DIGITAL SKILLS: ACADEMICS AT A SOUTH AFRICAN UNIVERSITY IN THE POST-COVID-19 ERA

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ABSTRACT

Academics from South African Universities have recently been bound to possess digital skills for curriculum delivery due to the lessons learned from the COVID-19 era. Universities have implemented various interventions to enhance digital skills in academics, which include but are not limited to training workshops, organised webinars, and seminars. Irrespective of these interventions, some academics still lack the digital skills to deliver effective digital curricula. The primary aim of the research is to develop other methods to address the shortage of digital skills among scholars. This research is based on a three-year qualitative interpretive study carried out at a university in South Africa, exploring a scenario where academics share their experiences on utilising digital platforms for teaching and learning following the COVID-19 pandemic. Data was generated purposefully and conveniently by sampling thirty-two academics from the school of education. The methods used for data generation included e-reflective activities, Zoom group discussions, and semi-structured interviews conducted one-on-one via WhatsApp. After thematic analysis, findings show that academics' digital background becomes the barrier to having the necessary digital skills for digital curriculum delivery. Hence, most of them were driven by informal skills for social needs and personal digital skills for individual needs at the expense of formal digital skills for discipline needs. With universities in developing countries still becoming victims of student protests, natural disasters, and other challenges, alternatives are being sought to accommodate the transition from face-to-face to online or hybrid curriculum delivery modes.

Keywords: academics, digital skills, e-learning, face-to-face, post-COVID-19, university curriculum

INTRODUCTION

For several decades, digital skills have been crucial in enabling higher education institutions to digitalise their curricula. As such, according to Adeyeye et al. (2022), its fundamental importance has been witnessed during the post-COVID-19 era, where academics' possessing digital skills is seen as a great need. Digital skills are defined as the ability to use any educational technology (EdTech) resources such as hardware, software, and ideological ware to find, assess, create, and share subject content using various digital platforms (Andrade et al. 2022; Mpungose 2020). In other words, digital skills include academics using all EdTech resources

provided by institutions to search, use the content from the internet, and disseminate it to students for curriculum delivery using different learning platforms. Furthermore, Sokhulu (2021) shares the same sentiment as Khalil and Er (2023) that the digital divide is characterised by unequal access to educational technology resources, stems from the differences in obtaining the software and hardware resources necessary for internet connectivity, and this plays a significant role for academics to possess various digital skills (formal, informal and non-formal) in academia. On the first hand, recent research shows that institution of higher education (IHE) compels academics to possess formal digital skills that address the institution's needs (Liu and Rodriguez 2019; Prensky 2001; Daniyan et al. 2020). These studies further outline that formal digital skills seek academic and formal platforms for curriculum delivery. As such, These platforms encompass, among others, the utilisation of Learning Management Systems (LMS) and video conferencing tools for curriculum delivery. On the other hand, the societal need for IHE drives academics to effectively utilise informal learning platforms like social media sites (SMS) and open AIs for communication to achieve educational goals, and this seeks academics to possess informal digital skills. (Anders 2023; Van der Bijl 2021; Zheng et al. 2023). Moreover, studies (Basilotta-Gómez-Pablos et al. 2022; Van der Bijl 2021) show that the majority of academics are good at informal digital skills as compared to formal digital skills, and this results from the daily use of SMS from their mobile devices. This is evident in Khoza's 2021 study, which examined how lecturers perceive the dissemination of curriculum through digital images. The study concluded that academics are better at using social images (from social media) than professional images (from books and other academic sources) for teaching and learning. In complicating this dialogue on digital skills, Khoza and Biyela (2020) further argue that possessing both informal and formal digital skills without non-formal digital skills does not bring justice to the digitalization of the curriculum. As a result, Govender and Khoza (2022) promote the integration of informal digital skills in academic settings, encouraging educators to leverage educational technology resources based on their unique identities to meet their individual needs. In other words, non-formal digital skills become the background skill for using personal platforms, including subscriptions to different Edtech resources such as YouTube, ORCID, etc. However, minimal research has been conducted on harmonising and establishing links among formal, informal, and non-formal digital competencies, especially within South African IHEs. Consequently, this article argues for the connectedness of the use of skills (formal, informal, and non-formal digital skills) to materialize alternative pathways to overcome this lack of digital skills in academics. Thus, the section that follows theorises digital skills.

THEORISING CONNECTED USE OF DIGITAL SKILLS

Siemens (2014) agrees with Downes (2010) that Connectivism consists of eight principles, as depicted in Table 1 below, and this is a recent theory that seeks the connected use of non-formal digital skills (personal need), formal digital skill (module/subject need) and informal digital skill (general/societal need) for effective digital curriculum delivery. Similarly, this theory is believed to be the 21st-century solution to the perceived gaps in traditional learning processes, particularly those related to the use of technological resources (Clement 2020). In other words, the possession of digital skills in IHE enhances the use of EdTech resources Platforms like SMS (including YouTube, WhatsApp, etc.), learning management systems (such as Moodle, Canvas, etc.), video communication technology (Zoom, MS Teams, etc.), and similar tools are essential in maintaining connection during the learning process. They facilitate online group discussions, problem-solving activities, simulations, and more.

Table 1: Connectivism learning framework (Siemens and Downes 2009)

Learning and knowledge rest in the diversity of opinions
Learning is a process of connecting specialised nodes or information sources
Learning may reside in non-human applicances
The capacity to know more is more critical than what is currently known
Nurturing and maintaining connections is needed to facilitate continual learning
The ability to see connections between fields, ideas, and concepts is a core skill
Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities
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.

Principle #1: Learning and knowledge rest in the diversity of opinions

This principle advocates for structures to be put in place that enable academics to have dialogue or debates to build their unique interpretations of the taught module content. As such, internet access and online platforms (Wikipedia, LMS, SMS, and others) need to be put in place for academics to use digital skills to share their own diverse opinions about the module taught (Makumane and Khoza 2020). This suggests that teaching and learning are not recently all about listening to the teacher (teacher-centredness) but are also about students being actively involved (student-centredness) and being exposed to different educational technologies, which allows both parties (academics and students) to be connected and exchange diverse viewpoints and experiences during the educational process. This is seen in the recent empirical research study done by Selwyn and Gallo Cordoba (2021) in Australia, intending to explore the basic public understanding of the digital skills required to use open AI (artificial intelligence). The findings portrayed that even though the public has access to the internet, they only have little

digital skill in using Open AI, while most do not have hands-on knowledge of open AI. This suggests that a lack of digital skills (formal, informal, and non-formal digital skills), which can enhance the diversity of opinions, may affect the curriculum delivery process. As such, if IHE colleges do not support and develop the required digital skills for teaching and learning, there might be no connectedness between a lecturer and student in order to achieve module goals (objectives and learning outcomes) (Goodyear, Carvalho, and Dohn 2014; Makumane and Mpungose 2022). As such, academics need to possess different digital skills in order to use different EdTech resources as sources of knowledge, which allows them to draw knowledge from diverse sources instead of one source (Bates 2018; Baidoo-Anu and Ansah 2023). However, they need to leverage their informal digital skills significantly in order to meet the social requirement by being exposed by the institution to social platforms that can facilitate easy communication among students and academics. These social media platforms may include but are not limited to WhatsApp, Facebook, YouTube, and Blogs in order to give space for social debates about the content/assessment of the module and also share their experiences (Sephokgole and Makgato 2019; Cullen 2001).

Principle #2: Learning is a process of connecting specialized nodes or information sources

For Siemens (2005), this principle is about finding relevant connections or good information sources that result in effective teaching and learning, which requires a particular digital skill. As such, this requires academic formal digital skills to enable students to tap into significant and different information sources and make connections with those sources (Amory 2018; Downes 2022). This suggests that academics should be underpinned by formal digital skills to be able to use available resources to search for information that can provide details of the module taught. In other words, drawing from such skills helps academics connect to relevant sources of information to address the module need. Consequently, Siemens and Downes (2009) further allude that in this digital age, the connections and connectedness within networks (specialised notes) lead to effective learning. As such, in this world of the digital age, academics seek to enhance the connections and connectedness within networks, which leads to the smooth process of teaching and learning. As such, Downes (2022) further alludes that modern-day teaching and learning occur by connecting specialized nodes to form network connections that allow academics to share their experiences (interests, knowledge, perspectives, expertise, and opinions) in an online platform. In other words, this allows learning to be executed anytime, anywhere, synchronous and asynchronous, and this gives academics freedom to make connections and have direct access to reliable and relevant information irrespective of time and

venue. For instance, accessing Edtech resources like search engines, journal articles and others can easily facilitate teaching and learning. In as much as studies are showing that there are lecturers who give up the use of emerging technologies either because of a lack of digital skills or reluctance to use them (Shelton and Archambault 2022). Moreover, they are sometimes called digital immigrants because they require training before utilising any available technology. (Prensky 2001). However, in a world with emerging technologies, the use of recently developed educational technologies like Open AI (ChatGPT, MS Copilot, and others) become one of the major approaches.

Principle #3: Learning may reside in non-human appliances.

This principle emphasise that teaching and learning does not only reside with only the presence of an academic but it also occurs through the use of other available resources (any tools used for teaching and learning) ranging from hardware to software (Downes 2022; Aina and Ogegbo 2022). This is shown in the secondary study by Utecht and Keller (2019), which explores how institutions of learning can use connectivism theory to enhance effective online learning. The study found that having a digital skill to use artificial intelligence (OpenAIs -Chat GPT), social media sites (WhatsApp, LinkedIn, and others), search engines (Google Scholar, Web of Science, and others), learning management systems (Moodle, Canvas, and others) and others, gives powers to academics to teach effectively and be able to address their needs. This suggests that teaching may occur provided academics have access to other non-human resources such as laptops, smartphones, the internet, and others so that they can search, produce, and share information about the module taught.

Kotzee and Palermos (2021) concur with Downes (2022). This principle advocates that curriculum delivery should occur in and out of the lecture venue, and information about a module/lesson might be contained within a collection of items, not just a single person. This suggests having a specific digital skill so that students can easily understand the content studied if it is discussed in groups (learners). This allows students to learn from each other in a connected/networked environment. Furthermore, this also gives freedom even to students with disabilities to ensure inclusive education effectively by using different helpful technological resources (Adigun 2021). Nowadays, devices such as smartphones, laptops, tablets, and desktop computers come equipped with text-to-speech software that can vocalize any text displayed on the screen. Additionally, many e-books are accompanied by audio files to support students with physical impairments. Moreover, If a student finds writing or note-taking challenging, using an audio recorder to record the teacher’s lectures in class can be a helpful strategy. This allows the student to replay the recordings at their leisure for review.

Principle #4: Capacity to know more is more critical than what is currently known

The creation of new EdTech tools is a crucial element within the higher education sector, significantly influencing the delivery of curriculum across online, face-to-face, or hybrid/HyFlex formats. As such, Ndzinisa and Dlamini (2022) allude that these developments come with various digital skills, and the accuracy and validity of this information may evolve over time as discoveries are made in the field. Consequently, Downes (2010) concurs with Siemens (2008) that in a connected/networked teaching and learning environment, the capacity to know is more critical than what is actually known. In other words, academics' digital skills enhance understanding of the module content, and the ability to search and learn may keep changing depending on the new developments in the field. For instance, previous teaching and learning was mainly based on the use of paper and pen environment (traditional resources). However, currently, it is mainly based on web-based resources like search engines, OpenAIs, SMS (Morden resources), and others. Thus, this requires scholars to possess the ability to judge the pertinence of the information or knowledge they find, enabling the learning process to occur. Consequently, it is important for students to develop the skill to search for up-to-date information and the capability to sift through secondary and unnecessary details pertinent to their field of study (Boyraz and Ocak 2021b; Downes 2019).

Principle #5: Nurturing and maintaining connections is needed to facilitate continual learning

According to Siemens, Rudolph, and Tan (2020), concurred with Zhang and Dang (2020), learning is currently not only about internal or personal activity but also an external/social activity that seeks external connection to sources of information. Thus, central to the entire discipline of teaching and learning, maintaining connections to digital skills is the key aspect of continual teaching and learning (Boyraz and Ocak 2021b; Downes 2019). In other words, academics should focus on building networks with their peers and others involved in the educational sphere, whether in the same field or a different discipline. This, according to Glassner and Back (2020), consequently creates collaborative learning, not just in-person cooperation, but also virtual collaboration through the cooperative aspect of technological tools linked by internet connectivity is essential. This suggests that lecturers must support academics in creating connections to communicate with sources/people outside the school environment for further learning. For instance, students can create internal WhatsApp groups linked with internal experts as well as external experts in the field for further engagement on the content taught. Moreover, more social network sites can be used to create and maintain connections,

including but not limited to Instagram, Twitter, and LinkedIn.

Principle #6: Ability to see connections between fields, ideas, and concepts is a core skill

This principle encourages scholars to be both producers and consumers of module content, transforming them into prosumers. Thus, it is imperative for lecturers to possess digital skills to foster the delivery of a curriculum that enables students to draw links among the ideas and concepts of the module, thereby generating new insights from these established connections. This is evident in a study by Navio-Marco et al. (2022) at one of Europe's most prominent blended-learning universities, which showed that the number of students creating content surpasses those merely consuming it. This trend is shaped by the educational environment. This indicates that as digital natives adapt to utilising technological resources, students desire a supportive, technology-driven teaching and learning environment to effectively create and consume module content.

In other words, this principle seeks academics to have digital skills to enhance students to learn for themselves by producing module content while consuming it for understanding. This encourages individuals to engage with an open and unrestricted information environment, like utilising open-source software, including platforms such as encyclopedias, YouTube, Snapchat, and more. As such, academics should have the skills to select the suitable resources for a particular content to be unpacked and the skill to organize the consumed content according to the manner in which it will make meaning. Furthermore, learning in these principles seems to be driven by personal experience, where academics should use their cognitive level of learning in order to understand and make meaning of the world around them (Gould 2008; Zulfikar and Mujiburrahman 2018). In other words, learning in a connected environment gives the student the freedom to draw from their identities (love, respect, and passion) to learn from within without being followed or forced to do their learning and assessment activities.

Principle #7: Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities

In the realm of higher education, staying current and possessing accurate, up-to-date knowledge constitutes a significant focus. This necessitates that academics enhance their capabilities with the necessary digital skills relevant to their context. This is why "the ability to access up-to-date information has never been easier, and the need for users to critically analyse that information for accuracy has never been more important" (Utecht and Keller 2019, 116). In other words, as much as students can be good at creating networks to find information from

different sources, the question of whether the searched and found information is accurate, recent, and relevant to the module context becomes a learning activity on its own. This suggests that academics must draw much from formal experiences to address the module need by evaluating if the information at their disposal is Up-to-date and relevant to the module content. As such, academics need to rely more on scientific sources of knowledge during curriculum so that they can quickly address questions asked on assessment tasks (quizzes, assignments, and exams). In support of this, academics need to rely more on formal learning platforms (scientific search engines, LMS, and others) as compared to informal learning platforms (Wikipedia, social media sites, and others) in order to ensure currency.

Principle #8: Decision-making is itself a learning process

To date, there has been little agreement on what content (decolonising curriculum) should taught/learnt, but the outbreak of natural disasters (COVID-19 disease, floods, and others) brought in the question of having digital skills on the use of learning environment (face-to-face, online, and Hyflex) (Khoza and Biyela 2020; Liu and Rodriguez 2019; Selwyn et al. 2021). In other words, it involves making decisions about what to study, identifying the best sources for studying, determining the most appropriate time for learning, and choosing the locations for acquiring this knowledge, and this is also a duty of academics that needs to be honored depending on their digital skill. As such, academics are to draw from formal digital skills so that they can decide what technology resources are fundamentally used in their discipline in order to tackle the needs of the module. Sokhulu (2021), as well as St Clair et al. (2022), argue that this includes being cognisant of Necessary hardware resources, including both conventional and contemporary physical tools, alongside software resources such as learning management platforms, social networking sites, and video communication technologies. Additionally, ideological resources are grounded in the perspectives of leading theorists in the field. Building on this, Aina and Ogegbo (2022) carried out a qualitative case study to investigate teachers' experiences as they moved from in-person to remote online teaching during and following the COVID-19 pandemic. It was found that teaching students online was a challenge resulting from the lack of digital skills and inadequate infrastructure by both students and academics. This suggests that the decision whether the lecture should be online, face-to-face, or hybrid is influenced by the kind of digital skill an academic possesses and the availability of necessary resources ranging from internet access, network connectivity, lecture halls, and work/home infrastructure. Moreover, this principle seeks students to be critical information consumers in a networked environment with new technological developments such as OpenAIs and numerous search engines, including Google Scholar and Web of Science,

among others (Downes 2019; Siemens 2014). In other words, if students are driven by formal experiences to address the module need, they should use scientific sources in a particular discipline. However, if driven by informal experience to address the societal need (peers), they should use any available social media sites.

THE CONTEXT AND METHOD OF THE STUDY

Context of the study

The majority of universities in South Africa have implemented Learning Management Systems (LMS) to meet the need for more accessible and flexible distribution of online content, as noted by Amory (2010) and Mpungose (2020). In shifting from traditional in-person classes to a digital format, the University of KwaZulu-Natal in South Africa embraced the Moodle LMS in 2010. This system became mandatory for all first-year students by 2016 and was fully integrated into fourth-year courses by 2019. The absence of a clear policy guiding online learning and insufficient instructor training led to difficulties, as seen in how students interacted with LMS (Mpungose and Khoza 2022). In pursuit of this objective, between 2019 and 2020, I carried out a postdoctoral research endeavor focused on exploring students' experiences with LMS within a School of Education. I extracted a case of 26 students' experiences using the LMS from the project. A South African University at the School of Education offers various degree program courses across various fields of study. It focuses on equipping disadvantaged students, primarily Black, followed by other minorities, including Indian, mixed race (colored), and White individuals, with the necessary skills for professional teaching careers in Education Studies and various other fields. The School of Education primarily provides lectures in person with the presence of academics. Concurrently, academics utilise the LMS as a repository for online resources, including lecture notes, which students can access. The COVID-19 pandemic outbreak necessitated the transition of all School of Education lectures to an online format. However, academics are servicing the majority of students registered in the School of Education at universities in South Africa who are impacted by the digital divide. This divide poses a challenge to their ability to teach them effectively online access as according to a study by Ngubane-Mokiwa and Khoza (2016). Hence, this research aims to suggest different strategies for eliminating obstacles that prevent academics from efficient e-learning.

Research methods and data generation

This research provides a qualitative analysis based on 32 purposely chosen academics selected for their convenience and accessibility due to their utilization of different Edtech tools for online

teaching. The academics were invited via an electronic flyer and submitted consent forms that detailed ethical aspects, including confidentiality, anonymity, and doing good. In this study, I employed the interpretive paradigm not to predict the digital skills of academics but rather to explore and articulate how they interpret and give meaning to their use of educational technology resources within the teaching and learning environments at a School of Education located in a South African university, as noted by Creswell (2014). Adopting a more explorative case study approach, I developed an in-depth and insightful portrayal of academics' digital competencies, leading to the creation of innovative solutions for addressing obstacles in the digitalization of curriculum (Yin 2013).

Scholars were assigned an electronic reflective task that needed to be finished within a fortnight, along with participating in two MS Teams group discussions lasting 45 minutes each and a semi-structured interview over WhatsApp for 40 minutes, as outlined by Creswell (2014) and Yin (2013). The interviews were recorded and stored on University One's drive for the purpose of direct transcription, aiming to uphold trustworthiness through transferability, dependability, confirmability, and credibility. The data were analyzed thematically through both inductive and deductive reasoning approaches, as outlined by Creswell and Poth (2017). The information collected from the two devices was documented and not converted into text. Instead, it was openly and directly coded from the recordings to prevent any loss of meaning that might occur during transcription. Open coding was used to connect codes to categories to form themes; I systematically aligned the codes with the predefined categories based on the theoretical framework and the literature.

However, my approach was to utilise an inductive method to identify and categorise the remaining codes that had not been analysed deductively in the previous analysis. Following the guidance of these methods, we refined and honed our categories, ultimately forming three distinct themes, as detailed in the findings section. As a result, two research inquiries were formulated: What digital skills do academics possess, and what explains the specific rationale behind their digital skills in the context of teaching and learning? The initial question provided insights into the first goal of the research, which aimed at comprehending the digital skills of academics. In contrast, the second question tackled the research's second objective, focusing on identifying the factors that influence the digital competencies of academics. In the findings and discussion section, suggestions are presented as alternatives to help academics, including those lacking digital skills, to experience the advantages of using connected digital skills.

FINDINGS AND DISCUSSION

This section presents the key findings on academics' digital skills. As such, it articulates the

influence of formal, informal, and non-formal spheres of digital skill before crafting the alternative pathway of connected digital skills.

Reflecting on the use of formal digital skill

Regarding the impact of possession of a formal digital skill, the experiences of various academics are outlined below.

> Academic 3: "I post various video clips, which are only 6 minutes, on Moodle [learning management system] ... I daily use broadcast emails using MS Outlook to all students in my modules for communication purposes ...."
>
> Academic 7: "Universities have a lot of software such as Moodle LMS, MS Teams, endnote software, and others used for curriculum delivery, including research, but there are few capacity-building workshops provided."
>
> Academic 15: "I am not confident about the use of Zoom for teaching and learning because students can disrupt the class while in progress, and I lack the digital skills to stop such kinds of disruption."
>
> Academic 02: "I can set an assignment on Moodle LMS, but I am not well-versed in marking online unless I download all assignments ...."
>
> Academic 09: "I refer my students to various search engines available, including Google Scholar and others, to read articles and reference them for assignments and other assessment tasks ...."

Reflecting on the use of informal digital skill

Most of the academics agreed with Academic 27, who stated the following:

> "Students only go to Moodle to download a video recording. Even if I can set up a discussion forum on Moodle LMS, only a few can participate ... there is where I get many responses when we use WhatsApp group discussions and other social media sites."

Academic 28 shared the following sentiment:

> "... students can hardly read and respond to emails, and I ended up using WhatsApp [social media sites] groups for communication purposes."

Academic 17 said:

> "I have taught at a high school level before becoming a lecturer .... I am still trying to adapt to the use of university formal software ... yes, I am good at the use of WhatsApp."

Reflecting on the use of non-formal digital skill

Academics 19 and 29 agreed with academics 12 and 21, who stated the following to reflect on the application of non-formal digital skills.

> "... I have a various subscription, such as YouTube, to download videos and share the links with students. I have various subscriptions to receive monthly newsletters from search engines based on my research niche."

DISCUSSION OF FINDINGS

Using EdTech resources requires academics to possess a particular digital skill ranging from non-formal, formal, and informal digital skills. Thus, the new development in digital technology in academia suggests the need for the possession of digital skills for effective teaching and learning. However, not having enough digital skills brings frustration to academics. This is evident from the presentation in which one academic (15) reflected on being frustrated while teaching a class online via Zoom and unable to stop students who disrupt the class. Studies (Anderson 2016; Daniyan et al. 2020) further argue that not having digital skills for teaching and learning gives academics hardship and technostress, which can yield disconnectedness between students, module content, and lecturers. Furthermore, formal digital skills seem to drive teaching and learning because most institutions provide formal EdTech resources that can be used for curriculum delivery. As such, even the majority of academics reflected on having more digital skills on the formal learning platforms, which include but are not limited to Moodle LMS, Zoom, MS Teams, google search engines, and others. In support of this, studies (Aspin and Chapman 2000; Laal 2011; Zenda and Dlamini 2022) further assert that these platforms in universities are used for the formal dissemination of curriculum and, therefore, they are bound to provide formal learning platforms that require formal digital skills in order to guarantee effective curriculum delivery. According to Ngubane-Mokiwa and Khoza (2021) as well as Gamede and Uleanya (2019), a particular digital skill is influenced by the background from which an academic is coming and shaped by having an interest in learning how to use the EdTech resource provided. This becomes clear from Academic 17's statement, which highlighted that a background in education hinders the speed of acquiring formal digital skills for teaching and learning. However, this academic excelled in utilizing social media platforms (informal digital skills).

Findings further suggest that even though the IHE advocates for formal digital skills, most academics ended up opting for informal digital skills. This is evident when academics (27, 28, and 17) opted to use social media sites such as WhatsApp to communicate teaching and learning because most students are more active on various informal learning platforms as compared to formal platforms. Research (Khoza and Biyela 2020; Mpungose 2020) shows that very few institutions have adopted social media platforms for curriculum delivery and policies in place to regulate their use. Consequently, universities must focus on exploring means of digitizing

curriculum and promoting new forms of dissemination to students (Dewa and Ndlovu 2022; Mhlongo et al. 2023; Bell 2011). This suggests that IHE may also recognise the use of social media sites for curriculum delivery by implementing policies.

Non-formal digital skill enhances curriculum delivery to take place outside formal and informal learning platforms but within some kind of personal framework to address individual academic needs in order to address digital skill divide (Prensky 2001; Selwyn et al. 2021; Boyraz and Ocak 2021a; Van Dijk 2006). This suggests that this kind of skill arises from academic, personal identities (love, possession, responsibility, self-esteem) to master a particular learning platform, and this is mainly done through personal subscriptions of different non-formal platforms, which include but are not limited to YouTube, creating profiles on different search engines (Google, research gate, and others). As such, very few academics have indicated this kind of skill, but Academic 21 outlined the importance of having a non-formal skill to subscribe to non-formal platforms (YouTube, search engines, and others). This suggests that non-digital skills address academics' personal needs because they can choose to subscribe to any learning platform to address their personal needs.

Additionally, the results appear to indicate that the absence of diverse digital skills (formal, informal, and non-formal) can yield to the disconnected teaching and learning processes and hinder university curriculum dissemination. As such, IHEs seek lecturers to be driven by formal digital skills to use formal learning platforms to address the module/content need at the expense of informal digital skills to use informal learning platforms that address the societal need (students and others) (Calvani et al. 2012; Du Preez and Le Grange 2020). Unfortunately, findings show that very few IHEs are advocating for non-formal digital skills to use non-formal platforms that are personal, where academics subscribe in order to address their personal needs. Overall findings indicate that if there is a disconnectedness in these digital skills (formal. formal, and non-formal) in the use of various teaching and learning platforms, it leads to the digital skills gap and ineffective curriculum delivery. Consequently, connected digital skills advocate the balanced use of formal. Formal and non-formal digital skills driven by principles of connectivism are the suitable model to overcome the digital skills gap in IHE (Siemens and Downes 2009; Corbett and Spinello 2020).

CONCLUSION AND IMPLICATIONS FOR EDUCATION

This study draws from the connectivism theoretical framework and scholarship in education to explore academics' digital skills on the use of learning environment to attain the following research objectives: to understand academics' digital skills and to find reasons that inform academics' digital skills. As such, this study outlined the three most essential and driving digital

skills (formal, informal, and nonformal) influencing the use of learning platforms in IHE. Moreover, the stated rationale behind the disconnected use of digital skills is influenced by the background of each academic. This suggests that maintaining efficiency and maximum potential use of different learning environments for effective teaching and learning is always challenging because of varying disconnected digital skills, forcing universities to lose some academics (Bates 2018). Therefore, this study concludes that academics' digital background becomes the barrier to having the necessary digital skills for digital curriculum delivery. Hence, most of them are driven by social skills for social needs and personal digital skills for individual needs at the expense of formal digital skills for discipline needs. This imbalance presents a global issue requiring future research across various disciplines. However, this study, therefore, proposes adopting and using a connected digital skill framework that seeks to balance the use of formal, informal, and non-formal digital skills to ensure connectedness among human and non-human nodes in the use of learning platforms via ensuring principles of connectivism. This model seeks academics to be fundamentally driven by non-formal digital skills for personal needs rather than formal digital skills for a module need or informal digital skills for a societal need in the use of learning platforms.

REFERENCES

Adeyeye, B., S. E. Ojih, D. Bello, E. Adesina, D. Yartey, C. Ben-Enukora, and Q. Adeyeye. 2022. "Online learning platforms and Covenant University students' academic performance in practical related courses during the COVID-19 pandemic." *Sustainability* 14(2): 878.

Adigun, O. T. 2021. "Inclusive education among pre-service teachers from Nigeria and South Africa: A comparative cross-sectional study." *Cogent Education* 8(1): 1930491.

Aina, A. Y. and A. A. Ogegbo. 2022. "Investigating TVET college educators' experiences transitioning from the traditional classroom to the virtual classroom during the COVID-19 pandemic." *Perspectives in Education* 40(1): 129–142.

Amory, A. 2010. "Use of Information and Communication Technology in teaching, learning and administration in the Gauteng Department of Education, South Africa." *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications* 29 June.

Amory, A. 2018. "Use of the collaboration-authentic learning-technology/tool mediation framework to address the theory–praxis gap." In *Authentic Learning Through Advances in Technologies*, 61–73. Springer.

Anders, B. A. 2023. "Is using ChatGPT cheating, plagiarism, both, neither, or forward thinking?" *Patterns* 4(3).

Anderson, T. 2016. "Theories for learning with emerging technologies." *Emerging Technologies in Distance Education* 7(1): 7–23.

Andrade, M. S., R. M. Miller, D. McArthur, and M. Ogden. 2022. "The impact of learning on student persistence in higher education." *Journal of College Student Retention: Research, Theory & Practice* 24(2): 316–336.

Aspin, D. N. and J. D. Chapman. 2000. "Lifelong learning: Concepts and conceptions." *International Journal of Lifelong Education* 19(1): 2–19. https://doi.org/10.1080/026013700293421.

Baidoo-Anu, D. and L. O. Ansah. 2023. "Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning." *Journal of AI* 7(1): 52–62.

Basilotta-Gómez-Pablos, V., M. Matarranz, L. A. Casado-Aranda, and A. Otto. 2022. "Teachers' digital competencies in higher education: A systematic literature review." *International Journal of Educational Technology in Higher Education* 19(1): 1–16.

Bates, A. 2018. *Teaching in a digital age: Guidelines for designing teaching and learning for a digital age.* London: Tony Bates Associates Ltd.

Bell, F. 2011. "Connectivism: Its place in theory-informed research and innovation in technology-enabled learning." *The International Review of Research in Open and Distributed Learning* 12(3): 98–118.

Boyraz, S. and G. Ocak. 2021a. "Connectivism: A literature review for the new pathway of pandemic driven education." *International Journal of Innovative Science and Research Technology* 6(3): 1122–1129.

Boyraz, S. and G. Ocak. 2021b. "Connectivism: A Literature Review for the New Pathway of Pandemic Driven Education." *Online Submission* 6(3): 1122–1129.

Calvani, A., A. Fini, M. Ranieri, and P. Picci. 2012. "Are young generations in secondary school digitally competent? A study on Italian teenagers." *Computers & Education* 58(2): 797–807.

Clement, J. 2020. "Most popular social networks worldwide as of January 2020, ranked by number of active users." https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users. (Accessed 23 March 2020).

Corbett, F. and E. Spinello. 2020. "Connectivism and leadership: Harnessing a learning theory for the digital age to redefine leadership in the twenty-first century." *Heliyon* 6(1).

Creswell, J. 2014. *Qualitative inquiry and Research Design: Choosing among five approaches.* 3rd Edition. California: SAGE Publications, Inc.

Creswell, J. and C. N. Poth. 2017. *Qualitative inquiry and research design: Choosing among five approaches*. Sage.

Cullen, R. 2001. "Addressing the digital divide." *Online Information Review* 25(5): 311–320.

Daniyan, I., K. Mpofu, M. Oyesola, B. Ramatsetse, and A. Adeodu. 2020. "Artificial intelligence for predictive maintenance in the railcar learning factories." *Procedia Manufacturing* 45: 13–18.

Dewa, A. and N. S. Ndlovu. 2022. "Use of information and communication technologies in mathematics education lecturers: Implications for preservice teachers." *Journal for Transdisciplinary Research in Southern Africa* 18(1): 1–8.

Downes, S. 2010. "New technology supporting informal learning." *Journal of Emerging Technologies in Web Intelligence* 2(1): 27–33. https://doi.org/https://doi.org/10.4304/jetwi.2.1.27-33.

Downes, S. 2019. "Recent work in connectivism." *European Journal of Open, Distance and E-Learning (EURODL)* 22(2): 113–132.

Downes, S. 2022. "Connectivism." *Asian Journal of Distance Education* 17(1): 58–87.

Du Preez, P. and L. Le Grange. 2020. "The COVID-19 pandemic, online teaching/learning, the digital divide and epistemological access." Unpublished paper.

Gamede, B. and C. Uleanya. 2019. "Factors impacting entrepreneurship education in TVET colleges: A case of South Africa." *Journal of Entrepreneurship Education* 22(3): 1–12.

Glassner, A. and S. Back. 2020. "Connectivism: Networks, Knowledge, and Learning." In *Exploring Heutagogy in Higher Education: Academia Meets the Zeitgeist*, 39–47.

Goodyear, P., L. Carvalho, and N. B. Dohn. 2014. "Design for networked learning: Framing relations between participants' activities and the physical setting." In *Proceedings of the 9th international conference on networked learning*, 137–144. Edinburgh: Network Learning Conference Organiser.

Gould, M. A. 2008. "Teacher as researcher: A paradigm for professional development." *Kappa Delta Pi Record* 45(1): 5–7.

Govender, R. G. and S. B. Khoza. 2022. "First-hand user experience: Can Kaltura video come to the rescue of Moodle during/post COVID-19?" In *African Identities*, 1–18. DOI: 10.1080/14725843.2022.2082376.

Khalil, M. and E. Er. 2023. "Will ChatGPT get you caught? Rethinking of plagiarism detection." *arXiv preprint arXiv:2302.04335*.

Khoza, S. B. 2021. "Can Teachers' Identities Come to the Rescue in the Fourth Industrial Revolution?" *Technology, Knowledge and Learning* 28: 843–864.

Khoza, S. and A. T. Biyela. 2020. "Decolonising technological pedagogical content knowledge of first year mathematics students." *Education and Information Technologies* 2020(1): 1–15. https://doi.org/https://doi.org/10.1007/s10639-019-10084-4.

Kotzee, B. and S. O. Palermos. 2021. "The teacher bandwidth problem: MOOCs, connectivism, and collaborative knowledge." *Educational Theory* 71(4): 497–518.

Laal, M. 2011. "Lifelong learning: What does it mean?" *Procedia-Social and Behavioral Sciences* 28: 470–474.

Liu, C.-Y. A. and R. C. Rodriguez. 2019. "Evaluation of the impact of the Hyflex learning model." *International Journal of Innovation and Learning* 25(4): 393–411.

Makumane, M. A. and C. B. Mpungose. 2022. "Digital Divide: Secondary School Learners' Experiences of Using Educational Technologies." *Alternation Interdisciplinary Journal for the Study of the Arts and Humanities in Southern Africa* 39: 214–238.

Makumane, M. and S. Khoza. 2020. "Educators' reasoning (s) and their effects on successful attainment of curriculum goals." *South African Journal of Higher Education* 34(2): 95–111. https://doi.org/https://doi.org/10.20853/34-2-3428.

Mhlongo, S., K. Mbatha, B. Ramatsetse, and R. Dlamini. 2023. "Challenges, opportunities, and prospects of adopting and using smart digital technologies in learning environments: An iterative review." *Heliyon*.

Mpungose, C. B. 2020. "Emergent transition from face-to-face to online learning in a South African University in the context of the Coronavirus pandemic." *Humanities and Social Sciences Communications* 7(1): 1–9.

Mpungose, C. B. and S. B. Khoza. 2022. "Postgraduate Students' Experiences on the Use of Moodle and Canvas Learning Management System." *Technology, Knowledge and Learning* 27(1): 1–16. https://doi.org/10.1007/s10758-020-09475-1.

Navio-Marco, J., L. M. Ruiz-Gómez, R. Arguedas-Sanz, and C. López-Martín. 2022. "The student as a prosumer of educational audio–visual resources: A higher education hybrid learning experience." *Interactive Learning Environments* 32(2): 463–480.

Ndzinisa, N. and R. Dlamini. 2022. "Responsiveness vs. accessibility: Pandemic-driven shift to remote teaching and online learning." *Higher Education Research & Development* 41(7): 2262–2277.

Ngubane-Mokiwa, S. A. and S. B. Khoza. 2021. "Using community of inquiry (CoI) to facilitate the design of a holistic e-learning experience for students with visual impairments." *Education Sciences* 11(4): 152.

Ngubane-Mokiwa, S. and S. B. Khoza. 2016. "Lecturers' experiences of teaching STEM to students with disabilities." *Journal of Learning for Development* 3(1): 37–50.

Prensky, M. 2001. "Digital natives, digital immigrants, Part 1." *On the horizon* 9(5): 1–6. https://doi.org/https://doi.org/10.1108/10748120110424843.

Selwyn, N. and B. Gallo Cordoba. 2021. "Australian public understandings of artificial intelligence." *AI & SOCIETY* 37: 1–18.

Selwyn, N., C. O'Neill, G. Smith, M. Andrejevic, and X. Gu. 2021. "A necessary evil? The rise of online exam proctoring in Australian universities." *Media International Australia* 186(1).

https://doi.org/10.1177/1329878X211005862.

Sephokgole, D. and M. Makgato. 2019. "Students' perception of lecturers' assessment practices at Technical and Vocational Education and Training (TVET) colleges, South Africa." *Age* 16(19): 41.

Shelton, C. and L. Archambault. 2022. "Educators engaging in online educational marketplaces: A vision for teacher education to prepare critical consumers, careful creators, and discerning professionals." *Journal of Technology and Teacher Education* 30(2): 155–166.

Siemens, G. 2005. "Connectivism: A Learning Theory for the Digital Age*." International Journal of Instructional Technology and Distance Learning* 2. http://www.itdl.org/Journal/Jan_05/article01.htm.

Siemens, G. 2008. "Learning and knowing in networks: Changing roles for educators and designers." *ITFORUM for Discussion* 27(1): 1–26.

Siemens, G. 2014. "Connectivism: A learning theory for the digital age." *Journal of Emerging Technologies in Web Intelligence* 2(1): 27–33.

Siemens, G. and S. Downes. 2009. "Connectivism and connective knowledge 2009." *International Journal of Instructional Technology and Distance Learning* 2(1): 3–10.

Siemens, G., J. Rudolph, and S. Tan. 2020. "'As human beings, we cannot not learn': An interview with Professor George Siemens on connectivism, MOOCs and learning analytics." *Journal of Applied Learning and Teaching* 3(1): 108–119.

Sokhulu, L. H. 2021. "Students' experiences of using digital technologies to address their personal research needs during the COVID-19 lockdown." *African Identities* 19(4): 436–452.

St Clair, N., V. Rada, P. McCray, and S. Szeszko II. 2022. "The impact of digital learning driven by COVID-19 Emergency Remote Teaching." SITE Interactive Conference.

Utecht, J. and D. Keller. 2019. "Becoming Relevant Again: Applying Connectivism Learning Theory to Today's Classrooms." *Critical Questions in Education* 10(2): 107–119.

Van der Bijl, A. J. 2021. "Integrating the world of work into initial TVET teacher education in South Africa." *Journal of Education and Research* 11(1): 13–28.

Van Dijk, J. A. 2006. "Digital divide research, achievements and shortcomings." *Poetics* 34(4–5): 221–235.

Yin, R. K. 2013. *Case study research: Design and methods*. New York: Sage publications.

Zenda, R. and R. Dlamini. 2022. "Examining factors that influence teachers to adopt information and Communication Technology in rural secondary schools: An empirical study." *Education and Information Technologies* 28(1): 1–18.

Zhang, Y. G. and M. Y. Dang. 2020. "Understanding essential factors in influencing technology-supported learning: A model toward blended learning success." *Journal of Information Technology Education Research* 19: 489–510.

Zheng, H., W. Ma, J. Li, and J. Botero. 2023. "Relationship between internet use and negative affect." *Applied Research in Quality of Life* 18: 1693–1713. https://doi.org/10.1007/s11482-023-10158-z.

Zulfikar, T. and Mujiburrahman. 2018. "Understanding own teaching: Becoming reflective teachers through reflective journals." *Reflective Practice* 19(1): 1–13.