

Transformational Change at the Intersections of Technology, Education and Design at the Open University of Sri Lanka

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Abstract: *Technology, education and design* are at the heart of any educational transaction. For optimum impact these need to be carefully choreographed and orchestrated. Despite acknowledgement and acceptance of technology, education and design as critical attributes of any successful educational transaction, bringing them together to ensure transformational change, both at the individual and at the institutional level, remains a serious challenge. This includes not only the development of the knowledge and understanding of the subject matter content, but also a rethink and reorientation of the essential value principles of education. This paper reports a case study of the experiences of the Open University of Sri Lanka in bringing about such transformational change in relation to the adoption of open educational practices (OEP) over the past decade. This is captured in the narratives of key participants involved in the projects. These achievements comprise: 1) the professional development of academic staff in the integration of OER; 2) a robust model for the integration of OER; and 3) a rigorous approach to the evaluation of the impacts of OER integration on a range of dependent variables including perceptions and practices of educators towards OEP.

Key words: Technology, Education and Design; Transformational Change; Teacher Professional development

Introduction

Despite acknowledgement and acceptance of technology, education and design as critical attributes of any successful educational transaction, bringing them together to ensure transformational change, both at the individual and at the institutional level, remains a serious challenge. This includes not only the development of the knowledge and understanding of the subject matter content, but also a rethink and reorientation of the essential value principles of education. These principles include notions about access to educational opportunities without barriers such as prior knowledge and entry qualifications, and ability to pay; the opportunity to study and learn at anytime, anywhere and at any pace, as well as anyhow irrespective of one's physical location; and the release of educational resources under an open license scheme which permits no-cost access, use, reuse, adaptation, retention and redistribution to others. When left to chance, the adoption and integration of technology, education and design is at best sketchy.

A more concerted and proactive position is required to bring about such transformational change. This should involve a mixed approach - both a top down as well as a bottom up approach to policy development and formulation. Practice informing policy would be a viable approach for policy formulation with a comprehensive change of mind set among staff and management. This paper reports on the experience of the Open University of Sri Lanka (OUSL) with the support from COL, CEMCA, and ROER4D on bringing about such transformational change in relation to adoption of open educational practices (OEP).

Conceptual Framework

Convergence of Technology, Pedagogy, Content and Design in Teaching and Learning

With the growing popularity of technology-enhanced learning (TEL), there is increasing concern about pedagogical approaches as well as pedagogical designs for such environments. The convergence between technology and pedagogy is a widely discussed issue (Gordon, 2014; Beetham & Sharpe, 2013; Henard, 2010; Richards, 2007) that is also an essential aspect in teacher education. The Technological Pedagogical Content Knowledge (TPACK) framework provides a framework for capturing the kinds of knowledge that is required by teachers to teach effectively in TEL, and it presents three broad knowledge bases- Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK), and their interactions – Pedagogical Content Knowledge (PCK);

Technological Pedagogical Knowledge (TPK); Technological Content Knowledge (TCK); and the synthesized knowledge on all these (TPACK) (Koehler & Mishra, 2009).

The inter-relationships among the seven constructs of the TPACK provides useful guidance for teachers to create a synthesized form of knowledge, with a focus on how technology could be effectively integrated into classroom teaching and learning, meeting the pedagogical needs to teach the subject matter content in specific contexts (Koehler & Mishra, 2009; Mishra & Koehler, 2006). The TPACK framework has been extensively adopted in the design of teacher education programs for ICT-integrated teaching and learning (Hofer, Bell, & Bull, 2015; Chai, Koh, & Tsai, 2013), and a range of quantitative and qualitative instruments have been developed to measure TPACK (Koehler, Mishra, Akcaoglu & Rosenberg, 2016).

A key concern in the cohesion of technology and pedagogy in the teaching-learning process is the design of learning experiences. Highlighting the concepts of “learning by design” (Harel & Papert, 1990) and “teachers as designers” (Koehler & Mishra, 2005), it is suggested that the teachers can use this synthesized knowledge to put it into practice by designing appropriate learning experiences for their students. Teachers with developed TPACK will “use technology to design learning experiences tailored for specific pedagogies, crafted for specific content, as instantiated in specific learning contexts” (Koehler et al., 2016, p.22).The implication of TPACK framework in learning experience design is emphasized (Naidu, 2016). Seeing teaching as a “Design Science” (Laurillard, 2012) is crucial in achieving Effective, Efficient and Engaging (E3) teaching (Spector & Merrill, 2008). Essentially, *design* is a creative process where teachers function as architects or choreographers designing learning experiences for their students. This needs careful thought about the intersections of subject matter content, pedagogical approaches and technological affordances (Naidu, 2016). Design of effective, efficient and engaging experiences based on innovative pedagogical models offer viable solutions for transformational change in educational contexts (Karunanayaka & Naidu, 2016).

Transformative Learning for Transformational Change

Transformational change is a process whereby positive results are achieved and sustained over time by institutionalizing policies, programmes and projects within national strategies (UNDP, 2011). Transformational change alters the basic elements of an organization’s culture, including the norms, values and assumptions under which the organization functions. Transformation is a fundamental change in the belief systems of individuals that would affect their actions to eventually become natural and thereby achieving the desired results, and making transformation more permanent. Paradigms, mental models and mindsets are identified as “triple barriers to transformational change” (Duffy, 2009) that interact to influence educators’ behavioural strategies.

Alternatively, transformative learning is, “learning that transforms problematic frames of reference—sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets) to make them more inclusive, discriminating, open, reflective, and emotionally able to change” (Mezirow, 2003, p. 58). Hence, transformative learning is a process through which transformational change can happen. *Designing* transformative learning would contribute to foster transformational changes in institutions.

Initiatives implemented at the OUSL contributing to transformational change

This study comprised an exploration of four initiatives that were implemented at the Faculty of Education at OUSL over 2003 – 2016, to capture how they contributed to transformational change at OUSL, especially, in relation to adoption of open educational practices (OEP). A brief description of these initiatives are presented in Table 1.

Table 1: Summary of four initiatives at OUSL contributing to transformational change

Initiative	Design & Development of MA in Teacher Education-International Programme - (MATE-I) -supported by COL (2003-2005)	Integrating ICT & OER in Teacher Education Programmes (OERTE)supported by COL2013/14)	Implementing an OER-based e-Learning Online Course– (OEReL) - supported by CEMCA - (2014/15)	Impacts of OER integration in Teacher Education– (OERTL) - under ROER4D Project (2015/16)
Aim	Professional development related to	Integration of ICT and OER in teacher	Professional development of	To ascertain impacts of integration of OER in

	key competencies of teacher educators	professional development courses.	educators in OER-based e-Learning	teaching-learning via teacher professional development
Design Framework	A Scenario-Based Learning (SBL) design based on a situated learning approach. Authentic learning scenarios; Learning and assessment tasks as challenges; Learning resources to support.	The SBL approach adopted for effective and efficient OER integration. A “learning engine” framework as an effective strategy to design learning experiences.	The “learning engine” framework and the ‘OPAL’ framework (Ehlers, 2011) successfully integrated to design an online course on OER-based eLearning.	An intervention using a Design-based Research (DBR) approach (Reeves, 2006), to support open educational practices along: Instructional Resource use; Pedagogical thinking; Pedagogical practices.

In the first initiative, the careful orchestration of learning experiences using the SBL design promoted learners to become ‘reflective practitioners’ (Naidu, Menon, Gunawardena, Lekamge & Karunanayaka, 2007). Similarly, in the second initiative, the design of effective, efficient, engaging learning experiences based on innovative pedagogical models, supported with OER as fuel for the learning engine, offered a viable solution to enhance ‘changes’ in perspectives and practices among teachers to move towards OEP (Naidu & Karunanayaka, 2014). During the third initiative, educators were supported to progress in a gradual manner during a carefully orchestrated series of online learning experiences based on SBL, with different levels of OER integration, supporting them to move from OER to OEP (Karunanayaka, Naidu, Rajendra & Ratnayake, 2015). The DBR framework adopted in the fourth initiative allowed examining the impact on the three aspects: Resource usage in terms of 5Rs – Retain, Reuse, Revise; Remix; Re-distribute; Pedagogical Perspectives in terms of 5Cs - Context-centric/ Constructivist/ Collaborative/ Creative/ Critical thinking; Pedagogical Practices in terms of 5Cs - Context-centric/ Constructivist/ Collaborative/ Creative/ Challenging practices (Karunanayaka & Naidu, 2016).

Methodology

A case study design was adopted (Yin, 2003) to explore in detail the experience of the OUSL in bringing about a transformational change in relation to adoption of OEP, in terms of technology, education and design. It took a reflective approach, where the research was mainly built around the reflections of the researchers and the key participants in the effort to gain a deeper understanding of the phenomena being studied.

The research questions of the study were as follows:

1. What are the challenges faced at the intersection of technology, pedagogy and content in the selected professional development programmes?
2. To what extent the synergy of technology, education and design provided solutions for these challenges?
3. What is the impact of the designed interventions in bringing about institutional transformational change in relation to the adoption of OEP?

Participants who had significant involvement in one or more of the four projects - MATE-I; OERTE; OEReL and OERTL, were identified as key respondents. Qualitative data were collected via reflective narratives of key respondents (12), semi-structured interviews with selected participants (05) and reflective narratives of the researchers (03). Data analysis involved content analysis, coding, categorization and interpretation of the contents of reflective narratives and interview transcripts. Interpretive Phenomenological Analysis (IPA) approach allowed to explore in greater detail by examining ‘lived experiences’ (Reid, Flowers & Larkin, 2005; Smith & Osborne, 2003) in order to discover the meaning of experiences through participants’ and researchers’ interpretations. A framework including 3 categories and 12 codes was used to analyze and organize data, in terms of the intersections in Technology (T) Pedagogy (P) and Content (C). (See Table 4). Meaningful chunks taken as units of analysis from the contents of reflective narratives and interview transcripts were analyzed according to this framework.

Table 4: Data analysis framework

Intersection in T, P and C	Challenges faced at the intersections	Strategies to address challenges	Type of transformational change
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TP	TP-Ch	TP-St	TP-Tr
TC	TC-Ch	TC-St	TC-Tr
PC	PC-Ch	PC-St	PC-Tr
TPC	TPC-Ch	TPC-St	TPC-Tr

Results & Discussion

What are the challenges at the intersection of technology, pedagogy and content?

Coping with technology and pedagogy, and a resistance to change from the established traditional practices were identified as the key challenges in all four initiatives, as revealed by following quotes:

'Technology' was a very big challenge. Access to technology as well as exposure to the use of technology was limited at the time MATE-I program was initiated....some very senior academics were reluctant to use the technology...not willing to change from their traditional mindsets: "Why should we take additional challenges?" ... People got 'awed' by the need to use new technology as well as new pedagogy at the same time. [TP-Ch/MATE-I]

The challenges faced were manifold. For examples, issues with technology such as lack of ICT knowledge, bandwidth problems and lack of equipment, difficulties in using English, resistance to change, heavy workloads and time factors... [TC-Ch/OERTE]

Pedagogy is the biggest challenge. Lots of people are not convinced with new pedagogical approaches...Even though staff development and innovative practices are being introduced... People still have misconceptions that design of content is only limited to very rigid ways of ticking a checklist! ...[PC-Ch/OEReL]

Foremost, there was the technology which posed significant challenges...there was this fear of the technology, unease around its use and lack of certainty in its value to their work as teachers...Pedagogy posed another challenge. We were dealing with participants who had been used to teaching in their own ways for decades. So why were they going to change, and modify their approaches when it had served them well for so long?...The most critical challenge was the design of the learning experiences...Many had been used to teaching the content alone, and not how that content might be used or applied. That required a shift in the mindsets of teachers from a content-focused approach to teaching to a problem-centered and scenario-based approach...Other challenges had to do with the readiness, motivation and resilience of participants...[TPC-Ch/All]

It was evident that stereotype mental models and mindsets of individuals has been a key barrier to transformational change (Duffy, 2009) that influenced their behavioral strategies to cope up with the intersection of technology, pedagogy and content.

To what extent the strategies adopted with the synergy of technology, education and design provided solutions for the challenges?

Various design strategies adopted in the initiatives had helped overcoming the challenges.

Our approach was to work with tried and tested models, such as Scenario-Based Learning, Action Research, Design-Based Research, and Case Study Research to overcome many of these challenges...[TCP-Ch/All]

Scenario based style changed our mindset to think in novel way and we were able give opportunities for students to experience more authentic learning...to create learning environments to get involved the students in learning process rather than giving facts and learn, it changed the mind sets of students too ... (PC-St/MATE-I)

The concept of Scenario-Based Learning (SBL)...was something new to me. Each module was contextualized and situated in an authentic setting with tasks requiring us to engage in a number of activities which centered on designing an OER based- e-learning course... The real life activities...to fit the learning outcomes were challenging yet motivating. The experience I gained from engaging in these tasks was invaluable...[PC-St/OEReL]

Support received in the integration of technology too has facilitated in facing the challenges.

Use of technology supported the new pedagogical design, such as having online support. An example is, developing and offering one of the courses in MATE-I as the first fully online course at OUSL...(TP-St/MATE-I)

The way in which the “OER-based eLearning” course has been designed...simple technology and the structured instruction design has led them to follow the course easily...[TP-St/OEReL]

Certain other factors related to individuals and institution have also contributed in this regard.

Commitment and motivation of staff was a crucial factor that helped overcome challenges...Younger people came into the scene and took up responsibilities. By ‘doing’ the program amidst challenges, we managed to successfully implement it. The support of our international colleagues was extensive throughout...[TP-Ch/MATE-I]

The whole team worked as a family and helped each other. They all supported me to get many experiences...This project remarkably changed my attitudes, knowledge and experiences related to OERs...[TP-Ch/OERTE]

In all the projects, the guidance and support given by expertise were remarkable. Also, the combined effort of the course team members was a supportive factor...Lecturers who received the experiences during the 1st project guided the others...in the 2nd project (OER), with confidence. [TP-Ch/All]

It was revealed that engagement in carefully structured authentic experiences to integrate technology in course design, with ongoing expert and peer support, has motivated academics to face the challenges with confidence.

What is the impact of the designed interventions in bringing about institutional transformational change in relation to the adoption of OEP?

The four initiatives have notably contributed in transformational changes at OUSL in different ways.

The MATE-I programme...was the first programme in the University which did not have a formal final written examination. This was a major change from the traditional evaluation system adopted in the University...I was able to convince the Senate, who approved it without any hesitation...(PC-Tr/MATE-I)

There was a very significant shift in the mindsets of teacher educators of the Faculty of Education...They, who had no idea about the concept of OER...became a group of people with a very good knowledge of the concept and with built capacities of putting them into practice and...training their student teachers...(TPC-Tr/OERTE)

The OEReL course provided an opportunity for its participants to contribute in the formation of an OER policy for OUSL. This was accepted at Senate. That is a great impact...The Senate has decided to convert all the Foundation level course material as OER...The formation of an OER Policy further strengthened this...[TC-Tr/OEReL]

Faculty of Education has taken the leadership in many initiatives. I see a very positive change in the mindsets and ways of thinking in the academic staff in the Faculty, especially in the use of OER and online teaching/learning. They are talking more on integrating these new thinking in their current practices.... [TPC-Tr/OERTL]

MATE-I project surely started the momentum for a longer and sustainable transformational change further facilitated by the other projects...I think the MATE (I) project used free resources even before the OER movement became popular. Hence it was only natural for the Faculty of Education to readily take up OER (practices) and this enabled the University later to formulate an OER policy. The leadership in the Faculty of Education had already developed the capacity and mindset to readily accept the adoption of OER. It is important that the innovations sustained in the Faculty of Education will have to be practiced in other Faculties and university-wide capacity building efforts will have to be continued to expect a longer and sustainable transformational change.[TPC-Tr/All]

At the individual level, I have evidence of collaboration with participants in relation to authoring conference papers, journal articles, books and websites...I have seen the quality of the work produced by all of the participants improve over time...This is a legacy that has been left behind that will continue to influence their work after the project is over. That is priceless! And at the institutional level, I have seen Faculty groups and institutions redesigning their policies as a result of the work that we undertook and embarking on a different trajectory, one that they wouldn't have gone onto, had it not been for the work that we undertook... [TPC-Tr/All]

Institutional support and leadership were identified as critical factors for such transformational change.

Good relations with institutional leaders is essential. You should be able to convince the others about the need for a ‘change’ and get their support; for this, first, you have to be convinced yourself! As the Dean at that time, I worked very close with the then VC, who was very supportive... the senior academics at the Senate were also very positive...

The leadership of the senior academics is crucial. Not only by being exemplary, but also by getting the junior academics involved in their initiatives. Such team efforts will start penetrating innovative approaches...Most staff might be 'dormant' and we need to 'activate' them... Institutional leadership plays an important role here...

Always you will need a "push". Otherwise, people will just be happy with what they are used to do, maintaining the 'status quo', and not taking an effort to change...

With the adoption of an OER policy for the OUSL, I believe the academic community will readily embrace this initiative...Now we have a group of people who believe in OER...to develop instructional materials for distance learners. This will further help institutional transformation... University authorities taking this agenda forward...

A summary of the findings are presented in Table 4.

Table 4: Summarized findings

Intersection in Technology (T) Pedagogy (P) and Content (C)	Challenges faced at the intersections of Technology, Pedagogy and Content	Strategies designed to address challenges	Type of transformational change that took place
Technology/ Pedagogy (T/P)	Coping with (new) technology and (new) pedagogy at the same time; Resistance to change.	"Teachers as Designers" approach; A sequence of carefully structured hands-on activities to design technology-enhanced, constructivist, situated learning experiences; Compelling motivation.	Capacity development in designing and developing technology-enhanced constructivist, situated learning environments; Development of understanding in technological affordances for pedagogical requirements
Technology/ Content (T/C)	Non-conversant with technology; Non-awareness of openly-licensed online learning resources (OER)	Hands-on experiences to integrate technology in course design, development and delivery; Search, identify and integrate various types of OER available online as sources of subject matter content, in the learning experiences.	Capacity development in ICT and OER integration in course design, development and delivery; Shifts in mindsets and changes in practices.
Pedagogy/ Content (P/C)	A key focus on 'delivery of content' by experts; Exam-oriented knowledge transmission	Adoption of Scenario-based learning (SBL) – a situated learning approach; Adoption of a 'Learning Engine' framework with OER as essential fuel;	Shifts in mindsets and changes in practices -from content-centric to more context- and learning-centric -from conventional to more innovative/creative ways
Technology/ Pedagogy/ Content (T/P/C)	Reluctance to "change" from the conventional thinking and practices	Designing OER-integrated e-learning environments using SBL; Use of DBR approach with a carefully designed intervention in stages; Researchers working collaboratively with the practitioners, promoting adoption of OER/OEP.	Significant changes in thinking, perspectives and practices towards OEP; Becoming reflective practitioners; Application of new knowledge/experiences; Impact on institutional policy development.

As evident by the findings, in all four initiatives practitioners have faced various challenges when encountered with the transections of technology (T), pedagogy (P) and content (C). This was mainly due to a resistance to change from established practices and mindsets. However, engagement in a series of carefully structured and systematically designed capacity building and professional development experiences have supported participants in all initiatives to

overcome or minimize such challenges, resulting in changes in their thinking and practices, contributing towards a gradual transformational change at OUSL.

Conclusions & Implications

A critical analysis of the experiences of key participants involved in the institutional transformation process at OUSL revealed that institutional policy formulation and capacity building are closely connected. This transformation comprised 1) Professional development of academic staff in the integration of OER in teaching and learning (design and development of OER-integrated online modules) including micro, meso and macro level policy development in OER-based e-Learning; 2) A robust model (using situated cognition and scenario-based learning) for the integration of OER in professional development programs at OUSL; and 3) A rigorous approach (using design-based research methods) to the evaluation of the impacts of OER integration and adoption of OEP.

The key challenges faced by individuals during the transformation process such as coping with technology and pedagogy, and a resistance to change from conventional thinking and practices, were successfully addressed through carefully designed capacity development interventions. It was evident that technology, education and design as a three-pronged stool has helped the development of comprehensive and sustainable frameworks for policy formulation and bringing about a transformational change at the institutional level towards OEP.

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