Supporting educational access and resilience through digitization of curriculum

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Abstract

One of the main challenges faced in developing countries is that many children and youths are not in any form of education, employment or training. Unlike the developed world, these countries have young populations and are characterized by relatively high population growth rates. It is practically not feasible to accommodate the increasing number of children and youth in existing educational institutions, using the traditional methods of classroom education. There is the risk of keeping more children and youth out of education and by so doing, exposing them to all forms of social problems like alcohol and drug abuse. Unfortunately, even those learners that find themselves in school sometimes hardly realise significant educational achievements. This is mainly because many schools have crumbling infrastructure, overcrowded classrooms and poor educational outcomes.

The problem of poor educational outcomes in developing countries is exacerbated by occasional natural disasters like tsunamis, volcanic eruptions and pandemic outbreaks. As was witnessed with the Covid-19 pandemic, these disasters not only constrain the smooth-running of education systems, they also make educational provision more expensive. This further pushes more children out of school. It is clear from experience that education institutions need to build systems that provide more access at affordable cost and that are more resilient to the myriad of challenges that are posed by nature. The advent of technology provides a window of hope in this regard. Use of educational technology allows more people to participate in education, provides greater flexibility, and has immense potential to enhance the quality of education. This paper is a reflection of the contribution COL is making in supporting digitisation of the curriculum at the schooling level as a way of addressing the challenges of access, quality and resilience. The paper highlights the initiatives that were implemented, the methodology that has been used to collect data from various countries where COL supported technology enhanced learning, achievements that were made and challenges that were encountered. It also highlights emerging results of these interventions and surfaces their potential impact.

Introduction

The advent of Web 3.0 technologies has ushered in great opportunities for reforming pedagogical approaches in education. The use of Learning Management Systems (LMSs) has become commonplace not only in higher education, but also at the schooling level, for instance. This varies though from context to context, depending on a number of factors which are teacher –related, student –related and institution –related. In some institutions, online learning has been mainstreamed in the teaching and learning processes of universities. In others, blended learning has been preferred in place of the fully online approach. The latter has been implemented differently by different universities, resulting in different perceptions and understandings of what exactly blended learning entails.

Most of the research on blended learning has been conducted in higher education, where much of this approach to teaching and learning has been prevalent, (Anthonysamy , et al 2020)[1]. The closure of educational institutions that was brought about by the COVID-19 pandemic forced all educational institutions to resort to remote teaching and learning. This development accelerated use of technology even at the lowest levels of education. Thus, schools resorted to using technology with primary and secondary school learners. There was no time for proper induction, there was no time for training in online designing, neither did schools get an opportunity to make rational assessment of which learners had access to what form of technology and which ones did not. As MacMahon , (2021)[2] notes, this shift towards use of technology was a radical change for some teachers and schools whilst for others it was an acceleration of ideas and practices already in place. Thus, the benefits of using technology during the period of remote teaching vary greatly from institution to institution, if not from learner to learner. Widespread use of technology during remote teaching and learning clearly brought to the fore the need for equipping teachers with the relevant skills and knowledge of designing for online and blended learning, supporting online learning and for appropriate online assessment. The need for training teachers in using technology appropriately for teaching and learning at the schooling level cannot be overemphasised. This paper reflects on the work COL is supporting in building capacity for education systems to draw on the affordances of technology to expand access, achieve equity and enhance the quality of provision. It outlines some of the technology enabled learning (TEL) initiatives that have been implemented in the Commonwealth countries, highlights the challenges that were faced, and reports educational gains that were made. The argument that is pursued throughout the paper is that unless teachers are sufficiently equipped to use educational technology appropriately, the benefits of TEL may never be realised in developing countries.

Theoretical framework

There are many benefits that are associated with use of technology in teaching and learning, especially blended learning. Cleveland-Innes, M. & Wilton, D. (2018)[3] argue that benefits of blended learning for learners include increased learning skills, greater access to information, improved learner satisfaction, and opportunities to collaborate in the process of learning. The same authors cite advantages of blended learning that emerge from recent research, which include:

- Providing opportunities for learners to collaborate at a distance: Individual students work together virtually and support each other both synchronously and asynchronously. Blended learning also offers a platform for increased student-teacher interaction,

- Increased flexibility: Technology-enabled learning gives learners the convenience of learning anytime and anywhere. Thus, learners learn without the barriers of time and location but with the possible support of in-person engagement,

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[1] Anthonysamy, L., Koo, A. C., & Hew, S. H. (2020). Self-Regulated Learning Strategies in Higher Education: Fostering Digital Literacy for Sustainable Lifelong Learning. *Education and Information Technologies, 25*(4), 2393–2414. **https://doi.org/10.1007/s10639...**
[2] MacMahon, S. , Harris, R, A., Gilliver, M., Leggett, J.,& Carroll, A. (2021) The Science of Blended Learning – a research-practice partnership. https://www.teachermagazine.com/au_en/articles/the-science-of-blended-learning-a-research-practice-partnership?utm_source=CM&utm_medium=Bulletin&utm_campaign=1Mar
[3] Cleveland-Innes, M. with Wilton, D. (2018) Guide to Blended Learning. Commonwealth of Learning, Vancouver

- Enhanced learning: The student actively engages with learning activities during the learning process and this promotes student-centred learning. As a result, students achieve higher and more meaningful levels of learning, and

- Learning to be virtual citizens: Learners practice the ability to project themselves socially and academically in an online community of inquiry. Digital learning skills are becoming essential to be a lifelong learner, and blended courses help learners master the skills for using a variety of technologies, (Cleveland-Innes, M. with Wilton, D. 2018).

Merely bringing in technology in the teaching and learning processes does not necessarily yield the above-mentioned benefits. Choice of technology to be used and the way it is used will determine the quality of teaching that takes place and the resultant learning benefits. Research shows that capacity building is a key element determining the success of technology-enabled learning, (Mishra, 2019[4]; Bates, 2016; and Cleveland-Innes and Wilton 2018). Khan, (2010)[5] posits that designing and delivering instruction and training on the Internet requires thoughtful analysis and investigation, combined with an understanding of both the Internet's capabilities and resources and the ways in which instructional design principles can be applied to tap the Internet potential. Unless teachers are trained and consciously design to take advantage of particular technological tools, meaningful learning might not be realised.

Effective implementation of TEL requires creating an enabling environment where all learners are supported and motivated to learn, where they see the purposefulness of the learning process, and where deep engagement with content is maximised. Cleveland-Innes with Wilton, (2018) rightly emphasise the importance for teachers/designers to have knowledge about who has access to what technology in order to design appropriate learning activities. For example, limited bandwidth, unreliable Internet connectivity, and lack of devices are factors that constrain use of technology in teaching and learning and these factors pose challenges to effective use of technology in many developing contexts.

In using technology –enabled learning, the aspect of independent learning is important to consider. Learning should be designed in such a way that students do not get preoccupied with the technology at the expense of learning. Learning resources, learning activities and all the support needed should be designed in such a way that they are readily accessible. Several frameworks are given for effective online learning in the literature. Building on Shulman's (1986)[6] work, Mishra and Koehler (2005) advanced a framework for use of technology which is applicable universally, the Technological Pedagogic Content Knowledge (TPACK). Whilst Shulman prioritised the importance of Pedagogical Content Knowledge (PCK) in implementing technology-enhanced teaching and learning, Mishra and Koehler extended this PCK framework to include technology, hence their Technological Pedagogic Content Knowledge (TPACK) model. According to the TPACK framework, effective implementation of technology in teaching and learning requires the teacher to have appropriate skills to use the technology, subject matter (content) knowledge, and general knowledge of instructional methods (pedagogical knowledge).

Khan, (2001) argues that when using technology in teaching and learning, one has to make careful analysis of how to use digital technology tools in conjunction with instructional design principles. The interplay of digital technologies and the instructional design principles used gives rise to a particular online environment, which can be conducive to or can constrain learning. Khan, (2010) proposes a framework with eight important factors that affect the quality of online courses, namely pedagogical, technological, interface design, evaluation, management, resource support, ethical and institutional factors. Khan's (2010) eight-factor framework is illustrated in the diagram below:

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[4]Mishra, S. (2019) Implementing Technology-Enabled Learning in Indian Universities. In *University News*, 57(34), PP.7-11

[5]Khan, B. (2010) The Global E-Learning Framework. In *E-Learning*, (pp 42 – 51)
https://www.academia.edu/2478564/The_Global_e_Learning_Framework_by_Badrul_H_Khan

[6]Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4-14
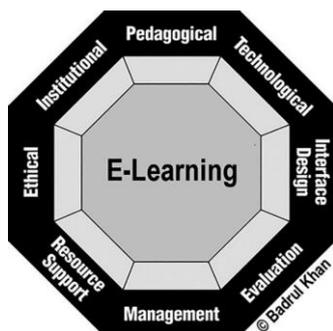
Khan's Eight-Dimensional e-Learning Framework

Source: Khan, (2001)

This paper uses Khan's (2010) framework as a conceptual lens for understanding what is emerging from this study on teacher support in transitioning from traditional paper-based to digital delivery of curriculum. In particular, the paper uses Khan's pedagogical dimension of e-Learning, which refers to teaching and learning, content analysis, audience analysis, goal analysis, medium analysis, design approach, organization, and learning strategies, (Khan, 2010). For teachers to transition to technology-enhanced teaching and learning, they need to be well grounded in how learning takes place online, in addition to having appropriate technological skills. It is important to keep in mind that learning online requires learners to be assured of teacher presence all the time in order to have a sense of belonging. As Cleveland- Innes and Wilton, (2018:6) put it, "Students need adequate motivation when engaging in a wide range of often shifting learning modalities, some of which may require significant skill development". Unless teachers have sound pedagogical knowledge, they may not be able to design online learning environments that provide this kind of support.

COL support/initiatives

COL has supported a number of institutions in Commonwealth countries to increase access to education through open, distance and flexible modes of delivery. With the advent of education technologies, COL has gone a step further to support more use of technology in teaching and learning at both the schooling and post-schooling levels. The rationale behind this move is to expand access to education by reaching out to those people who, for one reason or the other, cannot participate in conventional face-to- face institutions. Technology-enabled teaching and learning provides an opportunity to continue learning even under disaster conditions, like pandemic outbreaks, volcanic eruptions and tsunamis. Besides affording education systems resilience, technology-enabled learning has great opportunity for enhancing the quality of learning, as highlighted above. In its support work, COL has prioritised using blended and online modes of delivery, in addition to the traditional form of delivery. Such use of multiple modes of delivery can accommodate a wider range of educational needs and interests than face-to-face delivery.

In Southern Africa, COL supported redesigning the curriculum for online and blended learning at university and in open schooling. In the South Pacific, COL has also supported similar initiatives in open schooling in order to bring into the education fold youth who are out of the education system. In all these instances, there was need for teachers to redesign the curriculum for online learning. Moodle was the common LMS that was used in these initiatives. In the majority of these cases, school teachers were designing for learning with technology for the first time. In universities, there were few academics who had designed courses online, the majority were also doing it for the first time. As would be expected, the experience was both exciting and challenging to most of the participants. The experiences of participants in doing this work will be highlighted below.

Methodology for data collection

Data used in this paper was obtained through various means by the author, who was directly involved as a consultant in facilitating the shift from traditional face-to-face to online and blended learning in the project countries. In each instance, the project started with a workshop where participants were trained on online design and on how to use Moodle tools. These workshops provided an opportunity for the author of this paper to elicited qualitative data from participating teachers by directly interacting with them during project workshops and as they designed content in Moodle. Secondly, the author reviewed content that was developed by participants in Moodle and documented strengths and weaknesses that were identified. Of course, he also provided comprehensive feedback to content developers. Thirdly, he also analysed results of the questionnaires

he administered at the end of the project in order to understand what participants benefitted from the workshop. The data used in this paper is therefore largely qualitative.

Results

As shown in Table 1 below, data were collected from five institutions that were involved in the study. Of these project institutions, three were open schools and two were universities. Thus, school teachers and university academics were involved in redesigning for online learning. The results of this study are summarised in the table below:

Table 1: Results by Institution

		Swaziland (A)	Botswana (B)	Rwanda (C)	Cameroon (D)	Papua New Guinea (E)
1.	Target Group	School teachers	School teachers	University academics	University academics	School teachers
2.	No. of Participants	28	16	20	20	20
3.	Number of courses	12	3	5	2	12
4.	Learning Design	Teacher centred	Learner cantered	Teacher cantered & content driven	Teacher cantered & content driven	Teacher cantered
5.	Internet Access	Average	Average	Good	Below average	Average
6.	Experience in designing in Moodle	None- Very little	None - Very little	Above average	Very little	Very little
7.	Familiarity with OER	None-Very little	Below average	Average	Very little	Very familiar

Data are reported around seven aspects of the project, which were deliberately selected by the author for this paper. The first column on the right shows these seven aspects. Data were collected for many more aspects than what is reported in this paper.

In each institution, between 20 and 28 participants were involved and the number of courses that were redesigned online ranged from 2 to 12. Generally, fewer courses were involved at university level than at the schooling level. From the courses that were reviewed, the researcher also analysed how content was packaged in Moodle and the assumptions designers had of how learning was going to take place. From this analysis, it was possible to identify the dominant learning design that underpinned course development. It is interesting to see that irrespective of the level, the teacher-centred learning design was used in all the five institutions. At university level, the courses were also content driven, with dense theories constituting the bulk of the content. There was very little application and student-student interaction in the learning design. For online and blended forms of learning to work smoothly, both teachers and learners need to have ready access to both hardware and software, as propounded in Khan's (2001) framework. Contrary to popular opinion about internet access in developing countries, especially in Africa, all institutions except one had average to good internet access during the project. Even in the one institution where below average internet access is reported, it so happened that there was disruption of internet connection country-wide during the course of the project, especially on workshop days. After the workshop, participants had good access and were able to design courses in Moodle.

One of the things the researcher collected data on before the commencement of the project was participants' experience and expertise in designing in Moodle. Participants from the three open schools and from one university reported no experience to very little experience in working with Moodle. Academics from the second university reported above average experience in working in Moodle. Thus, data showed dire need for training participants in Moodle first before they could start designing online/blended courses. One of the important skills needed in designing online learning is integrating open education resources (OER). This requires designers to

search for and find OER and adapt them for their courses. Participants from three institutions showed that they were not very familiar with OER. Only one university showed average familiarity with these resources. Participants from one open school reported that they were very familiar with OER as they had worked with these resources before. Interestingly, these participants were not aware of appropriate search methods to use in order to find relevant OER fast enough, like using search engines like Advanced Google Scholar and doing Creative Commons search. Much as participants might have known where to look on the Internet to find resources without using any search tools, the issue though was how to identify what is open and what is not. Repositories like YouTube, which is an obvious repository for video content and Flickr, which is a photo repository do offer a filter facility that allows users to identify videos and photos licensed with a Creative Commons licence. This is useful information that course designers will always find handy if they want to integrate OER in their courses. All participants in the project were not aware of these search tools.

Generally, the trend depicted by the results in the table above clearly shows that there was need for training participants in pedagogical and technological dimensions of the theoretical framework used in this paper if they were to accomplish their task. There was also need to rain them in the various aspects of using OER, including searching for these resources. In all the five institutions, this training was provided as part of the initial workshops and as follow up support to groups and to individuals as course designing was under way. Participants were also trained in how to design for online and blended learning, including on searching for and integrating OER in their courses. In many instance, especially amongst school teachers, more time was needed to master the requisite the skills than was available for the project.

Achievements

Despite the lack of experience in designing for online learning and in working with Moodle reported above, significant results were realised at all project institutions. In fact, many participants acknowledged that the initiative was an eye-opener in terms of possibilities that have been enabled by available technologies in education. They acknowledged that the project was very productive and they learnt new things that are relevant for their contexts. The few that had LMSs in place picked confidence to use the technology for the benefit of their learners, something which they had not done before. Although they still needed a lot of support, participants had picked basic technological skills which help them in their work. It was also fascinating to note that in all the institutions, participants who were fast enough to pick the skills provided immense support to their peers. Peer to peer support is one of the continuous professional development strategies that have been found to be most effective, particularly in higher education, Guskey, (2002)[7]. This is an achievement that will benefit institutions in the medium to long term. In addition to peer to peer support, the change in teachers' beliefs about the possibilities that are offered by technology will have a positive impact on teachers' practices, which in turn, is likely to result in increased learning outcomes, (Helenius, et al 2015)[8]. Thus, one of the main achievements of this COL supported initiative is the potential it has to change teachers' pedagogical approaches from the dominant teacher-centred approaches reported in the results above to more learner-centred approaches. This is beginning to emerge in some of the project institutions.

All the five project institutions managed to develop programmes developed in Moodle, although some may need to be improved. The foundations for online and blended learning have been laid in the project institutions. At one university, students are already enrolled in the five modules that were put on line. These modules are also generic across disciplines.

At the beginning of the workshops, it was evident that the majority of participants lacked technological skills necessary for them to design online. In fact, some of them barely had basic computer skills. As the projects unfolded, with more training being provided, one could see dramatic improvement in the computer skills of participants. Thus enhancing the basic computer skills of participants is a noteworthy achievement of the projects, a competency that is upheld in the TPACK framework.

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[7] Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: theory and practice*, 8(3/4), 381-391.

[8] Helenius, O., Johansson, M. L., Lange, T. Meaney, T., Riesbeck, E., and Wernberg, A. (2015) Theorising the Design of Professional Development Web Modules.
https://www.researchgate.net/publication/281743879_Theorising_the_Design_of_Professional_Development_Web_Modules

Challenges faced

Notwithstanding the successes highlighted in the foregoing paragraphs, there were many challenges that were faced in undertaking the online design project, and these were more pronounced in some institutions than in others. In many instances, it was clear that developers were not guided by any explicit theories of online learning. As Tony Bates argues, with sound knowledge of alternative theoretical approaches, teachers and instructors are in a better position to make informed choices about how to approach their teaching in ways that will best fit the perceived needs of their students, (Bates, 2015). Online learning design should be grounded in appropriate theory. This shortcoming was apparent even amongst academics from universities. Thus, during training sessions on online course design, this aspect had to be explicitly dealt with, and participants were constantly exposed to some of the basic theories, like constructivism and connectivism. Most of the courses were largely content driven, with a lot of unguided reading expected of students. Very little or no reflection activities were built into the courses. Where these were included, they were too superficial to encourage development of critical thinking and problem solving skills. Moreover, developers lacked skills to develop authentic learning activities and authentic assessment. Unless course developers think seriously about how learning takes place online, guided by theory and armed with sound content knowledge, the courses may not be designed in a way that encourages deep learning. As underscored by the theoretical framework used in this paper, good online design is premised on sound technological and pedagogical competencies that should be coupled with sound knowledge of subject content.

The results reported above show that access to internet ranged from good to below average. Some developers struggled to participate in the workshops uninterrupted and to search for OER and integrate these resources in their courses smoothly due to unstable internet connection, lack of reliable electricity and sometimes because they had to rely on campus-based personal computers instead of laptops. Learners will inevitably encounter these challenges; institutions need to plan how they will manage such challenges to make online/blended learning succeed.

The last challenge that was identified is that many developers were not familiar with OER, and therefore did not integrate them appropriately in their courses. For example, images found on internet were plugged into content without an acknowledgement. In fact, many participants made very little effort to look for information on how resources found on internet were licensed. Whilst they were keen and agreed to have their content published as OER, they were not aware of the tensions involved if they used content from other sources that was not openly licensed.

Conclusion

This paper was a reflection of COL supported educational initiatives that *Saide* supports in sub-Saharan Africa and in Pacific Island countries. The work mainly involves supporting universities and open schools in transitioning from traditional face-to-face to online and blended learning. Participants were trained in designing online courses and in using OER. The experience revealed positive changes that have happened amongst teachers and academics, mainly in terms of appreciating the value educational technologies can add to enhancing the quality and flexibility of learning. It was also evident that training had improved basic computer skills of participants.

This paper recommends that more research be conducted to establish whether better teaching is taking place and whether there are significant improvements in learning gains as a result of using technology in the project institutions.

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