Humanities & Social Sciences Communications

ARTICLE

https://doi.org/10.1057/s41599-020-00603-x OPEN

Emergent transition from face-to-face to online learning in a South African University in the context of the Coronavirus pandemic

Cedric B. Mpungose[1]✉

South African universities have been forced to transit from face-to-face to online learning (e-learning) as a result of the coronavirus pandemic (COVID-19). However, various challenges hinder disadvantaged students from realising the full potential of e-learning. Therefore, this study's main objective is to propose alternative pathways to overcome such challenges for students, to enable them to have access to effective e-learning. This study draws on a two-year postdoctoral qualitative research project conducted at a South African university to explore students' experiences of the transition from face-to-face to e-learning. Twenty-six students completing a curriculum studies programme were purposively and conveniently sampled to generate data using e-reflective activity, Zoom group meetings and a WhatsApp one-on-one semi-structured interview. Findings articulate the digital divide as a hindrance to students realising the full potential of e-learning, yet lecturers still want students to submit assessment tasks and engage with course activities on the Moodle learning management system. With universities using face-to-face learning becoming vulnerable to the COVID-19 pandemic and other challenges which result in a shutdown of university sites, alternatives need to be sought to allow students, particularly disadvantaged students, to realise e-learning.

[1] Discipline of Science Curriculum and Educational Technology, School of Education, University of KwaZulu-Natal, Durban, South Africa.
✉email: mpungosec@ukzn.ac.za

Introduction

Since the beginning of higher education, from the time of colonisation to the era of decolonisation, almost all South African universities have been dependent on face-to-face learning (Cuban, 1986; Mgqwashu', 2017). Jansen (2004) argues that face-to-face learning is believed be traditional and excludes students' experiences, because it occurs in the presence of a lecturer depositing knowledge for students in a demarcated classroom, using traditional methods (lecturer-centred) and traditional resources like textbooks, chats, chalkboards and others. However, these demarcated physical classrooms are not accessible in the case of challenges ranging from student protests to pandemic outbreaks. Face-to-face learning provides real-time contact with resources and others, takes place within a specified contact time, and provides prompt feedback to students (Black and Wiliam, 2006; Waghid, 2018). That said, e-learning is education that takes place over the Internet is alternatively called online learning, and it is an umbrella term for any learning that takes place across distance and not in a face-to-face platform (Anderson, 2016; Mpungose, 2020a). Furthermore, Choudhury and Pattnaik (2020) affirm that, e-learning definition evolves with the evolution of Web from Web 0 to 4.0. Thus, "the world was introduced to Internet-based learning with Web 0, which was a read-only site. Thereon, Web (2.0) and Web (3.0) allowed real-time interaction and connected intelligence, respectively. We now witness Web 4.0 where machine and the human brain can directly interact" (Choudhury and Pattnaik, 2020, p. 2). The concepts of e-learning, distance education, online learning and web-based education are concepts that have been used in the literature. However, Rodrigues et al. (2019, p. 88) affirm that both these concepts share the common feature that "they are a form of instruction that occurs between a learner and an instructor and are held at different times and/or places, using several forms of material". As such, Arkorful and Abaidoo (2015) refer to e-learning as the use of educational technologies to enable access to learning and teaching material online. Thus, the importance of e-learning which takes place through the use of the Internet in 21st century university education is undeniable, particularly for the students of today as digital natives (Bennett et al., 2008; Prensky, 2001). Amory (2010) and Khoza (2019b) state that e-learning is capable of making course content available online, because of the widespread use of modern technologies such as hardware resources (computers, laptops, mobile phones and others), and software resources (learning management system, software applications, social media sites and others). This suggests that students have freedom to access course information/content anytime and anywhere, irrespective of challenges such as the pandemic outbreak—provided they have access to hardware and software resources.

In complicating the above debate, some studies (Liu and Long, 2014; Nikoubakht and Kiamanesh, 2019) further argue that face-to-face learning is irreplaceable and is the cornerstone of every learning institution, even if the current discourse and technological revolution demand the use of e-learning. The latter studies believe that there is still a conundrum between face-to-face (person-to-person interaction in a live synchronous platform) and e-learning (self-paced learning in an asynchronous platform). As a solution to this conundrum, other scholars (Anderson, 2016; Bates, 2018; Graham, 2006) believe that blended learning which combines online and face-to-face learning is the way to go, so that students can use many ways of accessing course content based on their needs (strengths/limitations).

Nevertheless, there are compelling conditions that can make students choose online over face-to-face learning; this may include violent student protest, pandemic diseases like COVID-19 in the context of this study, and others. According the World Health Organization-WHO (2020), COVID-19 is a new strain of viruses discovered in 2019, which cause illnesses ranging from the common cold to more severe diseases that can lead to death. They are transmitted between animals and people. Common symptoms of infection include respiratory symptoms, fever, cough, and shortness of breath. As at 31 March 2020, statistics stay at 33 106 deaths globally and in Africa is currently 60 deaths. In other words, this pandemic poses a threat to the face-to-face learning context globally, including in South Africa.

On 11 March 2020 the WHO (2020) declared COVID-19 a pandemic, and everyone was advised to avoid close contact with anyone showing symptoms. Therefore, universities across the globe have to shut down. In the South African context the President called on all universities to shut down and find ways to offer lectures online as from 18 March 2020 as a precautionary measure (DHET, 2020). This call raised questions as to the feasibility of e-learning, particularly at the School of Education in one of the universities in the province of KwaZulu-Natal, because of the extent of inequalities in the South African context. While Mzangwa (2019) agrees with Bunting (2006) that since 1994 much has been done in higher education to redress the inequalities of the past through higher education institutions' policy amendments through the National Plan for Higher Education (Ministry of Education, 2001). These amendments have not led to benefits for the majority of previously disadvantaged black South African students in terms of access to e-learning.

In addition, the digital divide—the gap between those who have and do not have access to computers and the Internet—seems to be a huge factor limiting the feasibility of e-learning in a South African context (Van Deursen and van Dijk, 2019; Warschauer, 2002). These latter studies further assert that issues such as socio-economic factors, race, social class, gender, age, geographical area and educational background determine the level of the digital divide in a university context. While access to the Internet and computers is high in developed European and American universities, African universities—particularly in the South African context—are still battling because of the intensity of the factors which led to the digital divide (Van Deursen and van Dijk, 2019). Research shows that various programmes and policies have been developed and implemented to remedy this challenge; hence, universities provide students with free laptops and Wi-Fi (wireless network commonly allows technological devices to interface with internet) access inside the university and residences (Rodrigues et al., 2019; Schofield, 2007). However, little or no research has been done in the South African context to intervene in addressing university students' challenges (the digital divide) that hinder them from accessing e-learning from home. This study argues that e-learning while students are at home can never be realised in a South African university context unless the digital divide is addressed. In proposing alternative pathways for South African universities to deal with the digital divide, this study considers a connectivism learning framework.

Conceptualising learning in a digital age. The rapidly evolving technological landscape in the 21st century has meant that university lecturers "have been forced to adapt their teaching approaches without a clear roadmap for attending to students' various needs" (Kop and Hill, 2008, p. 2). As a result, connectivism is the promising initial lens through which to conceptualise learning in this digital age, because of its varying attributes from face-to-face to e-learning. Thus, Siemens and Downes (2009) see learning as the process of crossing boundaries by creating connections or relationships between human and non-human nodes through the setting of an interconnected

Table 1 Connectivism principles and conceptualised learning (Siemens and Downes, 2009).

Connectivism principles	F2F learning	E-learning
1. Learning and knowledge rest in the diversity of opinions.	Teacher-centred activities	Student-centred Activities
2. Learning is a process of connecting specialised nodes or information sources.	University	Home/resident
3. Learning may reside in non-human appliances.	Traditional resources	Modern resources
4. The capacity to know more is more critical than what is currently known.	Passive student	Active Student
5. Nurturing and maintaining connections is needed to facilitate continual learning.	Institutionalised connections	Social connections
6. The ability to see connections between fields, ideas, and concepts is a core skill.	Summative assessment	Formative assessment
7. Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.	Formal content	Informal content
8. Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. Although there is a right answer now, it may be wrong tomorrow because of alterations in the information climate affecting the decision.	• Professional rationale • Official time • Objectives	• Social rationale • Extra time • Learning outcomes

network. Connectivist learning draws much from available Internet and technological resources to make an effective network that will maximise learning. As a result, connectivity seeks university lecturers to consider the possibilities of Internet access and other technological resources for effective learning, so that each individual student may gather and share information irrespective of challenges (the digital divide) faced (Bell, 2011; Kop and Hill, 2008). In other words, for effective e-learning to occur even if students are at home, access to the Internet and technological resources should be made available so that they may make connections amongst themselves and the lecturers, irrespective of hindrances faced.

Siemens (2005) further argues that in connectivism, students are not taken as a blank slate or passive recipients of information but are taken as active participants who can nurture, maintain, and traverse network connections to access, share and use information for learning. In order to ensure this, Siemens and Downes (2009) propose eight principles guiding connectivist learning, as depicted in Table 1 overleaf, which are according to this study are now conceptualised to form dichotomies between F2F learning and e-learning. These principles draw from basic learning frameworks (behaviourism, cognitivism, and constructivism) to incorporate both subject and social experiences for learning. Traditionally, learning is believed to be occurring when the lecturer provides a stimulus (teacher-centred activities) so that students can respond, but the rapid development and implementation of new technologies seeks learning to be individually and socially constructed by students (learner-centred activities) to maintain a diversity of ideas. This suggests that digital learning is more participatory and effective than traditional learning because it seeks lecturers to engage students in a dialogue for social construction of knowledge (Downes, 2010). Moreover, Siemens and Downes (2009) agree with Anderson (2016) that learning is about creating and connecting to a community (node) of learning within a network. This connection does not only take place within a learning institution, but can also be online so that students at home or in their residences can access learning. In other words, connectivism prioritises e-learning as the first and best option for students to access learning, if there are forceful or compelling conditions that hinder face-to-face learning.

Siemens and Downes (2009) further argue in principle that traditional resources such as books, chats, chalkboard and others form the core of learning, but the digital age needs them to be supplemented by modern resources like the Internet, computers, mobile phones and others for students to make connections and share information amongst themselves and others. In other words, modern resources enhance active student participation and the capacity to know more; thus the active student has the ability to use resources provided to seek out current information from primary and secondary resources, as compared to being a passive student (Downes, 2010). This suggests that in connectivist learning, it is not enough for a student to depend only on the prescribed readings, taught content, consultation with one lecturer and students in a particular subject/module. However, connectivists seek students to enjoy exploring the world in order to connect with other people outside the normal context, through the use of search engines, social media and other means, because learning is about not only knowledge consumption but construction (Anderson, 2016).

The manner in which students are assessed depends on the ability to see connections between subject fields, ideas, and concepts (Siemens and Downes, 2009). In other words, assessment must be made enjoyable to students because it is not done for the purpose of grading but for developmental purposes (Black and William, 2009). The content (objectives) taught during the official time in the lecture may change over time, based on new contributions in a subject; this requires students to be driven by a professional and social rationale in making decisions as to what to learn and how to make meaning out of it (Downes, 2010). Therefore, just lecture contact time is not enough for students, and it should be supplemented with students' extra time so that learning outcomes can be achieved.

Furthermore, review of research done by Damşa et al. (2015) on quality in Norwegian Higher Education, outlines dichotomous aspect of F2F learning and e-learning. The study aimed at identified important contributors to enhance of quality learning in higher education, and to identify the knowledge gaps in the literature. It was found that, in as much as both platforms (F2F learning and e-learning) share the same aspect in communication, collaboration, and supervision and interaction. However, e-learning provides much of these aspect than F2F learning since it creates more intense atmosphere from synchronous to asynchronous teaching and learning aspect. This suggests that the development use of educational technology (videos, smart phones, learning management systems and social media sites) raises quality learning on e-learning as compared to F2F environment. Thus, e-learning advocates for student-centredness versus teacher-centeredness in teaching and learning of the content because "students learn together online, support mechanisms such as guiding questions generally influence the way students interact…" (Damşa et al., 2015, p. 56).

Review of the literature: technology in and of learning in a digital age. While there are various definitions of educational technology, a narrow definition refers to educational technology as "the effective use of technological tools in teaching and

learning" by bringing in students' experiences (Govender' and Khoza, 2017, p. 67). These studies (Amory, 2010; Khoza, 2019b) are pessimistic in tone, further pioneering the most narrow and concise definition of educational technology, that it is there because of technology in education (software and hardware resources in learning) and technology of education (pedagogical resources in learning). Thus, according to the context of this study, educational technology is all physical resources and online resources used in learning, and ideological resources behind the use of both physical resources and online resources.

Nocar et al. (2016) conducted a qualitative case study in China and the Czech Republic to outline the importance of physical resources. Findings outlined that the use of both traditional physical resources and modern physical resources for teaching display a fruitful result for students' knowledge acquisition. Moreover, some scholars believe that traditional physical resources (traditional education), like stationary desks, books, chalkboard and others, enhance students' task to memorise and recite content during learning, and its use still symbolises the principle of slavery (Cuban, 1986; Freire, 1972). However, the use of traditional physical resources promotes a teacher-centred method, which is the most direct and effective way for teaching students because it provides face-to-face interaction (Hoadley and Jansen, 2014). As such, Liu and Long (2014) further argue that traditional physical resources, sometimes referred to as 'old technology' (television, chats, radio, posters and others) is irreplaceable and the cornerstone of every learning institution, even if the current discourse demands the use of modern physical resources.

Furthermore, the importance and usage of modern physical resources (technological tools) is witnessed in every corner of each university. A study conducted by Keengwe, Onchwari, and Wachira (2008), to provide a literature review on the use of modern physical resources (computers, mobile phones and others) for teaching and learning university courses, affirmed this. The study outlined that modern physical resources provide opportunities to support students' learning and need good and strategic planning for maximum integration into the curriculum. Consequently, in the past two decades universities have begun to integrate modern physical resources into the curriculum for effective learning (Khoza, 2019a; Mpungose', 2019a). This suggests that students should be provided with relevant technological devices, which may include but are not limited to netbooks, iPads, webcams, laptops and desktop computers, mobile phones and others. These kinds of new technology have made life easier for students, because they would find notes and all course information stored electronically and easily accessible (Amory, 2010; Waghid, 2018). In other words, that the accessibility of modern physical resources give students options to use any available resources in order to access online resources.

van de Heyde and Siebrits (2019) revealed that online resources are software resources in education that help physical resources to communicate learning. This includes but is not limited to application software packages (Microsoft Office 365), Internet browsers (Firefox, Chrome), social media sites (Twitter, Facebook), and learning management systems (Moodle, Canvas) (Anderson, 2016; Bates, 2018). In the context of this study, the focus is more on learning management systems and social media sites to enhance e-learning. As such, the importance of e-learning is witnessed in study conducted Swinnerton et al. (2018) in unbundled University project exploring digitalisation and marketisation of higher education in both United Kingdom and South Africa. The study revealed that irrespective of existing inequalities, but the use of e-learning for teaching and learning university courses is significantly the effective way to ensure relationships between universities and private sector. In other words, if students does not have access to technological resources for e-learning they are less likely to be unemployed after receiving their qualification because of the lack of technological skills applicable in the workspace.

Cavus and Zabadi (2014) argue that in trying to move away from the traditional paper and pen environment (face-to-face), learning management systems (web-based learning environment to disseminate content) is one of the most highly adopted and used online environments in higher education institutions for e-learning. This includes open-source software learning management systems (free of charge, where the source code can be changed) such as Moodle, Open edX and Chamilo, and cloud-based learning management systems (with a start-up cost and source code that cannot be changed) such as Canvas, Sakai, dot Learn and others. Ajlan and Pontes (2012) outline that almost all learning management systems have common features, which include pedagogy, learner environment, instructor tools, course and curriculum design, administrator tools, and technical specifications. However, their efficiency can be different because of various factors such as being unclear to users, bandwidth requirements, take-up and maintenance cost, manuals, customisation and adaptation to the local environment (Anderson, 2016). However, this needs effective e-learning policies in place in order to address the needs of students and lecturers as according to the recent study conducted by Swartz et al. (2019) to explore the core business in contemporary South African universities.

In exploring first-year students' use of social media sites at one South African university of technology, Basitere and Mapatagane (2018) confirmed that students become more interactive when they use platforms that they are familiar with, such as social media sites, compared to learning management systems imposed by the university. Social media sites are referred to as Internet-influenced Web 2.0 technologies that allow users to create social networks to share content based on personal experiences, education and society. Hence, social media sites users can be referred to as 'prosumers' because they produce (create) and consume (share) information (Clement, 2020; Ritzer and Jurgenson, 2010). Moreover, a recent review conducted by Manca (2020) on the integration of social media sites into learning, revealed that both Twitter and Facebook are the most used social media sites in higher education, compared to Instagram, WhatsApp, Pinterest, Snapchat and others. In addition, social media sites content is easily accessible because it is compatible with both computers and mobile devices, and this makes life easier for students (Clement, 2020; Dlamini and Nkambule, 2019; Manca, 2020).

With all of the above being said about the use both physical resources (traditional and modern) and online resources (learning management system and social media sites) for learning, but digital divide remains the major issue. As such,Van Deursen and van Dijk (2019) assert that the digital divide is one of the big limitations on the use of educational technology globally. These authors' study further argues that the digital divide is a real phenomenon that is here to stay in developed countries, but is worse in developing ones—not only in terms of the first digital divide (access to Internet), but also in terms of the second digital divide (attitude, skills, type of use) and third digital divide (Internet outcomes/benefits). This suggests that even though universities can provide free access to Wi-Fi within their perimeters and students' residences, including free laptops, there will be some students (residing in rental rooms or at home) who might not have access to the Internet. Similarly, some students would prefer to use other resources, based on their strengths or limitations. Hence, this paper argues for alternatives to be made available by lecturers or university management, so that all students can have the same access to e-learning irrespective of

their geographical area, culture, race, socio-economic factors and others.

Selwyn (2004) further argue that the dichotomous aspect of digital divide clearly reveals the ones that either have access or do not have access to technological resources, and this influence the status of connectedness (either connected or not connected). The latter author assert that this situation is termed as 'haves' and 'have-nots'. Consequently, the latter author concludes that the digital divide is a critical issue in higher education landscape that is not just technological but it is also social, economic, cultural and political. This suggests that in mitigating digital divide, universities, communities, churches, political figures, businessman and others seek to collaborate and come up with both practical and theoretical solution in order to enhance effective e-learning in pre, during and post pandemic outbreak.

Research context and method

Study context. LMS have been adopted by most South African universities to cope with the demands for accessible and more flexible online content dissemination (Amory, 2010; Mpungose, 2019b). In transitioning from the paper (face-to-face) to the paperless (online) environment, the University of KwaZulu-Natal in South Africa adopted the Moodle LMS in 2010; it was made compulsory in 2016 for first-year students and fully implemented at the fourth-year level in 2019 (University Moodle Training Guide, 2017). Unavailability of a guiding online learning policy and lack of training for lecturers ignited challenges, which were evident in the use of learning management systems by students (Mpungose, 2019b).

To this end, from 2019 to 2020 I conducted a postdoctoral research project on students' experiences with the use of a learning management system in a School of Education. From the project, I extracted a case of 26 students' experiences of the use of the LMS. A South African University at School of Education offers a broad range of degree programme courses across various fields of study. It prepares mostly disadvantaged black students, followed by other minorities (Indian, coloured (mixed race) and white students) for professional teaching careers in Education Studies and other disciplines. The School of Education mainly offers all lectures in face-to-face form, while the learning management system is used as an online resources depository (holding lecturers' notes) for student access. The eruption of the COVID-19 pandemic forced the School of Education to move all lectures totally online. However, the majority of registered students in School of Education at South African universities are victims of the digital divide, and this hinders their access to e-learning (Bunting, 2006; Dlamini and Nkambule, 2019). Therefore, this study's main objective is to propose alternative pathways to overcome hindrances to students' access to effective e-learning.

Research methods and data collection. This is a qualitative interpretive case study of 26 students who were purposively and conveniently selected because they were accessible; they were attending face-to-face lectures and then transitioned to e-learning due to the COVID-19 pandemic. After recruiting students through an electronic flyer, they signed consent forms with details of ethical issues (confidentiality, anonymity, and beneficence). I used interpretivism not to predict what students experience, but to understand and describe how they make meaning of their actions during the transition period in their own context of the School of Education shutdown (Creswell, 2014). Through the use of a more explorative case study design, I generated a rich and deep description of students' experiences, which resulted in pioneering alternatives to overcome hindrances in realising e-learning (Yin, 2013).

Students were given an e-reflective activity to be completed in two weeks' time, two sessions of Zoom group meetings for a period of 40 min each, and a WhatsApp one-on-one semi-structured interview for 35 min (Creswell, 2014; Yin, 2013). iCloud was used to record meetings and interviews for direct transcription to ensure trustworthiness (transferability, dependability, confirmability and credibility).

Data were thematically analysed using inductive and deductive reasoning (Creswell and Poth, 2017). The data generated by the three instruments were recorded and not transcribed, but directly and openly coded from the recorded source in order to avoid loss of meaning during transcription. Open coding was used to connect codes to categories. I deductively mapped the codes onto the set categories (from the theoretical framework and the literature) to form themes. However, I sought to use an inductive process to recapture the remaining codes, which were not deductively analysed during the prior analysis, to form categories. After using these processes as a guide, categories were focused and sharpened to form three themes, as indicated in the findings section

Consequently, two research questions were unpacked, namely: what are students' experiences of the transition from face-to-face to e-learning and why their experiences are in particular ways when learning online. The first question gave answers to the first objective of the study, which is to understand students' experiences of the transition from face-to-face to e-learning, and the second question addresses the second study's objective, which is to find reasons that informs students' experiences. This is elaborated in findings and discussion section in order to propose alternatives that can assist or allow students, particularly disadvantaged students, to realise or enjoy benefits of e-learning.

Presentation of findings. In this section, I present the key findings on students' experiences of the transition from face-to-face to e-learning. I articulate the use of online resources and physical resources before crafting the alternative pathways through themes and its respective categories

Theme 1: Experiences of the use of online resources. Mpungose (2019b) Agrees with Selwyn and Stirling (2016) that accessibility to online resources enhances effective e-learning. This suggests that e-learning is only possible provided students have access to online resources ranging from emails, software applications, learning management systems, social media sites and others. As such, Student 1 articulated, "*I keep on receiving emails saying the assignment that is due needs to be submitted on Moodle … I was informed that lectures will be recorded and posted on Moodle* [learning management system]". However, digital divides limits most students for effective e-learning particularly those staying in remote areas. Moreover, Student 4 confirmed this "*…I only check my emails from the community library with internet access because I have no internet access and network service at home, but I can sometimes only receive voice calls and text messages from my phone…*".

Internet access seem to play a major role in order to observe effective e-learning, but this can never be achieved if students have limited or no access. For instance, Student 7 asserted, "*I do not have data bandwidth [Internet access] at home …submitting assignment is impossible …*". This assertion shows that online assessment is impossible if the students have no access to the internet. Student get frustrated if lecturers keeps on demanding students to meet due dates while students have no internet access. As shown by Student 24 who articulated, "*…having limited internet access but I am expected to submit an assignment next Friday, in a week's time …a lecturer is briefing us to download resources from Moodle*".

Furthermore, Selwyn (2016), as well as Khoza and Biyela (2019) share the same sentiment that social media sites plays a huge role in mitigating digital divide in order to realise e-learning in this digital age. As such, Student 5 indicated, "*since there is no Internet café by home, I use free Facebook or WhatsApp data bundles to communicate with other students …*" This suggests that most students have access to social media sites because of free data bundle access provided by network service providers (Vodacom, Telkom, Cell C and others in a South African context), and this helps student to communicate learning. Consequently, Khoza (2019b) further argue that having access to online resources without pedagogy behind the use can limit effective e-learning. This is witnessed by Student 12 who opined, "*I am so disappointed of this sudden shutdown without having proper ways or training in place to access lectures online …*" Similarly, Student 15 said, "W*e are still not told which online platform will be used for online lectures …*" In other words, students seek adequate training on the use of online resources so that they can be well informed to avoid confusion. Evidently, Student 9 showed confusion by outlining that "*…university informed us that lectures will be online, but they did not tell us the online platform is going to be used*".

Theme 2: Experiences on the use of physical resources. Makumane and Khoza (2020) argue that traditional physical resources is influenced by professional reasoning in order to attain specific discipline goals during curriculum implementation. This suggests that traditional physical resources are fundamentals in addressing the module needs in e-learning. For instance, most of the students agreed with Student 23 who posited, "*I am currently depending on the hard copy of module outline and recommended books for studying because even libraries with Internet at home are also closed*". In other words, traditional physical resources like textbooks, module/course packs, and other hardcopies can act as an alternative pathway in case students have no internet access. While it is valuable for students to have access to modern physical resources like laptops, smartphones, Wi-Fi routers and others in order to enhance e-learning, but affordability to possess such resources remains a question because of social divide (poor socio-economic background). Thus, this remains the burden of the university to provide modern physical resources to students for successful e-learning. As such, student 14 asserted, "*…We were promised to get laptops when the academic calendar commences but still there are no laptop, and I end up using my smart phones for correspondence*".

Similarly, Student 17 said, "*This shutdown will affect me because I am staying in remote areas away from campus and do not have funds to access Wi-Fi hotspot spaces like community libraries … and there are no funds provided for to support us…*" While the shutdown demands all lectures to be online and universities are also demanded to put measures in place for effective e-learning, but failure to provide all necessary resources to students can bring more frustration in the process. Evidently, Student 11 shared the same sentiment with other international students "*I will be suffering to find the transport to go and come back from home … Shutting down face-to-face lectures causes chaos since I do not have necessary equipment for learning*".

Discussion of findings. The adoption and use of online resources in a South African university shows the critical need to serve students for e-learning (van de Heyde and Siebrits, 2019). Van de Heyde and Siebrits (2019) further argue that online resources like learning management systems are highly used by universities for online lectures, but the form of customisation to adapt them to a local context may hinder learning. This is evident from students' accounts on the use of Moodle for e-learning, where they stated that only a few students had access to the Moodle learning management system to download readings, slides and others during the transition from face-to-face to e-learning (at home). This suggests that Moodle was customised as a depository, and not to provide asynchronous online lectures. In other words, there was poor customisation of the Moodle learning management system to link with other online resources for chatting (Pear Deck), video conferencing (Zoom), and recording (CamStudio) and others (Anderson, 2016). Consequently, the findings indicate the general consensus that the Moodle learning management system alone is not capable of offering online lectures, but needs to be supplemented by other online software and social media sites. This suggests that, universities should start to think out of the box to consider social media site as an official platform to supplement learning management system to offer lecturers online.

Consequently, students therefore preferred social media sites (Facebook and WhatsApp) for communication, which were not officially adopted by universities for e-learning. In support of this, 'prosumers'(students) as digital natives who are techno-savvy enjoy the use of Web 2.0 applications with good user-friendliness and swift communication (Clement, 2020; Ritzer and Jurgenson, 2010). Findings showed that even if students have limited access to internet but free data bundles form their social media sites account, they could access each other for content discussion and communication. As a result, Hamidi and Chavoshi (2018) further argue that if students can use social media sites successfully, universities should consider bringing social media sites (Snapchat, WhatsApp, Facebook, Instagram, twitter and others for e-learning.

Moreover, the findings show that the university did not have any policy in place guiding the use of e-learning and nor was training provided. This situation as according to Yu (2016) is termed to be influence that leads to students' technostress caused by the misfit between environmental demands (e-learning) and students abilities (access to online resources). In other words, the shutdown that occurred because of pandemic outbreak (COVID-19) demanded student to have access to online resources in order to take their lectures online while most of them are from remote areas having no internet access, and are still battling to use the newly introduced software for e-learning (video conference software like Zoom). As such, students were confused as to what resources were available for e-learning and how they will transition from face-to-face to e-learning. This was worsen by the unavailability of the guiding e-learning policy in place and no instructional designers employed by the university to provide relevant capacity building for students. As such, Mpungose (2019b) assert that the power lies with the university management to use e-learning policy that can address issues on content dissemination, execution of assessment, and online resources in order to equip students with necessary skills for effective e-learning. This suggesst that policy viability on the use of online resources also give direction to both students and lecturers so that they can know their roles.

Several students agreed that traditional physical resources is the core of learning at the university, even if there are challenges hindering e-learning, because they relied on recommended books, module outlines, written notes and others. This proves that the old technology is irreplaceable, and that it acts as a back-up to e-learning. Thus textbooks, posters, charts and others must be made available to support students' learning (Cuban, 1986; Freire, 1972). This suggests that traditional physical resources may be most useful to those students who have no or limited access to internet. As such, each module/course seek the need to have these resources in place even if the module/course is offered online. The use of traditional physical resources for learning displays a fruitful

result for students' knowledge acquisition (Simmonds and Le Grange, 2019). Moreover, traditional learning is vertical (formal) and driven by student knowledge for learning in a demarcated environment (Khoza and Biyela, 2019). This allows students have control over "selection of the content (selection), when and how they learn (pedagogy and sequence), as well as how quickly they learn (pace)" (Hoadley and Jansen, 2014, p. 102). As result, students preferred and opted to use the nearest local community libraries with access to Wi-Fi rather than staying at home (often with no Internet) in order to access online resources irrespective of difficulties faced at home.

Most students did not have laptops, even though these were provided free of charge by the university (many had been sold for personal benefit). They preferred to use mobile phones with free network data bandwidth for communicating amongst themselves. In other words, the use of modern physical resources provides an easy way to ensure e-learning, because it provides access to recorded lectures and electronic resources like videos, but it needs good planning (Keengwe et al., 2008; Mpungose', 2019a). The main concern that hindered students from realising the full potential of e-learning was the expensive cost of Internet infrastructure such as Wi-Fi routers, laptops, mobile phones and access to data bandwidth. Consequently, Van Deursen and van Dijk (2019) argue that Internet access and technological resources (the first digital divide) is the main limiting factor in universities from developing countries like South Africa, even though students do have skills (the second first digital divide) to benefit from e-learning (the third first digital divide). In other words, the use (ideological resources) of any available physical resources is not a problem to students (digital natives) in a digital age—the problem is the affordability and availability of those physical resources for e-learning.

Towards alternative pathways for e-learning. This study explored students' experiences during the transition from face-to-face to e-learning in a School of Education at a South African university. Based on the case study and the literature, including the guiding theoretical framework, the study identified benefits, challenges, and other related issues on the use of physical resources and online resources to realise e-learning. Most importantly, the interpretation of empirical data generated provides a summary of proposed alternative pathways and implications related to the use of physical resources and online resources to enhance effective e-learning. On the first hand, findings suggest that students are influenced by formal experiences (hardware), which seek students to use traditional physical resources to enhance e-learning. On the other hand, students are also influenced by informal experiences (software), seeking them to use online resources for effective e-learning. In complication this findings, students seem to miss non-formal experience (pedagogy), which seek them to use their own identities (love, passion, values, self-direction and others) to find thousand ways or theories to enhance a successful e-learning. Moreover, it is proven that e-learning resides in human and non-human appliances (Siemens and Downes (2009); thus students should be provided with relevant traditional resources (books, manuals, chats, posts and others) and modern resources (laptops, mobile phones/tablets, mobile Wi-Fi routers and others). In addition, free monthly Wi-Fi data bandwidth should be provided to students so that they may access e-learning, since this seems to be the main challenge to achieving e-learning in the South African context.

Downes (2010) argues that e-learning needs connectedness of specialised nodes or information sources, so that students can learn anyhow, anywhere and independently, at their own pace. To achieve this, this study therefore holds that the Moodle learning management system should not be used as a depository, but should be customised to be linked to social media sites (WhatsApp/Facebook), lecture-recording software (CamStudio), video and audio conferencing (Zoom, YouTube live, Skype, Microsoft Teams) and other learning resources in order to provide interactive lectures (both synchronous and asynchronous). This will serve to eliminate the dichotomy between face-to-face and e-learning, because the learning taking place when at the university should be the same as that which is available when students are at home.

The findings indicate that fully equipped university information centres should be identified and used to provide blended lectures, through the special arrangement of community libraries (since even these are not accessible now owing to COVID-19), in order to meet the needs of students coming from remote areas halfway. The findings also show that without proper planning, e-learning will never be achieved at a university. Hence, a university should have an e-learning policy, intense scheduled online learning capacity building, and allocated instructional designers (not technicians) to capacitate both lecturers and students.

All learning management system share the same features: pedagogy, learner environment, instructor tools, course and curriculum design, administrator tools, and technical specification features (Cavus and Zabadi (2014). However, the findings showed that the learning management system is missing the personal feature for students that will motivate them to love and have a passion for using online resources. This study posits that in order to leverage the potential of the Moodle learning management system, it should be linked with software that provides educational videos (NBC Learn), games for student-centred activities (game-based learning software), Edublogs (assessment for learning) and others. In other words, choosing what resources to use and learning to offer depends on rationale, time management and goals to be achieved during e-learning. This will assist students to incorporate both physical and online resources to achieve effective e-learning for these digital natives (Mpungose', 2019a; Prensky, 2001).

Conclusion

Despite challenges experienced by students in transitioning from face-to-face to e-learning—in particular, the prominence of the digital divide as the main hindrance to students realising effective e-learning—overall the customisation of the Moodle LMS to meet the local needs of disadvantaged students is beneficial to realise e-learning. Moreover, the findings indicate that while there may be many challenges that can hinder students from realising the full potential of e-learning, alternative pathways like the provision of free data bandwidth, free physical resources and online resources, and the use of an information centre for blended learning and others, seem to be the solution in the context of COVID-19.

However, it must be taken into consideration that while this can be the solution, students are unevenly challenged, and therefore still need capacity building on the use of learning management systems and other newly adopted online learning software. It is also imperative that university-wide teaching and learning pedagogy, instructional designers and e-learning policy consider the potential benefits and challenges when encouraging the use of e-learning.

Within the South African context, there is a critical need for increased investment in upgrading resources, both in universities and at community level, because of the digital divide. While there is still a need for further research, this article emphasises the both practical and theoretical alternative pathways that can be used to enable university students to realise the full potential of e-learning. Universities need to plan ahead of hindrances to learning such as a pandemic outbreak, student protests and others, and be abreast of the current literature on the rapidly evolving discipline of ET.

Data availability

The datasets used and/or analysed during this study are available from the authors on reasonable request.

Received: 5 April 2020; Accepted: 15 September 2020;
Published online: 02 October 2020

References

Ajlan A, Pontes E (2012) A comparative study between e learning features, methodologies, tools, and new developments for e learning Information system Management college of Business and Economics Qassim University Kingdom of Saudi Arabia 1(4):191–214
Amory A (2010) Education technology and hidden ideological contradictions. Educ Technol Soc 13(1):69–79
Anderson T (2016) Theories for learning with emerging technologies. Emerging technologies in distance education 7(1):7–23
Arkorful V, Abaidoo N (2015) The role of e-learning, advantages and disadvantages of its adoption in higher education. Int J Instruct Technol Distance Learn 12(1):29–42
Basitere, M, Mapatagane N (2018) *Effects of a Social Media Network Site on Student's Engagement and Collaboration: a case study of WhatsApp at a University of Technology*. Paper presented at the ECSM 2018 5th European Conference on Social Media
Bates A (2018) Teaching in a digital age: guidelines for designing teaching and learning for a digital age. Tony Bates Associates Ltd, London
Bell F (2011) Connectivism: Its place in theory-informed research and innovation in technology-enabled learning. Int Rev Res Open Distribut Learn 12 (3):98–118
Bennett S, Maton K, Kervin L (2008) The 'digital natives' debate: a critical review of the evidence. Br J Educ Technol 39(5):775–786
Black P, Wiliam D (2006) Inside the black box: raising standards through classroom assessment. Granada Learning, Northumberland
Black P, William D (2009) Developing the theory of formative assessment. Educational assessment evaluation and accountability. J Personnel Eval Educ 21 (1):5–31. https://doi.org/10.4135/9781446250808.n13
Bunting I (2006) The higher education landscape under apartheid. Transformation in Higher Education. Springer, pp. 35–52
Cavus N, Zabadi T (2014) A comparison of open source learning management systems. Proc-Soc Behav Sci 143(1):521–526. https://doi.org/10.1016/j.sbspro.2014.07.430
Choudhury S, Pattnaik S (2020) Emerging themes in e-learning: a review from the stakeholders' perspective. Comput Educ144(2020):1–20
Clement J (2020) Most popular social networks worldwide as of January 2020, ranked by number of active users. Retrieved from https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users
Creswell J (2014) Qualitative inquiry and research design: choosing among five approaches, 3rd edn. SAGE Publications, inc., California
Creswell J, Poth CN (2017) Qualitative inquiry and research design: choosing among five approaches. SAGE Publications, inc., California
Cuban L (1986) Teachers and machines: The classroom use of technology since 1920. Teachers College Press
Damşa C, de Lange T, Elken M, Esterhazy R, Fossland T, Frølich N, Hovdhaugen E, Maassen P, Nerland M, Nordkvelle YT, Stensaker B (2015) Quality in Norwegian higher education: a review of research on aspects affecting student learning. NIFU press, London
DHET (2020) Measures to deal with the Coronavirus COVID-19 in the post-school education and training sector. https://www.gov.za/speeches/minister-higher-education-science-and-innovation-statement-measures-deal-covid-19-threat (Accessed 20 March 2020)
Dlamini R, Nkambule F (2019) Information and communication technologies' pedagogical affordances in education. J Encyclopedia Educ Inform Technol 1(2019):1–14
Downes S (2010) New technology supporting informal learning. J Emer Technol Web Intellig 2(1):27–33. https://doi.org/10.4304/jetwi.2.1.27-33
Freire P (1972) Pedagogy of the oppressed. 1968. Myra Bergman Ramos, New York
Govender' N, Khoza S (2017) Technology in Education for Teachers. In: Ramrathan L, Le Grange L, Higgs P (eds) Education studies for initial teacher development. Juta & Company (PTY) Limited, Cape Town
Graham CR (2006) Blended learning systems. The handbook of blended learning: global perspectives, local designs. Wiley imprint, San Fransisco
Hamidi H, Chavoshi A (2018) Analysis of the essential factors for the adoption of mobile learning in higher education: a case study of students of the University of Technology. Telemat Informat 35(4):1053–1070. https://doi.org/10.1016/j.tele.2017.09.016
Hoadley U, Jansen J (2014) Curriculum: organizing knowledge for the classroom. Oxford University Press Southern Africa, Cape town
Jansen J (2004) Changes and continuities in South Africa's higher education system, 1994 to 2004. Changing class: education and social change in post-apartheid South Africa. Oxford University Press Southern Africa, Cape town
Keengwe J, Onchwari G, Wachira P (2008) The use of computer tools to support meaningful learning. AACE J 16(1):77–92
Khoza S (2019a) 2 Lecturers' reflections on curricular spider web concepts as transformation strategies. Transformation of higher education institutions in post-apartheid South Africa. Routledge, New York
Khoza S (2019b) Lecturers' reflections on curricular spider web concepts transformation strategies. Transformation of higher education institutions in post-apartheid South Africa. pp. 15–26
Khoza S, Biyela AT (2019) Decolonising technological pedagogical content knowledge of first year mathematics students. Educ Inform Technol 2020 (1):1–15. https://doi.org/10.1007/s10639-019-10084-4
Kop R, Hill A (2008) Connectivism: learning theory of the future or vestige of the past? Int Rev Res Open Distribut Learn 9(3):1–13. https://doi.org/10.19173/irrodl.v9i3.523
Liu C, Long F (2014) The discussion of traditional teaching and multimedia teaching approach in college English teaching. Paper presented at the 2014 International Conference on Management, Education and Social Science (ICMESS 2014)
Makumane M, Khoza S (2020) Educators' reasoning (s) and their effects on successful attainment of curriculum goals. South African J High Educ 34 (2):95–111. https://doi.org/10.20853/34-2-3428
Manca S (2020) Snapping, pinning, liking or texting: Investigating social media in higher education beyond Facebook. Internet High Educ 44:1–13. https://doi.org/10.1016/j.iheduc.2019.100707
Mgqwashu' E (2017) Universities can't decolonise the curriculum without defining it first. www.conversation.com/universities-cant-decolonise-the-curriculum-without-defining-it-first-63948
Ministry of Education (2001) National Plan for Higher Education. Pretoria Government printers
Mpungose' C (2019a) Is Moodle a Platform to Decolonise the University Curriculum? Lecturers' Reflections. Africa Educ Review 17:1, 100–115, https://doi.org/10.1080/18146627.2018.1479645
Mpungose' C (2019b) Is Moodle or WhatsApp the preferred e-learning platform at a South African university? First-year students' experiences. Educ Inform Technol 1–15
Mpungose C (2020) Beyond limits: lecturers' reflections on Moodle uptake in South African universities. Educ Inform Technol (1):1–20. https://doi.org/10.1007/s10639-020-10190-8
Mzangwa ST (2019) The effects of higher education policy on transformation in post-apartheid South Africa. Cogent Educ 6(1):1592737
Nikoubakht A, Kiamanesh A (2019) The comparison of the effectiveness of computer-based education and traditional education on the numerical memory in students with mathematics disorder. J Psychol Sci 18(73):55–65
Nocar D, Tang Q, Bártek K (2016) Educational hardware and software: digital technology and digital educational content. EDULEARN16 Proceedings. pp. 3475–3484
Prensky M (2001) Digital natives, digital immigrants part 1. On Horizon 9(5):1–6. https://doi.org/10.1108/10748120110424843
Ritzer G, Jurgenson N (2010) Production, consumption, prosumption: the nature of capitalism in the age of the digital 'prosumer'. Journal of consumer culture 10(1):13–36
Rodrigues H, Almeida F, Figueiredo V, Lopes SL (2019) Tracking e-learning through published papers: a systematic review. Comput Educ 136(2019):87–98
Schofield J (2007) The dangers of Wi-Fi radiation (updated). https://www.theguardian.com/technology/blog/2007/may/21/thedangersof
Selwyn N (2004) Reconsidering political and popular understandings of the digital divide. New Media Soc 6(3):341–362
Selwyn N (2016) Minding our language: why education and technology is full of bullshit… and what might be done about it. Taylor & Francis, London
Selwyn N, Stirling E (2016) Social media and education…now the dust has settled. Learn Media Technol 41(1):1–5. https://doi.org/10.4324/9781315121697
Siemens G (2005) Connectivism: A Learning Theory for the Digital Age http://www.elearnspace.org.Articles/connectivism.htm (Accessed 28 March 2020)
Siemens G, Downes S (2009) Connectivism and connective knowledge 2009. Int J Instruct Technol Distance Learn 2(1):3–10
Simmonds S, Le Grange L (2019) Research in curriculum studies: reflections on nomadic thought for advancing the field. Transform High Educ 4:9
Swartz R, Ivancheva M, Czerniewicz L, Morris NP (2019) Between a rock and a hard place: dilemmas regarding the purpose of public universities in South Africa. High Educ 77(4):567–583

Swinnerton, B, Ivancheva, M, Coop, T, Perrotta, C, Morris, NP, Swartz, R,…Walji, S (2018) The Unbundled University: researching emerging models in an unequal landscape. Preliminary findings from fieldwork in South Africa. Paper presented at the Proceedings of the 11th International Conference on Networked Learning 2018. Springer
University Moodle Training Guide (2017) Moodle. In: Univesity of Kwazulu-Natal (ed). University Pres, Durban
van de Heyde V, Siebrits A (2019) The ecosystem of e-learning model for higher education. South African J Sci 115(5-6):1–6
Van Deursen AJ, van Dijk JA (2019) The first-level digital divide shifts from inequalities in physical access to inequalities in material access. New Media Soc 21(2):354–375. https://doi.org/10.1177/1461444818797082
Waghid F (2018) Action research and educational technology: cultivating disruptive learning. South African J High Educ 32(4):1–11
Warschauer M (2002) Reconceptualizing the digital divide. First Monday 7(7):1–16
WHO (2020) WHO Director-General's opening remarks at the media briefing on COVID-19-11 March 2020. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020 (Accessed 30 March 2020)
Yin RK (2013) Case study research: design and methods. Sage publications, New York
Yu KYT (2016) Inter-relationships among different types of Person–Environment fit and job satisfaction. Appl Psychol 65(1):38–65

Acknowledgements

I want to thank Prof. Simon Bheki Khoza for his supervision in to construct this article from a PhD research and Post-doctoral project, as well as Leverne Gething language for editing. Furthermore, I want to acknowledge support and advancement from the National Research Foundation (NRF) and the Fulbright scholarship within the framework of the Research and innovation.

Author contributions

I was the main author of this article and was involved in conceptualising the article. I have read and approved the final manuscript.

Competing interests

The author declares no competing interests.

Additional information

Correspondence and requests for materials should be addressed to C.B.M.

Reprints and permission information is available at http://www.nature.com/reprints

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.