

Interrogating Factors Affecting the Choice and Utilisation of Online Learning Technologies for A Higher Education Institution

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ABSTRACT

This desktop review paper advances the view that the utilisation of technology for online teaching and learning needs to be based on sound considerations. Online learning technologies are defined and the purpose of utilising such technologies is explored. Among the different considerations in online technology utilisation is the need to consider how the technologies assist in solving pedagogical challenges for teaching and learning. The context in which the learners and the course instructors find themselves using the technologies may promote or negate the effective use of the technology. Technology may be costly to procure and maintain, and this factor should be considered before the technology is procured for use in an institution of higher education. In many contexts, especially in sub-Saharan Africa, the digital divide is real in terms of access to technologies and the skills in technology use. The use of technology may perpetuate social differences as learners from disadvantaged backgrounds end up being left out of the learning process. Organisational and infrastructural issues are other important factors to consider in technology utilisation. The paper concludes that technology utilisation for online teaching and learning should be deliberately planned to consider numerous factors and address avoidable challenges in the implementation of online learning.

Keywords: Higher Education; Technology; Online learning; Teaching and learning.

INTRODUCTION

The use of technology for teaching and learning has become topical in higher education. Technology enhances teaching and learning and provides rich learning experiences for the students. However, important considerations should be made in the choice and utilisation of the technologies for teaching and learning. Online learning technologies exist in various forms [1] and are used to support and enhance the learning process. Online learning technologies facilitate learning by controlling the learning environment, media, and teaching methods by controlling and improving performance [2]. Artificial intelligence, Immersive learning with

virtual reality, the Internet of things (IoT), and mobile learning are some of the few mentioned examples of the emerging trends of online learning technologies. This paper explores the innovation pace of institutions in rural areas concerning online learning technologies. A prior study by [3] suggests that in developing countries, mobile technologies possibly provide education without reliance on traditional communications infrastructure, skipping some expansion stages encountered in developed countries such as connecting widespread electricity infrastructure, and building several computer laboratories in educational institutions.

The purpose of online learning technologies use

Online learning technologies need access to connectivity such as electricity, internet, mobile coverage, a broadband connection, and or access to hardware such as computers, mobile phones, or tablets [4]. Understandably, the availability of these technologies, to an extent, will influence the feasibility of implementing online learning, and the kind of online learning technologies available for instructors to choose from. There is a need for sustainable funding to create suitable solutions to the technology access challenge.

In light of the above, online learning technologies can still be used in places where Internet connectivity is irregular or unreliable. Caching online content for offline use as suggested by [5] is an innovative approach that enables off-line access to a variety of online resources in a manner that can imitate online environments. The same author offers another approach, the advent of low-cost e-readers with long battery life. The e-readers allow for issuing a large number of books in digital formats to students who read them on portable, tailor-made reading devices. Such approaches could be implemented into teachers' instruction so that the pool of distance learners with access to quality education is opened up.

One of the most fundamental uses of online learning technology has been to strengthen learner engagement. For example, turning on webcams and mics during video meetings is a way to foster engagement [6]. Nevertheless, in a low bandwidth environment video conferencing software may be compatible with a low-bandwidth environment if certain features are enabled and students gain access to copies of the presentations. Bandwidth is reduced for video meetings by reducing the number of meeting attendees and limiting screen sharing. The more people in attendance, the more bandwidth is required for all participants, even when there are no video feeds. Also, enabling students to call into video meetings without internet access allows for increased participation [7]. Therefore, students in low resource communities can also reap returns of education such as the existence of online learning technologies.

Furthermore, online learning technologies can be used generally for formative assessment. Efforts in Pakistan [8] show that mobile phones can help, especially when students are sent short quizzes through Short-Message-Service (SMS) to help them measure how well they understood the topics discussed in class. Therefore, mobile phones can be used to support learning and teaching by providing access to learning content.

Considering pedagogy before technology

It is an important consideration that any technology utilized should be advancing a clear pedagogical approach. As noted by [9] course instructors who wish to integrate technology into teaching and learning should be clear about their teaching and learning approaches and how

technology will assist in enhancing the teaching and learning approaches. Similarly, [10] state that course lecturers often use technology without any consideration of a pedagogical problem that the technology seeks to solve. Furthermore, [11], notes that considering technology before pedagogy is placing the cart before the horse. This suggests that it is not prudent for course instructors to bring technology into teaching and the environment, without considering how the technology is meant to improve teaching and learning.

In underscoring the need for course lecturers to consider pedagogy before technology, [12] note the importance of [13] Technological Pedagogical Content Knowledge (TPACK) framework. The TPACK framework advances the view that there should be a strong relationship between technologies, curriculum content, and pedagogical approaches. The course lecturers should have a clear knowledge about the way technology, pedagogy, and content interact with each other to produce effective teaching and learning of the subject content through the utilisation of different technologies.

On the importance of considering pedagogy before technology, [14] call for a paradigm shift in the teachers' pedagogical beliefs. They note that teachers should be persuaded about learner-centered and constructivist pedagogical approaches as opposed to teacher-centered ones. To this end, the different technologies would then be utilised to provide opportunities for learners to work on their own to construct knowledge, with the teacher using the same technology to facilitate learning.

Considering learners' and instructors' context

The context in which learners and course instructors have to use technologies for online learning affects the effectiveness of the use [15]; [16]; [18]. The context may promote or negate the effective use of the technology [16]; [17]. This paper focuses on rural contexts. [16] describes rural areas as remote places found in the countryside, in forests and mountains, and isolated from urban areas where human settlements have agricultural production as the main economic activity. He adds that rural people normally lack access to socio-economic amenities, such as quality education, good health services, transport, marketing facilities, and even electricity. They mostly lack the social and economic viability needed to sustain technological improvement.

According to [17], learners from rural and low socio-economic contexts are usually low performing in education. They assert that the use of technologies in E-learning is considered a new solution to bridge the inequality gap in education in many developing countries and policies to apply technologies in learning have been developed. However "a massive problem arises when these technologies are applied to other countries". The problems related to the use of technologies in rural settings include learners resisting adapting from traditional classrooms to computer-led learning in virtual classrooms, schools lacking necessary e-learning equipment, such as highly efficient devices and Internet connections, and learners lacking skills in computer literacy and self-motivation.

Consistently, [16] Dube posits that using online learning mode excludes many rural learners from teaching and learning, due to a lack of access to resources to connect to the internet, due to a lack of infrastructures such as the unavailability of electricity and electronic gadgets, and due to lack of access to the learning management system and low-tech software as well as a lack

of qualified teachers who can assist with online learning.[16] states that seemingly, online learning favours urban and well-privileged learners, thus, widening the gap between the poor and the rich. The adoption of technologies such as mobile smartphones and applications for education and equality of use remains a problem in rural communities even in advanced countries [18].

[19] explored how teachers and learners use iPads, which is one of the new educational technologies, in rural high school classes with iPad carts. The findings revealed that the overall use of technology by both teachers and learners was very low, but learners used it more than the teachers. The most common barrier reported by teachers was learner attitude and preference, followed by teacher attitude and preference and infrastructure problems. This finding shows that the context does influence the effective use of technology for teaching and learning. Learners' interaction with technology is vital for effective online learning [20].

In their study, [18] identified factors that could impact the adoption of mobile apps for the teaching-learning process in a girls' school in rural India. The findings showed that Perceived Usefulness, Perceived Ease of Use, and Effort Expectancy have a significant and positive impact on Behavioural Intention; Perceived Risk has a significant but negative impact on Behavioural Intention, and the Price Value has an insignificant impact on the Behavioural Intention.

It is clear from the above discussion that learners' and instructors' contexts are important in the choice and effective use of technologies for online learning. Instructors should consider the learners' contexts in planning and designing learning content and activities for online learning which requires the use of technologies.

The usefulness and ease of use of technology

In the 21st century, there has been a wider talk of technological knowledge as an important variable to advance educational success [13]; [21]. Since technology integration has emerged as an important aspect that has taken centre stage in education sectors, for its integration to be meaningful, it is important that educators clearly understand what it means to use technology in teaching and learning. Technology integration must not be narrowly perceived as the use of any technological gadget one has, rather it should be considered alongside other issues that go into teaching and learning [22]. Because of this, it is critical to look at the usefulness and ease of use of technology from both the teachers' and the students' perspectives.

The Technology Acceptance Model (TAM) as explained by [23] and [24] advances the view that the perceived usefulness (PU) of technology and ease of technology use are the main drivers for technology acceptance by the users. Furthermore, [25] note that technology is best accepted for adopting in instances where the users have positive views about the usefulness of the technology and find it easy to use, it is, therefore, important for an institution of higher learning to make use of technology that staff members and students consider useful for teaching and learning and also find it easy to use.

Cost

It is important to consider costs in the choice and utilisation of technologies. The users have to consider the cost of the hardware and software of technology. In instances where the costs are prohibitively high, it may not be useful to opt to use such technology. [26] note that:

The financial cost is a significant factor that must be considered prior to the introduction of technology in the classroom or experiential site, and it should be evaluated from both the school/site perspective and the student perspective.

The above observation is also true for institutions of higher learning which should consider the financial implications before any technology is considered for use. The costs may affect the institutions and the students. On the same issue of costs, [27] argues that an institution of higher learning should conduct a cost-benefit analysis before implementing e-learning.

[28] further notes that the costs associated with technology use in an institution of education may not be limited to the purchasing of devices. The purchasing of devices is costly to institutions and users. A study by [29] established that a large number of students at the University of Eswatini in Eswatini did not possess their laptops and this is attributed to prohibitively high costs of the devices. Similarly, [30] found that students at the University of Venda in South Africa had challenges in securing technological devices because of the high costs. It is, therefore, important to consider the students' access to devices before technology utilisation is considered. Costs extend the purchasing and licensing of the different software. Some of the software may be sourced through open sources yet others are purchased. [31] note the expenses involved in acquiring tools and applications required for virtual reality in education. Other resources are also required to realise the full implementation of e-learning ventures and this may involve new infrastructure as well as training of staff and students.

The students' use of the Learning Management System (LMS) requires data and in some countries, data is not affordable. [32] note that about half of the students in Ghanaian universities have unlimited access to the internet. It, therefore, means the other half has problems in accessing the internet yet access to the internet is a prerequisite to participation in online learning. Similarly, [33] note the challenges of online learning in the Covid-19 environment in South Africa and advocate the use of offline learning materials for the benefit of students without internet access. Access to the internet and data cost become important considerations in the choice and utilisation of online learning technologies in disadvantaged rural-based universities.

The digital divide

The choice and utilisation of technologies for teaching and learning in rural-based higher education institutions are also affected by the existence of the digital divide. [34] state that the digital divide is about "access to various dimensions of information and communication technology (ICT) including physical access, motivation, skills, and actual usage of digital technologies." Similarly, [35] refer to the digital divide as the "gulf between groups of individuals who have access to ICT and those who do not ...". On access to technological devices, the digital divide in an institution of higher learning manifests in other students having access to the devices while others do not have access at all. It becomes a real challenge to integrate technologies into teaching and learning when a fair number of students would not be able to access learning due to a lack of the required devices. [36] Rogers (2016) notes the digital divide as a social justice concern in the modern world. The divide shows the serious inequalities in modern society, where others have access to material possessions while others do not have.

The digital divide also extends to the use of technologies. Some students in higher education institutions in sub-Saharan Africa can use technologies while others are not. [37] note that digital inequality also entails differentiated competencies in technology use. Students are always at different levels of competency in technology use. The utilisation of technologies in teaching and learning becomes a challenge in instances where some of the students are not able to use the chosen technology.

The ability to use technological devices also extends to the course instructors. According to [38] the utilisation of technologies in teaching and learning depends on how the course instructors possess the pedagogical skills to integrate technologies in teaching and learning. While some course instructors may be competent in technology use, others may lack this aspect. There will, therefore, be a need to train course instructors on technology use and online pedagogies. The sourcing of technologies should consider how easy it would be to train course instructors to be competent users of the technology.

Digital literacy

The issue of digital literacies for staff members and students is an important factor to consider is the utilisation of online learning technologies. According to [39] digital literacy is “the ability to understand and use information in multiple formats with emphasis on critical thinking rather than information and communication technology skills”. As noted by [40] digital literacy involves several skills and literacies. Students should be able to engage in problem-solving activities within the digital context.

Digital literacy begins with the consideration of the students’ access to technological devices, internet connectivity, and relevant software [41]. It is imperative in sourcing the relevant technologies for use for learning to consider the access of the technology by students. If the technologies are unavailable, difficult to procure, or are unaffordable for the students, it becomes difficult to have the technology utilised by the students. [42] notes that converting learning material to online learning formats suitable for the different learner needs may be a challenge for course instructors. Some required software for conversion may be expensive for the institution. Almost all technologies rely on internet connectivity for use. Students may have challenges in securing the relevant devices and internet connectivity, especially in rural-based universities [43].

One of the basic and defining aspects of digital literacy is the ability to use the available digital technologies [44]. It is therefore an important consideration to make on how the users of the technology will be able to use it. The Technology Acceptance Model (TAM) as observed by [45] states that the perceived ease of use is one component that influences the acceptance of technology and the actual use of it. In instances where the technology utilised for learning is difficult to use, it will result in students' willingness to use the technology. Institutions should consider how the users will learn how to use the new technology and use it for learning.

One of the important aspects of digital literacy is the course instructors’ ability to integrate technologies in teaching and learning. Course instructors should be able to utilise the technologies fully for meaningful teaching and learning. [46] states that teachers should be able to adapt quickly to technology integration in teaching. However, [47] notes that effective teaching and learning by the utilisation of technology should be informed by sound pedagogical

principles. Course instructors should utilise technology to facilitate the pedagogical approaches in use. To this end, technological integration in teaching is more than just the ability to use technologies but the use of technologies to advance a clearly defined pedagogical agenda.

Organisational issues

Some organisational issues should be considered in the choice and utilisation of online learning technologies. One of the issues is the human resource capacity to drive online learning in the university. According to [48], online teaching is quite complex and requires course instructors to possess certain competencies. There is, therefore, a need for a strong support system within an institution. Such a support system assists with the technical and pedagogical support required in online teaching. In the choice of a Learning Management System, for example, the institution should have people within the institution who understand how the LMS works to train and support course instructors and students.

The issue of reliable and fast internet bandwidth is another important organisational consideration for technology utilisation. As noted by [49], the use of web-based Learning Management Systems relies heavily on internet access, and the internet should not only be available but should be of great speed to allow students to download and upload material. On the same issue, [50] note that given the internet bandwidth challenges that may be experienced, institutions should invest in low-cost intranet systems. The issue of internet bandwidth, therefore, is a crucial factor to consider for effective online teaching and learning.

Infrastructure and networking

Studies indicate that providing sufficient and excellent telecommunication services to rural communities is costly, mostly loss-making because of low service demand, and has inadequate incentives for telecommunication service providers [51]. Nevertheless, while the use of technology mostly focuses on trendy devices the use of seemingly old technology such as radio and television still exists in some places. [52] assert that radio is the most popular singular form of distance-education delivery in low-income countries. [5] shows that radio broadcasts are used to provoke specific actions by instructors and students in the learning environment. Therefore, radio and television technology can still be used in innovative ways. Initiatives under Interactive Radio Instruction (IRI) [53].

Where infrastructure challenges exist, device sharing is another approach. Students can use a single computer independently, as long as they each have their pointing device [5]. Such efforts are supported where technologies exist to help convert basic projectors into low-cost versions of digital whiteboards. Sharing computing facilities can bring additional benefits to higher education.

Low-income communities are known not to have infrastructure that supports high-speed Internet [51]. However, the emergence of 5G technology will allow students direct access to learning resources without the common obstacles of Wi-Fi connectivity [54]. Technologies supported by 5G, like virtual reality, could provide immersive capabilities to develop skills necessary by the workforce [55]. 5G wireless would enhance the quality of instructional methods. These improvements will not only expand the students' learning experience but also their competencies. Low-income communities lack adequate classroom equipment which leads to a gap in the quality of education in rural and urban institutions [51]. Thus, 5G would reduce

the quality gap in teaching and learning due to its universality [56]. Despite the location, 5G can transmit the lesson speedily and clearly. Consequently, 5G promises to reduce the access cost of teaching and learning information and improving educational technologies.

CONCLUSIONS

The utilisation of technologies for online teaching and learning should be deliberately planned, taking into account the institution's context. Without proper planning which considers contextual factors, there would be serious challenges in the selection, procurement, and utilisation of technologies that enhance online teaching and learning. Of importance is the utilisation of technologies that would advance the defined pedagogical agenda of an institution. Technologies should not be 'dumped' onto the teaching and learning environment without a clear pedagogical purpose. The issue of affordability is an important consideration for the sustainability of online teaching and learning. The utilisation of technologies should also consider the differences in physical access to technological devices and internet connectivity as well as the skills in the use of the technologies. Course instructors and students also differ in terms of digital competencies and this aspect should be factored in when considerations for technology utilisation are made.

RECOMMENDATIONS

Given the issues raised in the foregoing discussion, the following recommendations are made;

- a) There is a need to establish an institutional committee that deals with issues of technology integration into teaching and learning.
- b) Wide consultation with the users should be made before the selection and procurement of technologies are made.
- c) Any technology utilised for online teaching and learning should be based on the pedagogical value that it adds.
- d) Training and support programmes are important in addressing the digital divide in terms of differences in digital competencies for staff and students.
- e) In some instances, institutions would need to support students from disadvantaged backgrounds with technological devices for learning as well as data for educational purposes.
- f) Infrastructural issues may need to be attended to before any attempt to procure any technologies for online teaching and learning.

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