generally, such evidence might include a statement in the university's financial plan or budget that is explicitly earmarked with the same words that appear in the strategic plan. This may not always be the case, so what other evidence might be used? There might be statements within departmental plans that reference the strategic plan and have an internal budget line established for this. If these things are not present, then it is difficult for an institution to say, hand on heart, "This is fully in place."

Any good benchmarking tool will generally have explicit procedures for how best to conduct an activity contained in its documentation. For example, the COL Benchmarking Toolkit suggests the following six-step process:

1. A nominated department representative will first undertake an individual self-assessment of the benchmarks.

2. The departments typically represented would include those from IT, the central learning and teaching units, assessment and evaluation and/ or support units, representatives from the schools/faculties, a library representative and possibly someone from the finance or planning department.

3. Those involved would generally be the main stakeholders for each benchmark.

4. The nominated individuals come together and share their self-assessments with each other to then form a collective view or agreed stance.

5. It may well be that different departments are contributing to most or all of the benchmarks, while others may only be involved in one or two.

6. Once a consolidated stance is established, this is then used as the initial position.

More details about how these procedures can be applied may be found in the COL Benchmarking Toolkit. Needless to say, whether one is looking to use the COL benchmarks or the ACODE Benchmarks, generally the organisations themselves are keen for these tools to be used and can be contacted if more information is required on how to undertake a benchmarking activity.

Conclusion

There is clear evidence that benchmarks and benchmarking activities have value and importance for continuous improvement and quality assurance in diverse settings. The focus on TEL is now mission critical for most higher education institutions to ensure quality in the delivery of courses and programmes. The use of a benchmarking tool, as outlined here, can help improve practice by supporting a better understanding of the operational systems and processes present within an institution. Benefits found by institutions undertaking benchmarking include:

- the identification of strengths and weaknesses — for planning and priority setting;

- an improved understanding of strategic and operational requirements;

- a recognition of areas of achievement;

- the generation of ideas and a reinvigoration of practice, through the development of strategies for improvement in areas of need.

It is now in the hands of the reader to look to establish the best ways of improving their pursuit of technology-enabled learning, and one might hope that the application of a benchmarking tool, such as the COL Benchmarking Toolkit, will serve to help them meet this end.

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Epilogue

Epilogue: Towards Mainstreaming Technology-Enabled Learning

Santosh Panda and Sanjaya Mishra

Introduction

In this book's prologue, we provided a foundational discourse on developments within technology-enabled learning (TEL) and associated technologies in teaching and learning. The various chapters in the book have critically engaged with policy and development, strategy and implementation, and research and evaluation. This book project was initiated in a pre-COVID timeframe, and the ongoing pandemic and imagined post-COVID era both justify such a compilation and associated possible future engagements in reflection and discourse.

We all are passing through an unexpected crisis — COVID-19, unbearable and unpredictable. No one is definite about its lifespan. It may go but may come back in another form. Life is not going to be the same again. Some have said, most probably rightly, that it is the human being and the technology that need to explain, that both have been away from and at loggerheads with nature. With our present state of reflection and realisation, many may buy this proposition, but what could be the new formulation? Certainly, humans, technology and nature need to be in tandem in any formulation of human decision and action, and TEL is no exception.

The pandemic significantly affected teaching–learning and training activities in almost all countries, with over 90% of the world's students out of school, including 574 million students in the Commonwealth (Kanwar & Daniel, 2020). It is a matter of concern that most visualised it as emergency remote teaching rather than proper online learning (Hodges et al., 2020). A comprehensive and reflective guideline has been provided by Daniel (2020). In spite of greater preparedness, China, like many countries, to an extent did well (Bao, 2020; Zhou et al., 2020) but faced significant problems on the policy front, including weakness in the infrastructure of online teaching, teacher inexperience, and complexity in

the home environment (Zhang et al., 2020). The suggested policy intervention emphasised the education information superhighway as well as capacity building in teachers and associated personnel. In the American context, the suddenly pressing felt need included lack of preparedness to deal with new skills, and inadequate resources to deal with the new normal (Brandt & Thompson, 2020). No one is likely to disagree when the authors underline that such a shift requires structural, social and cultural changes. Both technology and education, and within this TEL, need to reflect on such changes and build on them. These developments also need to be seen within the context of innovative pedagogies for learners and learning, and how the several experiments in TEL could build a resilient future for us.

TEL as Essential Skills

Today's new learners are different in that they operate in a complex, chaotic and shifting networked learning society that requires diversified skills and competencies to effectively navigate and learn. More than a decade back, UNESCO in 2009, in the context of higher education, ICT and quality, underscored seven skills to be made compulsory at all levels of higher education: reading and writing; problem identification; problem solving; engaging in effective complex communication; disciplined thinking; navigating ethical dilemmas; and developing creativity and initiative (Altbach et al., 2009). Other crucial skills, which have often been stressed but less comprehensively worked out, include critical thinking, collaboration, complex communication, and self-direction (Evans et al., 2020).

A new attitude and approach are required to handle new learning with technology. Based on a survey of the research, seven strategies were suggested by Brandt and Thompson (2020):

- *Personalisation:* Creating personal spaces in learning and creating learning that is personally meaningful.

- *Choice:* Providing learners freedom in the way they would like to demonstrate learning outcomes.

- *Collaboration:* Creating spaces for problem solving in the community.

- *Scaffolding:* Continuous communication of feedback from a host of stakeholders.

- *Agency:* Providing opportunities to share (networks).

- *Reflection:* Creating a learning design that provides for reflection and self-evaluation in the process.

- *Application:* Most importantly, providing the opportunity to apply new knowledge to solve new problems.

The Partnership for 21st Century Skills (https://www.battelleforkids.org/networks/p21) records a comprehensive framework for 21st-century skills: life career skills; learning and innovation skills (critical thinking, communication, collaboration, creativity); and information, media, and technology skills — within the larger framework of learning environments, i.e., curriculum and instruction standards

and assessments/professional development. The new TEL vision needs to consider the imperative of 21ˢᵗ-century learners and 21ˢᵗ-century learning.

The World Economic Forum (2020) says post-COVID education needs to change to better prepare future generations for coping with similar challenges, by focusing on: (i) navigating across boundaries and educating in an *interconnected* world, (ii) new roles for teachers as *facilitators* of learners' development, (iii) compulsory curricular provision for *futuristic life skills* of creativity, communication, collaboration, empathy and emotional intelligence, and (iv) the development and use of *suitable and available technology* for educational delivery.

COVID-19 has equally provided a challenging opportunity to reflect on building on the old world and bridge this with the newly emerging world geared toward more equity, community and collaboration, and a world that is technologically prepared for networking, openness and open practices.

Current Trends in TEL

We have come a long way from the first industrial revolution through the second (electrification), and the third (automation) to the current fourth — cyber physical systems. The *NMC Horizon Report 2017* (NMC, 2017) underlined that while the short-term technology adoption by higher education institutions includes blended learning and collaborative learning, the mid-term trends focus on measuring learning and redesigning learning spaces, and the long-term trends include cultures of innovation, and deep learning approaches. Ten trends and technology developments were emphasised, ranging from cultural transformation to being able to adopt progressive learning approaches, real-world skills, collaboration, equal access, skilling at a personal level, deeper understanding of digital environments, adoption of online/blended/mobile learning, agile learning ecosystems, higher education as an incubator for technology developments, and lifelong learning as the lifeblood of higher education.

The *Horizon Report 2019* (Alexander et al., 2019) extends this to technology and creative enquiry, and underlines making informed choices as well as reflecting on failed initiatives. The forward-looking technologies include: mobile learning and analytics technologies (short-term), mixed reality and artificial intelligence (two to three years), and blockchain and virtual assistants (four to five years). The *2020 EDUCAUSE Horizon Report* (Brown et al., 2020) emphasises that higher education is shaped by the larger macro trends in society. As such, while implementing new technologies in higher education, there is growing importance placed on equity and inclusion, learning outcomes, faculty receptiveness, and cost. Taking into account the context of this book, Chapter 2 provided a brief background on the pre-COVID-19 scenario, and the focus on COL's TEL initiative led to the case studies discussed in various chapters. A brief overview is presented here as a recapitulation and prelude to the future.

More institutions and organisations are going for the provision of information and communication technology (ICT) in education, training and learning. These technologies range from local community radio to mobile-based applications and web-based interaction and support services. A significant trend visible today is consideration of out-of-class and offsite education and training provisions enabled by technologies, and a move toward online/web-based learning and learner

support, which of late has led to consideration of blended learning — blending curricular design, learning resources, education and training delivery, and technology mix/integration, among others.

Also, more institutions and organisations, especially in the schooling sector as well as in vocational education and training, are developing smaller but contextual and needs-based chunks of learning and skilling systems, which may be called "micro-learning" — education and training interventions that are short, contextualised and personalised. However, compared to online personalised services, these have yet to reach scale and ease of operation.

There is greater involvement of and reliance on mobile learning, in combination with social technologies and social networks. In terms of technology, applications have started following more standard web frameworks and technologies for both the design and the delivery of content and services. However, in spite of many successful pilots and projects on mobile-based education and training, it has not been possible to develop a comprehensive "system" of mainstream mobile learning and certification, especially in the low- and middle-income countries.

Due to influences from research and development in pedagogy/learning design, as well as pressure from the community for authentic and contextualised content and engagement, there is a visible trend toward learning in real-world situations. TEL provisions have been successful in contexts of outcome-based learning that is authentic, and that relates to socio-cultural contexts and connects to the world of work. The later developments in technology, such as augmented reality, are also, to some extent, facilitating this shift.

Another visible trend is toward the "digitisation/digitalisation" of socio-cultural, economic and community development activities, which eventually have facilitated TEL implementation in education and training. This has also necessitated "digital literacy for all," which has a direct bearing on education, training and development. Hence, certain significant technological innovations, such as artificial intelligence (AI) and the Internet of things (IOT), have started making inroads into teaching, training and learning. The progress towards big data and data analytics is also having an impact on teaching and learning at all levels.

Learning, at the institutional as well as the community level, is becoming more networked and therefore collaborative. In the absence of a culture of collaborative learning in many parts of the globe, TEL has facilitated the systematic augmentation of blending learning sites and learning networks in both face-to-face and out-of-class education and training.

Governments at federal as well as provincial levels have supported policy formulation on TEL at various levels of education, training, adult education and lifelong learning. There have, though, been constraints on digital infrastructure and organisational plans of action, and a lack of digital literacy and leadership skills.

A quite visible trend is movement toward the use of open educational resources (OER) and massive open online courses (MOOCs), which are providing increased access to teaching and learning and making cross-border qualifications a reality. However, there are still major challenges to mainstreaming this "open learning" toward more "open educational practices" (Ehlers, 2011; Peter & Deimann, 2013).

In the next section, we focus on the key lessons learnt from the case studies discussed in this book in the context of TEL implementation, and the key trends emerging out of the practices in the Commonwealth.

Lessons Learnt from TEL Practices

Keeping in view the technological and pedagogical developments of contemporary times, as well as the needs, resources and constraints of national governments and institutional leaders, COL embarked on its TEL initiative to support Commonwealth governments, educational institutions and individuals in adopting and integrating ICT in teaching and learning. The authors of the chapters cover a wide range of literature in the field of educational technology to situate their local practices and share experiences that can be applied elsewhere. The chapters in this book provide overwhelming evidence to support the initial assertion that the focus should be on policy–capacity–technology, which is a plausible theory of change for any future projects on TEL implementation.

The media-versus-method debate about the use of technology for teaching–learning has settled on examining how to leverage the affordances of educational technologies to optimise learning, and effectively align pedagogy and learning design to support quality learning experiences. Learning *with* technology is the primary concern to address at all levels of education, and it is in this context that national policies for ICT in education provide directions to stakeholders. Within this framework, significant developments have taken place in OER policy development and implementation through both top-down and bottom-up approaches, as reported in Chapter 3. COVID-19 has created new challenges and opportunities that policy and practice need to consider for strengthening the integration of OER in teaching and learning.

The implementation case studies presented through five chapters suggest important good practices as well as lessons to be learnt. Four of these case studies show the successful adoption of blended learning through a systematic process of policy–capacity–technology interventions with the support of COL. It is also important to note that some of the practices have continued beyond COL's support, indicating that the strategy could be further used elsewhere to scale. An important lesson learnt from these case studies is about the importance of capacity building, especially when it is designed more specifically as role oriented rather than as generic training. In the blended courses, what has worked best is using the range of tools available in a learning management system to align with the learning objectives. A template-driven approach to course design, as well as a checklist for self-review of the courses, helped teachers to develop blended courses. Learning effectiveness is enhanced when teachers go beyond text-based teaching to multimedia-enriched teaching–learning, using interactive videos, quizzes and discussion forums. Chapter 8 describes the success of a systematic role-based capacity-building intervention to help institutions adopt OER policy and practice.

Many of the Commonwealth Member States are either middle-income or low-income countries, and therefore, building TEL into the normal institutional culture of teaching–learning has been a challenge. Collaborative work-sharing, along with definite institutional plans and commitment to creating in-house

teams with adequate staff, coupled with continuous professional development, have worked even in technologically challenged environments. Providing autonomy to teachers and ensuring interaction and engagement in challenging activities have sustained teachers' interest in actually implementing and continuing further with innovations. Pedagogically mixing face-to-face teaching with online learning in a context of learner-to-learner and learner-to-teacher interactions has proven to be effective in ensuring faculty and learner engagement. Organisational leadership holds the key to creating a "system" of technology-enabled blending learning and ensuring system-wide interaction, initiative, and capacity building. Putting policy in place supported by capacity building proved effective for teacher buy-in of the new pedagogical approaches.

Chapters 9 to 16 show case studies on TEL research and evaluation, covering methodological challenges in conducting research on TEL, and inquiry into MOOC design and outcomes, digital education skills for teachers and students, return on investment on OER, and benchmarking for TEL. These chapters also present innovative ways of conducting research and evaluation in the digital learning space, based on sound theory and research on pedagogy, technology and learning. Some of the theoretical underpinnings that have enriched the quality of process and learning outcomes were based on the theories of Community of Inquiry (CoI), Experiential Learning, Social-Constructivist Learning, and Equivalence Theory, and the foundations for long-term impact and sustainability have been based on the Theory of Change (ToC) approach. The reliability and validity of the tools used to collect data for research on student learning are important to interpret the data for decision making, even within an action research framework, to improve pedagogy and practice within an institution. Chapter 10 indicates that the use of a CoI model in MOOC design for delivery of the TELMOOC resulted in high participant satisfaction, especially due to the balanced teaching presence, social presence and cognitive presence. We also learn in the next chapter about the importance of a long-term ToC for measuring the impact of MOOCs, especially when used in development contexts, as are most of the works of COL and other development organisations. Longitudinal studies to measure how participants have used their learning in practice are more important than just offering these courses for certification. The Sri Lankan experiences presented in Chapter 12 show that teachers can become change agents and digital education leaders when they are supported through a learning experience that is situated, is inquiry based and builds on creating a personal learning network. The next chapter evaluates the success of an online learning platform that promotes digital education leadership training at scale. Online learners in open and free courses are mainly "explorers," while "engagers" are those who actually take the time to delve deep into the course and complete all the required tasks. For the learners who completed the C-DELTA course, it improved their confidence about using ICT tools.

Online learning can be cost-effective (Jung, 2005). The "Understanding OER" online course offered by COL further provided evidence of the cost-effectiveness of online learning, especially in a development context with limited resources. This kind of training using online technologies, especially in the post-COVID-19 situation, is going to be more and more significant. Chapter 14, while supporting the use of OER, emphasises that along with the cost of educational materials, it is also important to focus on the quality and accessibility of these materials.

Quality is a process and not an end in itself. Measuring the quality of TEL using a benchmarking approach to compare and develop is recommended in COL's TEL Benchmarking Toolkit, discussed in Chapter 16, which proposes that the use of ICT in teaching and learning be considered at three levels: technology-enabled, technology-enhanced and technology-immersed.

Looking Ahead: Mainstreaming TEL

Here, our objective is to reflect on past experiences and, linking to the developments and experiences stemming from COL's TEL projects, to critically look to the future of TEL vis-à-vis some authoritative and critical works of researchers and scholars. We structure this within the lens of *policy, pedagogy* and *practice.*

Policy

Notwithstanding the debate about policy leading to practice or practice leading to policy, we proffer, based on our experiences, that a policy-based practice works better. COVID-19 has pressurised us to re-examine our *legal, regulatory* and *technology infrastructure* frameworks so we can be more prepared for the education of the future (Basilaia & Kvavadze, 2020). COVID-19 has also taught us a hard lesson: that the national responses to the pandemic have been better where the policy is pragmatic, responsive, doable, inclusive and has contingencies for sustainability in place. TEL policy should be no different.

As shown by some of the chapters in this volume, and by most of COL's efforts on policy for ODL and TEL across nations, considerable work has been done in this area. However, there are "miles to go" in terms of effective implementation of these policies and of having policies in all countries and institutions. Post-pandemic, we cannot afford to lag behind in having relevant policies and regulations in place to make our systems resilient. Policy needs to be examined in a holistic framework of lifelong learning that covers formal education, open and distance education, and TEL. Considerable handholding, clarity and capacity building are required to create a post-COVID, holistic TEL policy architecture to promote a flexible system of teaching and learning that is responsive to the needs of learners at all times, and is also inclusive. COL provides support to Commonwealth countries and educational institutions to adopt appropriate ICT in education and TEL policies. There are several policy briefs/guidelines in place for OER (COL, 2011; Miao et al., 2019), MOOCs (COL, 2016; Porter & Beale, 2015), virtual universities (Richards, 2015) and distance education (COL, 2020). In addition, there are national educational technology plans created by the US Department of Education (2017a, 2017b), which could be useful for developing national TEL plans aimed at policy makers, administrators, teachers and teacher educators/faculty developers.

Pedagogy

A learner-centred teaching–learning focuses on development of the learner through the learner's active engagement in context, construction of knowledge, and reflection on these processes (Kirkwood & Price, 2013). In such contexts, the entire process is pedagogy determined rather than technology driven. Building on and sharing knowledge is an important connection in the entire chain (Panda

& Santosh, 2017). The current COVID-19 crisis has alerted us to two aspects: sharpening individual competencies for TEL, as well as engaging in the processes of sharing and collaboration/networking.

On a critical note and with deeper concern for transforming higher education vis-à-vis technology, Henderson et al. (2017) suggest that digital technologies have penetrated the mainstream of student engagement in teaching–learning, but they neither have been able to "transform" higher education, nor have significantly "disrupted" student experiences. This requires further reflection in the post-COVID-19 teaching and learning environment. As an alternative or as an extension of current TEL, it is imperative to address aspects relating to deeper learning (collaborative, participatory, connected and creative learning), and to consider that TEL needs to go beyond the current outcome-based model to include empowerment and creativity in learners and learning.

A related and significant issue has recently been raised by Selwyn et al. (2020), emphasising that research on TEL needs to be geared towards theorising on the linkage between technology developments, socio-economic inequality, and educational provision. Outlining a framework for the social shaping of technology (beyond the established diffusion of innovation framework), Livingstone (2012) underscores the need for a radically distinct version of technology, one based on the digital literacies required for the new forms of technologies, as has been adopted by COL's TEL initiative, which includes digital education skills as a broader dimension covering digital literacy. This has been discussed as a case by Karunanayaka in Chapter 12 of this book through teachers' stories in Sri Lanka. With the advent of new TEL, the old question still persists: "Do they herald a more fundamental transformation in *learning infrastructure*, in which case the task is to rethink the relations between pedagogy and society, teacher and pupil, knowledge and participation?" (Livingstone, 2012, p. 20). Livingstone proposes that pedagogic research should centre around the possibilities of "child-centred digital creativity" and "collaborative communication."

In today's world of teaching and learning, we also need to consider the balance between the discourse on the "learnification" of learning and the "naturalisation" of learning (Biesta, 2013), expressed especially in the context of behaviourism, on which the current machine learning and learning analysis/analytics are based (Knox et al., 2020). This is a danger that needs to be guarded against. As Castaneda and Selwyn (2018) suggest, we may do more justice and service to the digitisation of higher education if we take more of a problematic rather than a celebratory stance. Further, the TEL vision for post-COVID-19, at both national and institutional levels, should go beyond the essentialist and instrumentalist bandwagons to relate and locate technology not only in the broader context of education but more so in socio-cultural contexts and practices (Bayne, 2015; Hamilton & Friesen, 2013). With these aspects in the background, we proffer the use of a variety of models of technology-enabled learning and teaching. These, in a face-to-face teaching environment, could manifest in one or more of the following:

1. Small group teaching face-to-face where ICT is integrated.

2. A blended learning model with occasional or weekend face-to-face contact.

3. MOOCs with anytime joining and exiting options.

4. Facilitated online courses with several teaching assistants.

Considering the affordances and need, blended learning — "the thoughtful fusion of face-to-face and online learning experiences" (Garrison & Vaughan, 2008, p. 5) — is the way forward. Blended learning can be organised at different levels: the institutional level, programme level, course level and activity level (Graham, 2006). Allen et al. (2007) recommended a classification of different types of courses based on the proportion of content delivered online. They suggested that to be considered blended, a course could have 30–79% of its content delivered online. COL has developed a systematic guide to help educational institutions and teachers adopt blended learning (Cleveland-Innes & Wilton, 2018). In practice, converting a face-to-face course into a blended learning course requires decisions about how much content needs to be available online and how the student's study time is converted into credits. Mishra (2020) suggests that a blended course can have videos (facilitating flipped learning in the classroom), discussion forums (contributing to meaning making and knowledge construction in a social environment), online quizzes, assignments, reading resources provided online, etc., as per the requirements of the course (see Table 17.1). These can be used according to the credit load of the course, keeping the face-to-face contact at anything between 30% and 50%.

Table 17.1. A suggested workload distribution.

Online Activities	Suggested Time in Learning Hours	Approximate Time (in 15 weeks)
Synchronous		
Live online interaction with students	Actual hours: 50-minute session every alternate week	12.5 hours
Student participation in group discussions online	Actual hours: 50 minutes every alternate week	6 hours
Asynchronous		
Watching video (without assessment)	Twice the actual hours of video (20 videos of 10 minutes)	6.5 hours
Watching video (with assessment)	Three times the actual hours of video (20 videos of 10 minutes)	10 hours
Discussion forum	At least 2 hours of engagement per forum (including critical analysis, reflection, posting, reading and critiquing posts of other learners, and summarisation). 5 discussion forums in a semester.	10 hours
Online reading with comprehension	150 words per minute. Calculated by the length of the documents.	
Online quiz (practice)	2 minutes per question (approximately 5 questions per week).	2.5 hours
Assignments, portfolio, term paper etc.	Time allocation based on the demand of the activity.	

Note: For a six-credit course, where one credit equals one hour of face-to face teaching per week. Source: Mishra (2020).

Learning Design

Though instructional design as a science has existed for the past several decades, what has come to the fore is a new "learning design" with new technological developments and learning paradigms. Designing a TEL course or a blended learning course requires an understanding of the various instructional design models and learning theories. Historically, the development of instructional theory by Bruner (1966) was in the pre-computer age, and that of Eckel (1993) was of the computer age but pre-Web 2.0, whereas the post-Web 2.0 learning design operates within a networked society and community of practitioners. New learning designs for (social) technologies and (social) networks have arisen (Conole, 2013; Garrison et al., 2000, 2010; Jonassen, 2011; Siemens, 2004). And we still have prominent works by Salmon (2002) and Khan (1997), among others, which exert significant influence in many institutional contexts. Learning design today demands that teachers, trainers and designers: adopt visual representations such that they promote learning; work at different layers with appropriate activities; interpret and facilitate interactions between illustrations and their meanings; and design for higher-order learning and problem solving. It is not easy for teachers and professional developers to cope up with such affordances of technologies, especially when design is not linear. It works best when it becomes an individualised creative process but involves interaction with others and includes cross-disciplinary dialogue, and this requires appropriate and sustained capacity building (Conole, 2013). Other learning design studies have contributed further to our understanding of current research and future directions (Hong & Sullivan, 2009; Kinshuk et al., 2016), including a very prominent culturally inclusive online learning design, WisCom — Wisdom Communities (Gunawardena, 2020; Gunawardena et al., 2019).

One important learning tool within TEL that has received less emphasis in the past is the use of the "e-portfolio" (Chaudhuri & Cabau, 2017), which should be an important part of learning design for quality learning, especially in the context of outcome-based and evidence-based teaching–learning of skills. Moving forward, the focus needs to shift to the use of innovative pedagogies (Kukulska-Hulme, 2020), including networked learning (Farrow, 2017; Hilton III et al., 2019; Hodgson et al., 2012), the scholarship of teaching–learning (Kirkwood & Price, 2013), and disruptive open education, open pedagogy and open educational practices (Farrow, 2017; Gourlay, 2015; Hilton III et al., 2019; Oliver, 2015). The blended course design template in Chapter 4 and also in Cleveland-Innes and Wilton (2018) helps simplify the complex world of learning design.

Practice

The practice of TEL starts with institutional capacity to design, develop and deliver blended and online courses. Capacity building has been a major variable as well as a major challenge in TEL design and implementation. Besides the capacity-building initiatives listed in Chapter 2, enriched resources have also been developed to facilitate the implementation of MOOCs, OER, TEL and ICT strategies (COL, 2015; Kirkwood & Price, 2016; Mishra et al., 2017).

COL's benchmarking toolkit (Sankey & Mishra, 2019) clearly spells out policy, strategic plan, infrastructure support and applications, human resources

development, leadership and organisational culture, and a benchmarking scoring system, and acts as a good-practices example for institutions to compare theirs and undertake the required organisational changes. Mishra (2019) provides a roadmap for educational institutions to practice TEL.

In terms of collaborative professional development/capacity building, the Carpe Diem learning design has emerged as an effective term-based process (Salmon, 2013) and has proved to be a globally acceptable, innovative learning design and development capacity-building exercise in many contexts, including South Africa (Salmon et al., 2020). The collaborative approach to curriculum and pedagogical design addresses student needs and promotes creativity and innovation in the process (Usher et al., 2018). Chapter 8 in this book also demonstrates an effective collaborative capacity-development model that has significant institutional impact.

In the context of conditions for the success of TEL for institutions, teachers/ educators and learners, Henderson et al. (2015) categorically spell out the conditions as well as the challenges. The conditions for success for institutions, educators and learners include the following:

- *Institutions:* (i) reliable and high-capacity technical infrastructure, (ii) flexible and friendly technologies, (iii) the use of standard technologies (not ad hoc) by faculty and students and (iv) technology provisions — not as seed-funding or pilots, but as sustainable and long-term.

- *Educators/teachers:* (i) motivated, skilled and confident teachers using technology to support learning (besides teaching), (ii) using technology to align with their own familiar ways of teaching–learning, (iii) act to "orchestrate the technologies . . . in meaningful conjunction with teaching (including delivery, student activities, responding to student needs, etc.)" (p. 138) and (iv) developing and using learning resources (teaching events, activities, other resources) for both immediate goals as well as different modes of consumption (both synchronous and asynchronous).

- *Learners:* (i) going beyond simply embedding technology into curriculum, to more technology-based practices as learning culture, (ii) aligning technologies and practices "that can intuitively be applied to the learning context" (p. 139) with students' everyday technology practices and (iii) fitting technology and activities with students' learning preferences.

Digital equity and the skills to use digital tools for teaching and learning are important issues of praxis on which educational institutions and governments need to focus. According to Beaunoyer et al. (2020), COVID-19 has exacerbated existing digital inequalities in terms of technology, autonomy and social support networks, and digital inequalities have adversely affected COVID-19 vulnerability. Therefore, we have to proceed systematically in the post-COVID-19 world of learning by creating digital equity. While COL's C-DELTA is a scalable training platform, student access to last-mile devices and the Internet is necessary to leverage the available online training opportunities.

A key dimension of TEL practice is research, and we recommend that a research agenda for TEL should be part of every educational institution.

Research

As has been suggested by Toquero (2020), it is essential during COVID-19 and post-COVID-19 that we focus on researching and documenting the impact of the pandemic on teaching–learning as well as what lessons we have learnt with respect to TEL, covering all curricular and socio-cultural dimensions.

Critical questions raised by Livingstone (2010, 2012) about ICT and the Internet are relevant, querying past research findings and urging the undertaking of longitudinal studies on how ICT can best be harnessed for enabling quality student learning.

A comprehensive research review on TEL by Kirkwood and Price (2013) provides direction for future research on TEL. They point out that most research has focused on infrastructure and architectural pathways that institutions have engaged with for teaching, whereas an emerging and much deeper focus should go beyond these provisions and mechanisms to focus on how exactly technology facilitates, in context, teachers' teaching and learners' learning. Therefore, teachers' and learners' conceptualisations of how technology facilitates teaching–learning assume greater importance.

An important review on the community of practice (CoP) framework for TEL research by Smith et al. (2017) could guide the CoP framework in researching online and blended learning in social and situated contexts within higher education and professional development, as well as TEL for social and intellectual engagement in the community. COL has also supported a TEL CoP for institutions to discuss, collaborate on and share resources and experiences (see https://www.telcop.net/). In the context of TELMOOC, alternative and practical frameworks have been suggested (Cleveland-Innes et al., 2019) in which collaboration and interaction are weighed above technology access. Future research on TEL at various levels of education and professional development is expected to further explore the pedagogic models that technologies can address to make learning more meaningful, engaging and productive in both individual and community contexts. The dominant constructivist perspective (Taber, 2016) needs to be researched further in combination with connectivism (Bell, 2011) and network theories to provide a holistic, integrated but flexible framework within the areas of curriculum, pedagogy and technology (Mishra & Koehler, 2006).

As a direction for future research, it may be useful to consider what de Laat and Ryberg (2018) have emphasised:

> The next wave of educational technology and networked learning research might involve a growing interest in the importance of being networked in a global learning landscape where the core is not necessarily learning communities and group learning, but rather a greater attention to the degrees of freedom and choice that social networks and learning relationships provide — as well as the challenges of such personalized, social networks to central networked learning values such as community and collaboration. (p. 18)

As a future direction for further research on TEL, Han et al. (2018) suggest research on: (i) policy contexts and TEL relationships, (ii) factors associated with variations in TEL across nations and (iii) comprehensive clusters of factors, within a comprehensive framework, associated with TEL. A related area of further

research is on the factors associated with teachers' adoption and integration of TEL in teaching–learning (Lawrence & Tar, 2018), and students' experience of learning in TEL contexts at different levels of education (Verdonck et al., 2019). A comprehensive review of research on the use of technology to support teachers, parents and children in improving learning outcomes (IFC Consulting, 2015) may provide guidance for further research in the area (see also Bond et al., 2020). COL's *TEL Implementation Handbook* (Kirkwood & Price, 2016) provides several survey tools and guidelines to use in institutional contexts, and Chapter 9 in this book also presents some methodological issues to consider while undertaking research.

Two scholarly works come to the forefront when thinking about comprehensive articulation of analytical discourses and research directions on "education and technology" (Selwyn et al., 2020) and on "learning design in an open world" (Conole, 2013). Conole reviews research on learning design, pedagogical patterns and OER, and provides contexts for further reflection on approaches to learning design in a technologically rich and open world. The hopes and concerns articulated by Selwyn and colleagues provide enough provocation to further reflect on the entire gamut of education and technology with respect to conceptualisation, educational design, and research. The concerns and debates include: new forms of digital inclusion/exclusion, datafication/artificial intelligence, human versus machine learning, industry actors, educational technology in an age of climate change, care versus competition, relational community approaches to design, and experimenting with alternatives. "Highlighting such alternative Ed Tech futures is not necessarily an optimistic endeavour, but it does retain a modicum of hope that is otherwise easily lost sight of" (Selwyn et al., 2020, p. 4). COL's TEL initiative could further explore these dimensions in collaboration with partner institutions to promote the praxis of TEL.

Conclusion

This collection has highlighted the important work undertaken by COL and has brought together international scholars to share their experiences of good practices and challenges in the implementation of various TEL activities. These experiences, we believe, will be handy for ongoing programmes and for promoting a new vision of TEL in the post-COVID-19 teaching and learning environment, as well as triggering further reflection on the practices, strategies, issues and challenges raised by the contributors.

While on the one hand we accelerate policy–capacity–technology as a theory of change model for the effective implementation of TEL, we also need to engage in capacity building in institutions and focus on our collective understanding of "learning" in a "networked" society, making use of resource-based learning within and beyond the Commonwealth in the broader sense as well as in the contexts of socio-cultural and educational ecologies. TEL has become a necessity, and building resilient education systems should address the complexities and adopt the solutions identified in this book.

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TECHNOLOGY-ENABLED LEARNING: POLICY, PEDAGOGY AND PRACTICE

Teaching and learning have undergone considerable transformation from the traditional classroom model to the current online and blended models. Developments in information and communications technologies hold the key to such transformation. Seizing the opportunities and affordances of these technologies, COL's Technology-Enabled Learning (TEL) initiative has focused on several activities to support governments and educational institutions in the Commonwealth since July 2015.

Significant and sustainable interventions include: the Commonwealth Digital Education Leadership Training in Action programme; ICT in education policy development, including open educational resources policy and implementation; massive open online courses on TEL and blended learning practices; systematic TEL implementation in educational institutions; and advanced ICT skills development.

Technology-Enabled Learning: Policy, Pedagogy and Practice, based mostly on various TEL projects in the last five years, presents diverse experiences of TEL from a critical research perspective, offering lessons that can be deployed elsewhere.

The book's 17 chapters provide success stories about the planned and systematic integration of technology in teaching and learning, and present models for online training at scale using massive open online courses and other platforms. Within the framework of the policy–technology–capacity approach to TEL implementation at the micro, meso and macro levels, the chapters also provide guidelines for researching and evaluating similar projects and interventions.

In the post-COVID-19 world of education, the lessons learnt and recommendations in this book will help policy makers and educational leaders rethink existing models of education and training.