EXPLAINING HOW HISTORICALLY MARGINALIZED STUDENTS IN AN ELITE PRIVATE UNIVERSITY IN NIGERIA GAINED EPISTEMOLOGICAL ACCESS AND SUCCEEDED THROUGH THE AFFORDANCES OF EDUCATIONAL TECHNOLOGIES

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Abstract

This study examined the journey of historically marginalized students in gaining epistemological access and achieving success within the context of an elite private university in Nigeria. Through the lens of Morphogenetic and Affordance Theories, the research delves into how educational technologies provided opportunities and support for these students. However, this study showcases how the affordance of educational technologies, including digital learning platforms, online resources, and communication tools, has empowered marginalized students to overcome obstacles and thrive academically. By adopting a morphogenetic approach perspective, the research elucidates the dynamic interplay between technological affordances, social structures, and individual agency in shaping the educational experiences and achievements of historically marginalized students. Through a critical realist case study, the study highlights the transformative potential of educational technologies in promoting equity, inclusivity, and academic success within higher education institutions. The findings contribute to a deeper understanding of the complex interactions between technology, education, and social justice, offering insights for policymakers, educators, and practitioners striving to create more inclusive and equitable learning environments. The study concludes that educating marginalized students helps build the capacity to leverage advantage from digital resources and information in safe, secure, and sustainable ways. This study recommended that constant interaction between students-students, and students-teachers should be maintained.

Keywords: Affordance, Educational Technologies, Elite, Epistemological Access, Private University, Marginalized Students,

Introduction

Historically marginalized groups, often facing barriers to higher education, encounter unique challenges in accessing and navigating elite educational institutions. The marginalized groups   The emphasis on intellectual capital, innovative readiness and entrepreneurship in postmodern societies influenced by globalization and technology has increased the number of institutions in higher education globally (Cross & Atinde, 2015; Omar & Chaudhry, 2019). The postmodern society refers to the ability and preparedness of individuals and organizations to generate, embrace, and implement new ideas, technologies, and business models in a rapidly changing and complex sociocultural context. This has further uncapped the potential, both in the public and private sectors, to access higher education for a better economic future in developing countries, where graduates are equipped to be creators of jobs rather than seekers of jobs. This vision has been hampered in the Nigerian higher educational institutions (HEIs) by political unwillingness to rightfully equip the universities, underfunding, flawed infrastructures, and immature design of curriculums and service delivery; consequently, its existence is still in a dwindling condition to date (Baba, 2011; Bowen, 2013; Fafunwa, 2018). This led to the establishment of private universities in Nigeria that are touted to be better equipped technologically, more business orientated and commodification of university education leading to high physical access to the universities by students. However, being opportune to enter the gate of a university through physical access (enrollment through JAMB admission and scholarships) has been achieved but still not enough yet. This is because such students, especially the underprivileged ones still fail to get meaningful access to the 'goods' of the university, access Morrow (2009) termed epistemological access (shortened as epistemic access) due to the harsh realities of their background and unpreparedness (Cross & Atinde, 2015; Rambe & Mawere, 2011). As such, underprivileged students are unable to translate academic experiences into purposeful professional experiences to succeed in their academic pursuits and after their graduation (Cross & Atinde, 2015; Rambe & Mawere, 2011). Thus, this study, therefore, explains how successful undergraduates from historically underserved or under-represented groups were able to gain epistemic access and succeed at a top-tier private university as a result of educational technologies' opportunities for action (affordance) and its enactments. How did they surmount the challenges imposed by their unique historical contexts to gain the epistemic access that allowed them to thrive at higher educational institutions (HEIs) through the opportunities provided by the adopted educational technologies?

If formal access to higher education is 'gaining' a place to study in HEIs as Morrow (2009) would say, then 'epistemic access' represents 'meaningful access' to available resources the universities provide. Such resources in focus here are the

implemented educational technologies, IT-enabled teaching services, and virtual learning/e-learning environment in HEIs needed to transform educational experiences into purposeful opportunities in the broader societies that are digitally connected and transformed (Du Plooy & Zilindile, 2014; Rambe & Mawere, 2011). Access is more than providing a place to get an education; it must provide meaningful learning for real achievement (Du Plooy & Zilindile, 2014; Morrow, 2009; Motala et al., 2009; Omar & Chaudhry, 2019). Such learning cannot be automatically injected into students by providing them with 'what to learn' in the classes; rather, it shall answer 'how to learn' in their disciplines to ensure quality teaching and learning practices (Omar & Chaudhry, 2019). This is because academic activities offered to students facilitate learning (Lotz-Sisitka, 2009; Omar & Chaudhry, 2019) but the 'willingness to learn' must come from the students for real and purposeful learning to occur. Therefore, 'epistemic access' requires the students to engage with the contents, practices, and ways of thinking of a discipline, and provide access to knowledge and ways of knowing for students to attain academic success and thrive in their careers or professions (Luckett & Hunma, 2014; Maniram, 2018). This also includes the discursive, linguistic, and textual practices of a discipline that students require to effectively function in a specific academic discipline (Rambe & Mawere, 2011). Students with such access can develop the necessary disciplinary identity and engage effectively in the discipline's discourse (Gee, 2005) through collaboration that is characterized by meaningful negotiations (Woo & Reeves, 2007), critical reflection that is endued with building on diverse ideas, and transitivity as what interlinks those ideas to reach a reflective consensus for knowledge improvement (Rivera *et al.,* 2023).

While the global North (for example, Israel, Japan, South Korea, Australia, and New Zealand) have subtly and systematically peddled the hype about the capacity of educational technologies to radically transform HEIs' learning and pedagogy, while most private universities in Nigeria have already invested heavily on such technologies, in which academics and policymakers have not questioned its contribution to epistemic access. More importantly, the heavy investments in educational technologies modelled along Western IT hubs have been parachuted without sufficient contextualization to suit the structural realities of resource-constrained environments (Rambe & Mawere, 2011). Moreover, hardly have such interventions been aligned with academics and learners' harsh structural backgrounds, especially the marginalized students of Northern extraction in Nigeria and their e-readiness and digital literacy levels to ensure effective enactment of its affordances to gain epistemic access in a technology-enhanced learning environment.

Research Objectives

The general objective of this research is to explain how marginalized students in an elite private university in Nigeria gained epistemological access and succeeded through the affordance of educational technologies. The specific objectives are to:

1. Identify the structural conditions constraining the underprivileged students from northern Nigeria from gaining epistemic access by enacting the affordances of the educational technologies provided by a private institution in Northern Nigeria
2. Understand how underprivileged students enact educational technologies' affordances to gain much-needed epistemic access and succeed in their disciplines at the private university they were admitted. And what are the mechanisms in interaction to facilitate such enactments
3. Understand the transformational changes that occurred at the end of underprivileged students' studies due to the gained epistemic access through the enactment of educational technologies' affordances at the American University of Nigeria after graduation in their respective disciplines

Literature Review:

Educational Technologies' Affordances & Epistemological Access and its Importance to a Chosen Discipline: Computer Science

Prior studies (Al-Maawali, 2020; Alexiou & Paraskeva, 2020; Bullock et al., 2017; D'Ambra et al., 2019; Dubé & McEwen, 2017; Hwang et al., 2021; Wegerif & Major, 2019) suggest that educational technology has been identified as an important phenomenon for gaining access to education in higher educational institutions (HEIs). Despite the promising and important future of educational technology, the successful integration of such technologies into HEIs requires the full engagement and dedication of educators and policymakers (D'Ambra et al., 2019). However, research has revealed that faculty members in HEIs in sub-Saharan Africa are frequently cautious, if not outright unwilling, to employ digital tools to provide students with an education (Ma et al., 2020).

With the introduction of high-tech learning environments such as flipped learning (Sams & Bergmann, 2013), massive open online courses (MOOCs) (Siemens, 2012), Google Meet (Fakhruddin, 2019), zoom (Zhang et al., 2019), Camtasia (Silva, 2012), ChatGPT (McGee, 2023), mobile technologies, social media, canvas, Talkwall, the use of educational technologies for gaining epistemological access to education in most African countries, particularly Nigeria, has become critically important. As these e-learning environments could greatly facilitate and ease access to education when deployed, higher educational institutions (HEIs) in Nigeria have not embraced digital technologies (Okwelogu et al., 2021), even though the Nigerian Federal Ministry of Education and the Nigerian Federal Ministry of Digital Economy have been advocating

and encouraging staff of HEIs to use cutting-edge technologies effectively for teaching, learning, and research purposes, with the hope of bridging the gap between marginalized communities and the elites' children in rural and urban regions (Adamu, 2019; Okwelogu et al., 2021). With the provision of digital technologies by the Nigerian government in most HEIs, the majority of lecturers do not use them (Okwelogu et al., 2021). They either responded poorly to the facilities provided (Huang et al., 2021; Ma et al., 2020) or used them in ways that lacked innovation and creativity (Li, 2017). Insufficient financing, a drop in national review, insecurity, corruption, poor ICT competence, a paucity of infrastructure facilities, political instability, and policy instability were identified as challenges impeding the efficient use of technologies for teaching and learning in their study (Okwelogu et al., 2021). Therefore, there is also a severe gap between policy requirements and teaching practice (Adamu, 2019; Kuru Gönen, 2019; Luo et al., 2021; Okwelogu et al., 2021) when it comes to technology usage in classrooms in HEIs. Such barriers as insufficient access to an appropriate learning management system, insufficiency in teachers' technological competence and confidence (Liaw, 2014), Confucianism influence which emphasizes respecting laws and order (Fu et al., 2020), prioritizing academic activities and performance, and accentuates the role of examinations (Kuru Gönen, 2019), are some of the major concern for implementing ICT-based facilities for teaching, learning, and research in most of the HEIs in Nigeria. In most literature (Al-Ani, 2013; Al-Maawali, 2020; Antonenko et al., 2017; Bahari, 2021; Bray & Tangney, 2016; Dinsmore, 2019; Eshchar-Netz & Vedder-Weiss, 2021; Gibson et al., 2021; Kuru Gönen, 2019; Okwelogu et al., 2021; Wankel & Blessinger, 2013), studies are mainly conducted about ICT-related facilities for teaching, learning, and research. There is a dearth of studies regarding access to disciplinary knowledge in universities (Okwelogu et al., 2021), especially through digitally supported classroom dialogue. Meanwhile, studies with a focus on marginalized students for social inclusion in HEIs are still lacking. As such, literature presents knowledge about structures that hinder epistemological access – they are less cohesive as a foundation for informing researchers and educators in the discipline (Groff, 2013; Peña-López, 2016).

The study reviewed so far shows the different types of educational technologies and their affordances. Some of the identified educational technologies with their corresponding affordances include flipped learning (flexibility, active engagement, individualized learning, accessibility, accountability, understandability, customizability, and learnability) (Sams & Bergmann, 2013), google meet (video conferencing, shareability, editability, and recordability), zoom (video conferencing, shareability, breakout rooms, and recordability) (Yuan, 2017), Talkwall (real-time collaboration, visual representation, and accessibility), Camtasia (recordability, editability, and annotation), Massive Open Online Course 'MOOC' (accessibility, flexibility, interactivity, and scalability) (Siemens, 2012), YouTube (searchability, shareability, and engagement), Canvas (learnability, content distribution, grading and feedback, communicability, and integration), Mobile Technologies (portability, and connectivity). When these educational technologies are deployed in higher educational institutions,

and used effectively by especially marginalized students, epistemological access can be gained. But unfortunately, the religious-based education system is more accessible and acceptable in most northern regions of Nigeria.

Before the arrival of colonial powers in the 19th century, the northern regions of Nigeria predominantly adhered to a religious-based system of education, as noted by Imam (2012) and (Okobiah, 2002). The foundation of this system rested on Islamic teachings, where a good grasp of religious knowledge, especially the Quran written in Arabic, was essential for active participation in religious practices like prayers and rituals (Imam, 2012; Umar, 2004). Over time, this religious education evolved into a formal literary form of instruction accessible to the marginalized students in the northern region, making it more widespread than other forms of education (Hubbard, 2021) as a form of epistemological access.

As a form of gaining access to education 'epistemic access', the British colonial introduced Western education to Nigeria in the early 1910s and 1920s (Fafunwa, 2018). However, western education faced resistance in the northern regions due to concerns about its compatibility with religious education (Graham, 1966). It was not until 1922 that Katsina College was established as the first higher education institution in the north, primarily to train Muslims for roles in the colonial administration (Darma, 2015; Okobiah, 2002; Umar, 2004). Even after gaining independence in 1960, the northern region still showed limited interest in Western education (Darma, 2015). In an attempt to address the educational gap between northern Nigeria and the southern regions, the federal government implemented Universal Primary Education (UPE) in 1975 (Joyce & Francis, 2014), but the North is still sceptical (Clarke & Linden, 1984) with this type of education. Challenges such as a shortage of qualified teachers and inadequate funding have plagued the implementation of this policy (Fafunwa, 2018), resulting in the near collapse of the educational system in northern Nigeria. Despite various efforts by the Nigerian government, the educational disparities between the North and South persist. Enrollment rates and performance in standardized examinations remain significantly low in the north (Tolu, 2019). The northern region lags in terms of institutional access to higher educational institutions, with only a fraction of northern students gaining admission compared to the south (Okobiah, 2002).

In the digital age, the intersection of educational technologies' affordances and the concept of epistemological access is reshaping the educational landscape (Tan et al., 2021). This powerful combination not only enhances learning experiences but also plays a pivotal role in inspiring and guiding students towards choosing a specific course of study such as computer science as a discipline. The profound importance of educational technologies' affordances and epistemological access in shaping the future of computer science education has so many advantages. As educational technologies have emerged as a force for equity in education (Dixon-Román et al., 2020), they transcend geographical and socioeconomic boundaries, offering equal access to computer science students from diverse backgrounds. Epistemological access, thus,

begins with the democratization of education through technology, making the field of computer science accessible to all. Educational technologies offer interactive learning experiences that foster active engagement through a virtual environment (Oliveira et al., 2019; Pirker et al., 2020; Pirker et al., 2021). This active learning approach ignites curiosity and passion (Demirci, 2017), making computer science an enticing choice for students as a whole. The marriage of educational technologies and epistemological access allows for personalized learning paths (Lowyck, 2014). Educational technologies bridge the gap between academia and industry by providing opportunities for students to work on authentic projects and engage with professionals (Yardi & Bruckman, 2007). This practical exposure underscores the relevance and impact of computer science, inspiring students to pursue it. Educational technologies facilitate interdisciplinary learning, enabling students to explore the interconnectedness of computer science with other fields like biology, healthcare, finance, and engineering. This holistic perspective highlights the versatility of computer science skills, appealing to students from diverse academic backgrounds. Students are more likely to pursue a discipline when they understand its career prospects. Educational technologies often provide insights into the diverse career paths within computer science (Parrish et al., 2018), including software development (Bell et al., 2022), artificial intelligence (Zawacki-Richter et al., 2019), cybersecurity (Parrish et al., 2018), and data science (Chang et al., 2019). This transparency enables students to align their interests with future career goals. Educational technologies cultivate a culture of lifelong learning and adaptability (Yarbrough, 2018), where students who engage with these technologies develop a growth mindset (Wright & Wrigley, 2019), valuing continuous improvement and embracing new challenges. Epistemological access is not solely about providing resources; it is about accommodating diverse learning needs (Du Preez & Le Grange, 2020). Educational technologies can cater to various learning styles, including visual, auditory, and kinesthetic (Cabual, 2021), ensuring that all students can thrive in a computer science discipline. The digital nature of educational technologies allows students to collaborate globally, connecting with peers and experts worldwide. This exposure broadens their horizons, fosters cultural understanding, and expands their outlook on the possibilities within the computer science discipline.

Therefore, the confluence of educational technologies' affordances and the principle of epistemological access is a driving force in shaping the choices of aspiring computer science as a discipline in Nigerian higher educational institutions. These technologies break down barriers, engage learners actively, provide practical exposure, and foster a lifelong learning mindset. By making the computer science discipline accessible, engaging, and relevant to diverse learners, educational technologies are empowering the next generation of computer scientists to make a lasting impact on our ever-evolving digital world.

Theoretical Foundation – morphogenetic approach, and affordance theory leading to the development of the research model

Authors consider the proximity of the Archer Morphogenetic Approach, Gibson Affordance theory and social constructivism theory, with their common underlying assumptions and explanatory power to the phenomenon, drawing on Okhuysen and Bonardi (2011), Ononiwu *et al*. (2018), and (Ononiwu *et al*., 2018) on theory choice and combination in critical realist in Information Systems research.

Archer morphogenic theory

The Archer morphogenic theory as an explanatory theory, enables the researcher to explain the different structures both artifactual and institutional as well as students' cultural systems about gaining epistemological access. The morphogenetic approach outlines Archer's interest in studying change, or lack thereof, over time. Archer achieves this by viewing change as a series of overlapping and recurring cycles (Archer, 1995). Each cycle begins at a specific point in time known as T1 – T2. T1 – T2 were thus envisioned as the cultural and structural systems at a specific point in time. Although, these structures include institutional structures, legal structures, and artifactual structures. Both cultural systems and structural systems are coming from T1 – T2 to imping on agents at T2 – T3. The period T2 – T3, refers to the second period of the cycle. During this time, users interact with artifactual structures and institutional structures through the interplay of certain mechanisms that trigger and catalyze the interaction. The use of morphogenetic theory here entails evaluating this interplay across time (Archer, 1995). T3 - T4 is the final stage of a morphogenetic cycle. At this moment, users of the IT artefacts may have been transformed (i.e., morphogenesis) into the extent to which change has occurred, or whether no change has occurred (i.e., morphostasis), in which T4 then becomes T1 for the next cycle.

Affordance theory

Affordance theory is a model, that possesses key capabilities and determines the future use of an artefact's survival in an uncertain and dynamic environment (Wang *et al*., 2018). Technology affordance theory explains how users of technology engage in intelligent behaviour as they interact with digital technologies. While the Morphogenetic theory is a theory of change or transformation. It explains how an individual transforms from one stage to another. Meanwhile, there is a completely new human being after undergoing the process of the Archer morphogenetic approach. Structural, instructive affordances (Ditzler *et al*., 2018), functional affordances (Al-Abrrow *et al*., 2022), enactive affordances (Major *et al*., 2022), and transformational affordance (Senyo et al., 2021) described the entire process. Thus, suggesting that the educational affordances of digital technologies is needed to achieve epistemological access.

Research Methodology

A realist single case study (Easton, 2010) was used to study the phenomena in this research. The realist case study approach provides "insights into the nature of the phenomena" in its natural environment (Easton, 2010, p. 118). Thus, a single case study allowed the researchers to explore various structural conditions that become impediments to epistemological access over time. Through a purposive search, the American University of Nigeria a higher institution from northern Nigeria was chosen as the case institution. We focused on students who had experienced a significant degree of marginalization because they were Hausa-Fulani, originally from Northern Nigeria, where poverty is mostly a family characteristic, and who had graduated from relatively under-resourced schools in rural areas, where seven (7) students were purposely chosen as participants of the study. Data was collected using structured-interviews.

1ˢᵗ Objective: First research question: Identify the structural conditions constraining the underprivileged students from northern Nigeria from gaining epistemic access by enacting the affordances of the educational technologies provided by a private institution in Northern Nigeria

Based on the participants' responses to the first objective, different views emerged. The structural conditions significantly hinder marginalized students' ability to access epistemological access and utilize educational technologies in Northern Nigeria as the prominent constraint is the lack of reliable electricity and internet infrastructure in many rural areas. Without a stable power supply and internet connectivity, it becomes exceedingly challenging to access online learning platforms and educational resources. This is in line with Brown's *et al*. (2020) assertion where it was reported that students coming from poor families experienced challenges in coping with the current trends of digital technologies. This infrastructure deficit is a major bottleneck for epistemic access. Furthermore, economic disparities play a pivotal role in limiting access to students. Many students from disadvantaged backgrounds cannot afford the necessary devices, such as laptops, smartphones, and data plans. Joshua et al. (2014) lamented that the cost of these resources creates a substantial barrier for underprivileged students in Northern Nigeria to gain education.

Most of the participants in this study indicated that language and content relevance also pose significant challenges. Educational materials are often not tailored to the local context and are primarily available in English. This language barrier can hinder effective engagement with educational technologies and further constrain epistemic access (Adeniran, 2020). The structural conditions constraining underprivileged students from Northern Nigeria from gaining epistemic access via educational technologies include infrastructure limitations, economic barriers, and language and content relevance issues. One of the most pressing issues is the lack of reliable electricity and internet infrastructure in rural areas (Smith et al., 2019).

Similarly, participants reported that the structural conditions that impede epistemic access for underprivileged students from Northern Nigeria are deeply rooted in the region's socio-economic challenges. This deficiency makes it difficult for students to access online educational platforms and leverage educational technologies effectively (Brown et al., 2020). This is especially true in regions like Northern Nigeria where energy access is limited (Adewole, 2020). Economic disparities also play a significant role. Many students from disadvantaged backgrounds cannot afford the necessary digital devices and internet connectivity. This financial constraint hinders their ability to fully engage with educational technologies, thus limiting their epistemic access. Language and content relevance are additional obstacles. Educational materials are often not adapted to the local context and are primarily available in English, which many underprivileged students may not be proficient in.

The structural constraints, including infrastructure limitations, economic disparities, and language and content relevance, hinder the epistemic access of underprivileged students from Northern Nigeria when it comes to educational technologies.

2ⁿᵈ Objective: Understand how underprivileged students enact educational technologies' affordances to gain much-needed epistemic access and succeed in their disciplines at the private university they were admitted to. And what are the mechanisms in interaction to facilitate such enactments?

On the second objective of the study, participants were asked how they enact educational technologies' affordances to gain much-needed epistemic access and succeed in their disciplines, and what mechanisms in interaction facilitate such enactments. In their responses, it was stated that enacting educational technologies' affordances to gain epistemic access and succeed in our disciplines has been a transformative journey for most of us. This process involves a combination of personal resilience, peer collaboration, and leveraging various educational resources.

Underprivileged students often exhibit resourcefulness and adaptability as they navigate educational challenges. Embracing limited resources through actions like device sharing, community centre utilization, and public internet access becomes a means to overcome the barriers imposed by their disadvantaged backgrounds. Peer collaboration emerges as a cornerstone for success. Students form study groups, fostering knowledge exchange and mutual support while navigating educational technologies. This collaborative effort not only deepens their understanding of subjects but also promotes active engagement. The utilization of Open Educational Resources (OERs) is a significant facet of their educational journey. These cost-effective or free educational materials complement their studies, enabling self-directed learning and alleviating financial burdens. Furthermore, many underprivileged students take advantage of free online tutorials and courses. Platforms such as Coursera, edX, and Khan Academy provide high-quality content that supplements their academic studies, which in turn enriches their knowledge. Engagement in online forums and discussion

boards within the university's learning management system (LMS) serves as a mechanism for interactive learning. This digital interaction empowers students to engage with faculty and peers, ask questions, and clarify doubts, thereby enriching their learning experience. Leveraging university resources, including the library, digital repositories, and academic support services, is essential for gaining epistemological access. These resources grant access to academic journals, e-books, and research papers, enabling students to delve deeper into their chosen disciplines. Seeking mentorship and guidance from faculty and senior students is a common practice. Their insights into the effective use of educational technologies, resource selection, and academic success are invaluable. Participants emphasized that underprivileged students should value the importance of time management. They acquire skills to efficiently allocate their time for online learning, assignment completion, and exam preparation, enabling them to balance their various responsibilities. Furthermore, underprivileged students often engage with advocacy groups and support networks in higher educational institutions. These groups advocate for improved access to resources, financial aid, and support services, enhancing the overall learning experience. Lastly, some private universities initiate programs to support underprivileged students, offering scholarships, subsidized devices, and internet connectivity schemes as mechanisms to facilitate access to knowledge for all.

Enacting educational technologies' affordances to gain epistemic access and succeed as underprivileged students involves a combination of personal determination and the utilization of various resources and support mechanisms. These mechanisms help bridge the gap created by our disadvantaged backgrounds and empower us to excel in our academic disciplines.

Figure 1: *A conceptualization of the morphogenetic approach and technology affordance of marginalized students in northern Nigeria*
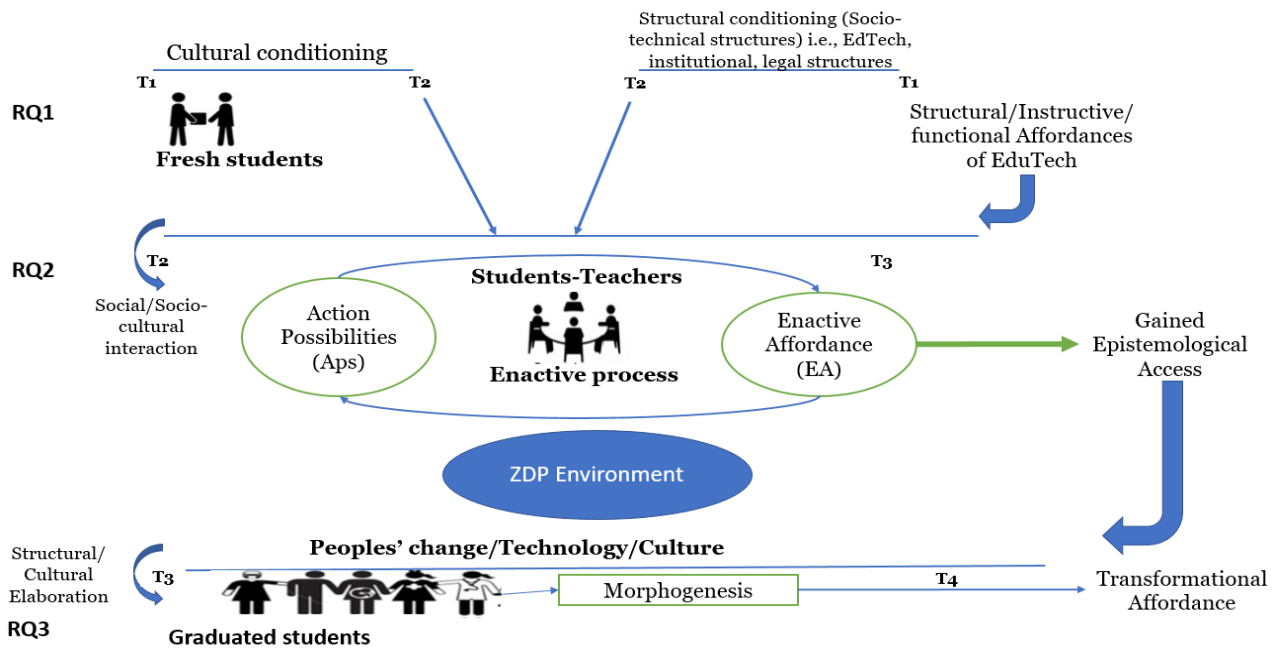
Source: Researchers 2023

Discussion of Findings

The point of departure for this paper has been the proclaimed global learning crisis and context as well as the authors' stance that discusses the integration of digital technologies into education systems in the sub-Saharan African countries have received little attention in the ongoing debates on quality education. Within the purview and knowledge integration discussions, the paper builds both on the argument that students in sub-Saharan Africa can be alienated by the indigenous knowledge for sustainable development. Concerning these issues, the described underprivileged students are interesting in several aspects.

First, the breadth of examples that participants reported in the study shows that educational technologies indeed exist in the university. In total, the overall opinion of participants of this study ascertained that not only obtaining educational technologies but enacting them is much more important. The depicted Figure 1 provides a research model where Archer's framework and Gipson affordance theory were used in the study. The model explicates how marginalized students can gain epistemological access through the enactment of educational technologies' affordances. These affordances when used, in a particular learning context which was term by Vygotsky as a zone of proximal development (i.e., ZPD) in conjunction with some mechanisms, a change or lack thereof would be achieved.

Contribution to Knowledge

Our study contributes to the growing literature on the educational affordances of digital technologies in HEIs in developing economies, with particular reference to the underprivileged students in Nigeria. Developing a novel mechanism-based research model of how educational affordances of digital technologies could be enacted by underprivileged students to gain epistemic access to HEIs in Nigeria will be of help to policymakers and educational practitioners in expanding educational inclusion. Generally, it is well acknowledged as fact about the poor success of underprivileged students, especially from Northern Nigerian higher educational institutions (Ilie & Rose, 2016; Ilie et al., 2021), especially in computing (Adepetun, 2021; Festus-Amaka et al., 2019) due to a lack of epistemic access to that field. Thus, seeing the underprivileged students from Northern Nigeria who brace the odds of the harsh realities of their lower socio-economic status (SES) to gain epistemic access through the enactment of the affordances of educational technologies provided by a university and succeed in their academic pursuits is worth investigating. Besides, closely theorizing through empirical work to understand the amiable transformational changes that occur in the lives of such students towards the expected promise of social mobility contributes to equity and, thus, to greater social justice and educational inclusion. Furthermore, the contribution of the study highlights the fulfilment of one of the specific Sustainable Development Goals (SDGs) targeted to higher education namely nations "by 2030 [should] ensure equal access for all women and men to affordable quality technical, vocational and tertiary education, including university" (SDG Target 4.3).

Conclusion

This paper argues the need for educational technologies for classroom dialogic interactions in higher educational institutions, which in turn facilitate teaching and learning for understanding the sort of competencies required to function productively, safely and ethically in diverse and increasingly digitally-mediated environments. The paper further highlights the importance of using digital technology in gaining epistemological access. Educating marginalized students helps build the capacity to leverage advantage from digital resources and information in safe, secure and sustainable ways. To facilitate this, a broadly-based model was produced (Figure 1), in which learning context and educational technologies have an important role to play in providing marginalized students with epistemological access. It further reveals that with constant interaction between students-students, and student-teachers, an effective learning environment can be enhanced.

References

Adamu, A. (2019). *National Policy on Information Communication Technologies (ICT) in Education*. https://education.gov.ng/wp-content/uploads/2019/08/national-policy-on-ict-in-education-2019.pdf

Adamu, A. U. (2010). Islamic Education in African Countries—The Evolution of Non-Formal Al-Muhajirun Education in Northern Nigeria.

Adeniran, A. (2020). *Investigating Real-Time Assessment and Support for Online Collaborative Learning* PhD thesis, University of Aberdeen].

Adepetun, A. (2021). Northern Nigeria captured for new digital literacy initiative. *The Guardian Newspaper*. https://guardian.ng/technology/northern-nigeria-captured-for-new-digital-literacy-initiative/

Adewole, P. (2020). *Adjustment to Higher Education Amongst Alumni of a Uk College on the Basis of the Accuracy of Their Predicted A-Level Grades*. The University of Liverpool (United Kingdom).

Adeyemi, K. A. (2016). The trend of Arabic and Islamic education in Nigeria: progress and prospects. *Open Journal of Modern Linguistics*, *6*(3), 197-201.

Ajekwe, C. (2017). Effect of culture on entrepreneurship in Nigeria. *International Journal of Business and Management Invention*, *6*(2), 1-6.

Al-Abrrow, H., Ali, J., & Alnoor, A. (2022). Multilevel influence of routine redesigning, legitimacy and functional affordance on sustainability accounting: Mediating role of organizational sense-making. *Global Business Review*, *23*(2), 287-312.

Al-Ani, W. T. (2013). Blended Learning Approach Using Moodle and Student's Achievement at Sultan Qaboos University in Oman. *Journal of Education and Learning*, *2*(3), 96-110.

Al-Maawali, W. (2020). Affordances in educational technology: Perceptions of teachers and students in Oman. *Journal of Information Technology Education: Research*, *19*, 931-952.

Alexiou, A., & Paraskeva, F. (2020). Being a student in the social media era: exploring educational affordances of an ePortfolio for managing academic performance. *The International Journal of Information and Learning Technology*, *37*(4), 121-138. https://doi.org/10.1108/IJILT-12-2019-0120

Anderson, R. A., Crabtree, B. F., Steele, D. J., & McDaniel Jr, R. R. (2005). Case study research: The view from complexity science. *Qualitative health research*, *15*(5), 669-685.

Antonenko, P. D., Dawson, K., & Sahay, S. (2017). A framework for aligning needs, abilities and affordances to inform design and practice of educational technologies. *British Journal of Educational Technology*, *48*(4), 916-927.

Archer, M. S. (1995). *Realist social theory: The morphogenetic approach*. Cambridge university press.

Attah, N. E., Sambo, U., Sule, B., Bello, M. A., & Saragih, M. Y. (2021). COVID 19 and increased security challenges in northern Nigeria: Interrogating armed banditry in northwestern Nigeria. *SIASAT*, *6*(1), 33-44.

Baba, N. M. (2011). Islamic schools, the Ulama, and the state in the educational development of Northern Nigeria. *Bulletin de l'APAD*(33).

Bahari, A. (2021). Computer-mediated feedback for L2 learners: Challenges versus affordances. *Journal of Computer Assisted Learning*, *37*(1), 24-38.

Bell, A., Bartimote, K., Dempsey, N., Mercer-Mapstone, L., Moran, G., & Tognolini, J. (2022). Student and educator perspectives on equity and online work integrated learning. *Australasian Journal of Educational Technology*, *38*(6), 185-200.

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS Quarterly*, 369-386.

Bowen, J. (2013). *A History of Western Education: The Modern West Europe and the New World*. Routledge.

Bray, A., & Tangney, B. (2016). Enhancing student engagement through the affordances of mobile technology: a 21st century learning perspective on Realistic Mathematics Education. *Mathematics Education Research Journal*, *28*(1), 173-197.

Brown, N., Te Riele, K., Shelley, B., & Woodroffe, J. (2020). Learning at home during COVID-19: Effects on vulnerable young Australians. *Peter Underwood Centre for Educational Attainment*.

Bullock, E. P., Shumway, J. F., Watts, C. M., & Moyer-Packenham, P. S. (2017). Affordance Access Matters: Preschool Children's Learning Progressions While Interacting with Touch-Screen Mathematics Apps. *Technology, Knowledge and Learning*, *22*(3), 485-511. https://doi.org/10.1007/s10758-017-9312-5

Cabual, R. A. (2021). Learning styles and preferred learning modalities in the new normal. *Open Access Library Journal*, *8*(4), 1-14.

Chang, H.-C., Wang, C.-Y., & Hawamdeh, S. (2019). Emerging trends in data analytics and knowledge management job market: extending KSA framework. *Journal of Knowledge Management*, *23*(4), 664-686.

Chankseliani, M. (2016). Escaping homelands with limited employment and tertiary education opportunities: Outbound student mobility from post-soviet countries. *Population, Space and Place*, *22*(3), 301-316.

Clarke, P. B., & Linden, I. (1984). Islam in modern Nigeria: a study of a Muslim community in a post-independence state, 1960-1983.

Cross, M., & Atinde, V. (2015). The Pedagogy of the Marginalized: Understanding How Historically Disadvantaged Students Negotiate Their Epistemic Access in a Diverse University Environment. *Review of Education, Pedagogy, and Cultural Studies*, *37*(4), 308-325. https://doi.org/10.1080/10714413.2015.1065617

D'Ambra, J., Wilson, C. S., & Akter, S. (2019). Affordance theory and e-books: evaluating the e-reading experience using netnography. *Personal and Ubiquitous Computing*, *23*(5), 873-892.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied developmental science*, *24*(2), 97-140.

Darma, M. (2015). Access to Quality Primary Education in Northern Nigeria: Transforming Public Underachieving Schools to High Achieving Schools Using Social Business Theory, University of Liverpool. *Journal of Business and Management (JOSR-JBM) 17 (7) 05*, *10*.

Demirci, C. (2017). The Effect of Active Learning Approach on Attitudes of 7th Grade Students. *International Journal of instruction*, *10*(4), 129-144.

Dinsmore, B. (2019). Contested affordances: teachers and students negotiating the classroom integration of mobile technology. *Information, Communication & Society*, *22*(5), 664-677.

Ditzler, L., Klerkx, L., Chan-Dentoni, J., Posthumus, H., Krupnik, T. J., Ridaura, S. L., Andersson, J. A., Baudron, F., & Groot, J. C. (2018). Affordances of agricultural systems analysis tools: A review and framework to enhance tool design and implementation. *Agricultural Systems*, *164*, 20-30.

Dixon-Román, E., Nichols, T. P., & Nyame-Mensah, A. (2020). The racializing forces of/in AI educational technologies. *Learning, Media and Technology*, *45*(3), 236-250.

Du Plooy, L., & Zilindile, M. (2014). Problematising the concept epistemological access with regard to foundation phase education towards quality schooling. *South African Journal of Childhood Education*, *4*(1), 187-201.

Du Preez, P., & Le Grange, L. (2020). The COVID-19 pandemic, online teaching/learning, the digital divide and epistemological access. *Unpublished paper*, *1*, 90-106.

Dubé, A. K., & McEwen, R. N. (2017). Abilities and affordances: factors influencing successful child-tablet communication. *Educational Technology Research and Development*, *65*(4), 889-908. http://www.jstor.org/stable/45018708

Dudley, B. J. (2013). *Parties and politics in Northern Nigeria*. Routledge.

Easton, G. (2010). Critical realism in case study research. *Industrial Marketing Management*, *39*(1), 118-128.

Eli-Chukwu, N. C., Igbokwe, I. C., Ifebude, B., Nmadu, D., Iguodala, W., Uma, U., Onyeneke, R. U., & Akudo, F. U. (2023). Challenges confronting e-learning in higher education institutions in Nigeria amid Covid-19. *Journal of Applied Research in Higher Education*, *15*(1), 238-253.

Eshchar-Netz, L., & Vedder-Weiss, D. (2021). Teacher learning in communities of practice: The affordances of co-planning for novice and veteran teachers' learning. *Journal of Research in Science Teaching*, *58*(3), 366-391.

Fafunwa, A. B. (2018). *History of education in Nigeria*. Routledge.

Fakhruddin, I. S. (2019). The impact of non-formal education in community development: a case study in pati, indonesia. *International Journal of Innovation, Creativity and Change*, *5*(5), 339-352.

Faraj, S., & Azad, B. (2012). The materiality of technology: An affordance perspective. *Materiality and organizing: Social interaction in a technological world*, *237*(1), 237-258.

Faraj, S., Kudaravalli, S., & Wasko, M. (2015). Leading Collaboration in Online Communities. *Management Information Systems Quarterly*, *39*(2), 393-412. https://aisel.aisnet.org/misq/vol39/iss2/8

Fayard, A.-L., & Weeks, J. (2014). Affordances for practice. *Information and Organization*, *24*(4), 236-249.

Ferguson, T., & Roofe, C. G. (2020). SDG 4 in higher education: Challenges and opportunities. *International Journal of Sustainability in Higher Education*, *21*(5), 959-975.

Festus-Amaka, E. N., Ugwu, U. U., & Okoloegbo, C. A. (2019). Enhancing The Acquisition Of Computer Knowledge In Nigerian Educational System. *Sapientia Foundation Journal Of Education, Sciences And Gender Studies*, *1*(1).

Fu, S., Gu, H., & Yang, B. (2020). The affordances of AI-enabled automatic scoring applications on learners' continuous learning intention: An empirical study in China. *British Journal of Educational Technology*, *51*(5), 1674-1692. https://doi.org/https://doi.org/10.1111/bjet.12995

Garba, T., & Kraemer-Mbula, E. (2018). Gender diversity and enterprise innovative capability: The mediating effect of women's years of education in Nigeria. *International Journal of Gender and Entrepreneurship*, *10*(4), 290-309.

Gee, J. P. (2005). Semiotic social spaces and affinity spaces. Beyond communities of practice language power and social context. *Beyond communities of practice. Language, power and social context*, 214-232.

George, R. M. (2019). *The successful transition of Black men at historically White universities*. Eastern Michigan University.

Gibson, C. B., Dunlop, P. D., Majchrzak, A., & Chia, T. (2021). Sustaining Effectiveness in Global Teams: The Coevolution of Knowledge Management Activities and Technology Affordances. *Organization Science*.

Graham, R. L. (1966). Bounds for certain multiprocessing anomalies. *Bell system technical journal*, *45*(9), 1563-1581.

Groff, J. (2013). Technology-rich innovative learning environments. *OCED CERI Innovative Learning Environment project*, *2013*, 1-30.

Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case study research: Foundations and methodological orientations. Forum qualitative Sozialforschung/Forum: qualitative social research,

Harry, T., Chinyamurindi, W. T., & Mjoli, T. (2018). Perceptions of factors that affect employability amongst a sample of final-year students at a rural South African university. *SA Journal of Industrial Psychology*, *44*(1), 1-10.

Huang, W., Hew, K. F., & Fryer, L. K. (2021). Chatbots for language learning—Are they really useful? A systematic review of chatbot-supported language learning. *Journal of Computer Assisted Learning*.

Hubbard, J. P. (2021). Government and Islamic Education in Northern Nigeria. In *Conflict and harmony in education in tropical Africa* (pp. 152-167). Routledge.

Hwang, B.-L., Chou, T.-C., & Huang, C.-H. (2021). Actualizing the Affordance of Mobile Technology for Mobile Learning. *Educational Technology & Society*, *24*(4), 67-80.

Hyett, N., Kenny, A., & Dickson-Swift, V. (2014). Methodology or method? A critical review of qualitative case study reports. *International journal of qualitative studies on health and well-being*, *9*(1), 23606.

Ilie, S., & Rose, P. (2016). Is equal access to higher education in South Asia and sub-Saharan Africa achievable by 2030? *Higher Education*, *72*(4), 435-455. https://doi.org/10.1007/s10734-016-0039-3

Ilie, S., Rose, P., & Vignoles, A. (2021). Understanding higher education access: Inequalities and early learning in low and lower-middle-income countries. *British Educational Research Journal*, *47*(5), 1237-1258. https://doi.org/10.1002/berj.3723

Imam, H. (2012). Educational policy in Nigeria from the colonial era to the post-independence period. *Italian Journal of sociology of education*, *4*(1).

Inuwa, I., Ononiwu, C., & Kah, M. M. (2020). Dimensions that characterize and mechanisms that cause the misuse of information systems for corrupt practices in the Nigerian public sector. *The Electronic Journal of Information Systems in Developing Countries*, *86*(6), e12136.

Johnson, M. D., & Bradbury, T. N. (2015). Contributions of social learning theory to the promotion of healthy relationships: Asset or liability? *Journal of Family Theory & Review*, *7*(1), 13-27.

Joshua, S., Loromeke, R. E., & Olanrewaju, I. P. (2014). Quota system, federal character principle and admission to federal unity schools: Barriers to learning in Nigeria. *International journal of interdisciplinary and multidisciplinary studies (IJIMS)*, *2*(2), 1.

Joyce, O. O., & Francis, O. I. (2014). From the Universal Primary Education (UPE) to Universal Basic Education (UBE): Implications for counseling in primary and junior secondary schools in Nigeria. *International Journal of Psychology and Counselling*, *6*(7), 89-93.

Kalina, C., & Powell, K. (2009). Cognitive and social constructivism: Developing tools for an effective classroom. *Education*, *130*(2), 241-250.

Kamerman, S. B. (2007). A global history of early childhood education and care. *Background paper for EFA Global Monitoring Report*.

Kholmuminov, S., & Wright, R. E. (2017). Cost efficiency analysis of public higher education institutions in Uzbekistan.

Ksinan, A. J., Vazsonyi, A. T., Jiskrova, G. K., & Peugh, J. L. (2019). National ethnic and racial disparities in disciplinary practices: A contextual analysis in American secondary schools. *Journal of School Psychology*, *74*, 106-125.

Kuru Gönen, S. İ. (2019). A qualitative study on a situated experience of technology integration: Reflections from pre-service teachers and students. *Computer Assisted Language Learning*, *32*(3), 163-189.

Last, M. (2000). Children and the experience of violence: contrasting cultures of punishment in northern Nigeria. *Africa*, *70*(3), 359-393.

Li, G. (2017). From Absence to Affordances: Integrating Old and New Literacies in School-Based Instruction for English Learners. *Journal of Adolescent & Adult Literacy*, *61*(3), 241-246.

Li, Z. (2014). Rethinking the relationship between learner, learning contexts, and technology: a critique and exploration of Archer's morphogenetic approach. *Learning, Media and Technology*, *41*(3), 501-520. https://doi.org/10.1080/17439884.2014.978336

Liaw, M.-L. (2014). The affordance of speech recognition technology for EFL learning in an elementary school setting. *Innovation in Language Learning and Teaching*, *8*(1), 79-93. https://doi.org/10.1080/17501229.2012.756491

Lotz-Sisitka, H. (2009). Epistemological access as an open question in education. *Journal of Education*, *46*(1), 57-80.

Lowyck, J. (2014). Bridging learning theories and technology-enhanced environments: A critical appraisal of its history. *Handbook of research on educational communications and technology*, 3-20.

Luckett, K., & Hunma, A. (2014). Making gazes explicit: facilitating epistemic access in the Humanities. *Higher education*, *67*(2), 183-198.

Luo, H., Li, G., Feng, Q., Yang, Y., & Zuo, M. (2021). Virtual reality in K-12 and higher education: A systematic review of the literature from 2000 to 2019. *Journal of Computer Assisted Learning*, *37*(3), 887-901.

Ma, J., & Baum, S. (2016). Trends in community colleges: Enrollment, prices, student debt, and completion. *College board research brief*, *4*, 1-23.

Ma, M., Chen, J., Zheng, P., & Wu, Y. (2020). Factors affecting EFL teachers' affordance transfer of ICT resources in China. *Interactive Learning Environments*, 1-16.

Major, L., Smørdal, O., Warwick, P., Rasmussen, I., Cook, V., & Vrikki, M. (2022). Investigating digital technology's role in supporting classroom dialogue: integrating enacted affordance into analysis across a complex dataset. *International Journal of Research & Method in Education*, 1-19. https://doi.org/10.1080/1743727X.2022.2032632

Major, L., & Warwick, P. (2019). Affordances for dialogue: The role of digital technology in supporting productive classroom talk. In *The Routledge international handbook of research on dialogic education* (pp. 394-410). Routledge.

Major, L., Warwick, P., Rasmussen, I., Ludvigsen, S., & Cook, V. (2018). Classroom dialogue and digital technologies: A scoping review. *Education and Information Technologies*, *23*(5), 1995-2028.

Maniram, R. (2018). *Epistemological access and authentic learning practice: a case study in hospitality financial management*

Markus, M. L., & Silver, M. S. (2008). A foundation for the study of IT effects: A new look at DeSanctis and Poole's concepts of structural features and spirit. *Journal of the Association for Information Systems*, *9*(10), 5.

Mayer, K. J., & Sparrowe, R. T. (2013). Integrating Theories in AMJ Articles. *Academy of Management Journal*, *56*(4), 917-922. https://doi.org/10.5465/amj.2013.4004

McEvoy, P., & Richards, D. (2006). A critical realist rationale for using a combination of quantitative and qualitative methods. *Journal of research in Nursing*, *11*(1), 66-78.

McGee, R. W. (2023). What Will the United States Look Like in 2050? A ChatGPT Short Story. *A Chatgpt Short Story (April 8, 2023)*.

Morrow, W. E. (2009). *Bounds of democracy: Epistemological access in higher education.* . HSRC Press.

Motala, S., Dieltiens, V., & Sayed, Y. (2009). Physical access to schooling in South Africa: mapping dropout, repetition and age-grade progression in two districts. *Comparative education*, *45*(2), 251-263.

Okhuysen, G., & Bonardi, J.-P. (2011). The challenges of building theory by combining lenses. In (Vol. 36, pp. 6-11): Academy of Management Briarcliff Manor, NY.

Okobiah, O. S. (2002). *The educational imbalance between the northern and southern states of Nigeria: a re-direction of educational policies* (Vol. 2). Delta State University.

Oku, A., Oyo-Ita, A., Glenton, C., Fretheim, A., Eteng, G., Ames, H., Muloliwa, A., Kaufman, J., Hill, S., & Cliff, J. (2017). Factors affecting the implementation of childhood vaccination communication strategies in Nigeria: a qualitative study. *BMC public health*, *17*(1), 1-12.

Okwelogu, I., Mohammed, U., & Ogunode, N. (2021). Implementation of National Policy on Information Communication Technology (ICT) in Public Secondary Schools in Nigeria: Problems and Solutions. *Middle European Scientific Bulletin*, *19*, 147-157.

Oliveira, A., Feyzi Behnagh, R., Ni, L., Mohsinah, A. A., Burgess, K. J., & Guo, L. (2019). Emerging technologies as pedagogical tools for teaching and learning science: A literature review. *Human Behavior and Emerging Technologies*, *1*(2), 149-160.

Oluka, N. L. (2022). Covid-19, global crisis and the challenges of human security management in Nigeria. *Indonesian Journal of Advocacy and Legal Services*, *4*(1), 161-194.

Omar, I., & Chaudhry, M. S. (2019). University efforts for quality to ensure epistemological access. *UMT Education Review*, *2*(1), 81-105.

Omitola, B., Adedire, S., Akinrinde, O. O., Omodunbi, O., & Sackflame, M. M. (2021). The Triangle of Terror: Boko Haram, Fulani Herdsmen, Bandits and Organized Insecurity in Nigeria. *Studia Securitatis*, *15*(1), 21-33.

Ong, D., Chiu, S., Andrews, E., & Nadarajan, G. (2023). One needs to be reminded and motivated: mediating role of digital nudging for food waste reduction. *Journal of Social Marketing*, *13*(3), 449-471.

Ononiwu, C. G. (2015). Mechanisms for emergent usage of adaptive information systems: a critical realist case of e-financial systems in South Africa.

Ononiwu, C. G., & Brown, I. (2013). Theorisation in critical realist IS research and its implications on structure and agency interplay: a morphogenetic approach.

Ononiwu, C. G., Brown, I., & Carlsson, S. (2018). Theory choice in critical realist information systems research. UKAIS,

Onuka, A. O. (2008). Funding the Nigerian university education: The role of the various stakeholders. In: Citeseer.

Onuka, A. O. (2012). Challenges and prospects of continuous assessment implementation in rural schools in Nigeria: the teachers' perspective.

Onyema, E. M., Eucheria, N. C., Obafemi, F. A., Sen, S., Atonye, F. G., Sharma, A., & Alsayed, A. O. (2020). Impact of Coronavirus pandemic on education. *Journal of education and practice*, *11*(13), 108-121.

Parrish, A., Impagliazzo, J., Raj, R. K., Santos, H., Asghar, M. R., Jøsang, A., Pereira, T., & Stavrou, E. (2018). Global perspectives on cybersecurity education for

2030: a case for a meta-discipline. Proceedings companion of the 23rd annual ACM conference on innovation and technology in computer science education,

Peña-López, I. (2016). Innovating Education and Educating for Innovation. The Power of Digital Technologies and Skills.

Pirker, J., Dengel, A., Holly, M., & Safikhani, S. (2020). Virtual reality in computer science education: A systematic review. Proceedings of the 26th ACM symposium on virtual reality software and technology,

Pirker, J., Kopf, J., Kainz, A., Dengel, A., & Buchbauer, B. (2021). The potential of virtual reality for computer science education-engaging students through immersive visualizations. 2021 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW),

Prawat, R. S. (1992). Teachers' beliefs about teaching and learning: A constructivist perspective. *American journal of education*, *100*(3), 354-395.

Rambe, P., & Mawere, M. (2011). Barriers and constraints to epistemological access to online learning in Mozambique schools. *International Journal of Politics and Good Governance*, *2*(2.3).

Ramli, A., Zain, R. M., Campus, C., Chepa, P., & Bharu, K. (2018). The impact of facilities on students' academic achievement. *Sci. Int.(Lahore)*, *30*(2), 299-311.

Rivera, D. A., Frenay, M., & Swaen, V. (2023). The Learning Design of MOOC Discussion Forums: An Analysis of Forum Instructions and Their Role in Supporting the Social Construction of Knowledge. *Technology, Knowledge and Learning*. https://doi.org/10.1007/s10758-023-09670-w

Sams, A., & Bergmann, J. (2013). Flip your students' learning. *Educational leadership*, *70*(6), 16-20.

Saxena, D. (2019). The search for mechanisms in business research: Reflections on retroductive analysis in a multilevel critical realist case study. *Electronic Journal of Business Research Methods*, *17*(1), pp17-27-pp17-27.

Senyo, P. K., Effah, J., & Osabutey, E. L. (2021). Digital platformisation as public sector transformation strategy: A case of Ghana's paperless port. *Technological forecasting and social change*, *162*, 120387.

Siemens, G. (2012). MOOCs are really a platform. eLearnspace. In.

Silva, M. L. (2012). Camtasia in the classroom: Student attitudes and preferences for video commentary or Microsoft Word comments during the revision process. *Computers and Composition*, *29*(1), 1-22.

Smith, R., Parr, T., & Friston, K. J. (2019). Simulating emotions: An active inference model of emotional state inference and emotion concept learning. *Frontiers in Psychology*, *10*, 2844.

Stake, R. E. (2008). Qualitative case studies.

Steffens, K., Bannan, B., Dalgarno, B., Bartolomé, A. R., Esteve-González, V., & Cela-Ranilla, J. M. (2015). Recent Developments in Technology-Enhanced Learning: A Critical Assessment. *RUSC. Universities and Knowledge Society Journal*, *12*(2). https://doi.org/10.7238/rusc.v12i2.2453

Tan, S. C., Chan, C., Bielaczyc, K., Ma, L., Scardamalia, M., & Bereiter, C. (2021). Knowledge building: Aligning education with needs for knowledge creation in the digital age. *Educational Technology Research and Development*, 1-24.

Tolu, A. (2019). *In Focus: Education in Northern Nigeria*. https://toluasade.medium.com/in-focus-education-in-northern-nigeria-da0bfcb30be4

Tsang, E. W. (2013). Case study methodology: Causal explanation, contextualization, and theorizing. *Journal of international management*, *19*(2), 195-202.

Tsang, E. W. (2014). Case studies and generalization in information systems research: A critical realist perspective. *The Journal of Strategic Information Systems*, *23*(2), 174-186.

Umar, M. S. (2004). Mass Islamic Education and Emergence of Female 'ulamā'in Northern Nigeria: Background, Trends, and Consequences. In *The transmission of learning in Islamic Africa* (pp. 99-120). Brill.

Vogel, F., Kollar, I., Ufer, S., Reichersdorfer, E., Reiss, K., & Fischer, F. (2016). Developing argumentation skills in mathematics through computer-supported collaborative learning: The role of transactivity. *Instructional Science*, *44*, 477-500.

Vygotsky, L. (1978). Social development theory. *Instructional Design*.

Vygotsky, L., & Cole, M. (2018). Lev Vygotsky: Learning and social constructivism. *Learning theories for early years practice*, *66*, 58.

Vygotsky, L. S. (1962). The Development of Scientific Concepts in Childhood.

Wang, H., Wang, J., & Tang, Q. (2018). A review of application of affordance theory in information systems. *Journal of Service Science and Management*, *11*(01), 56.

Wankel, C., & Blessinger, P. (2013). *Increasing student engagement and retention in e-learning environments: Web 2.0 and blended learning technologies*. Emerald Group Publishing.

Wegerif, R., & Major, L. (2019). Buber, educational technology, and the expansion of dialogic space. *AI & society*, *34*(1), 109-119.

Woo, Y., & Reeves, T. C. (2007). Meaningful interaction in web-based learning: A social constructivist interpretation. *The Internet and Higher Education*, *10*(1), 15-25. https://doi.org/10.1016/j.iheduc.2006.10.005

Wright, N., & Wrigley, C. (2019). Broadening design-led education horizons: Conceptual insights and future research directions. *International Journal of Technology and Design Education*, *29*, 1-23.

Wynn, D. E. J., & Williams, C. K. (2020). Recent Advances and Opportunities for Improving Critical Realism-Based Case Study Research in IS. *Journal of the Association for Information Systems*, *21*(1). https://aisel.aisnet.org/jais/vol21/iss1/8

Wynn Jr, D., & Williams, C. K. (2012). Principles for conducting critical realist case study research in information systems. *MIS Quarterly*, 787-810.

Yarbrough, J. R. (2018). Adapting Adult Learning Theory to Support Innovative, Advanced, Online Learning--WVMD Model. *Research in Higher Education Journal*, *35*.

Yardi, S., & Bruckman, A. (2007). What is computing? Bridging the gap between teenagers' perceptions and graduate students' experiences. Proceedings of the third international workshop on Computing education research,

Yin, R. K. (2003). Design and methods. *Case study research*, *3*(9.2).

Yonezawa, A., Kitamura, Y., Meerman, A., & Kuroda, K. (2014). *The emergence of international dimensions in East Asian higher education: Pursuing regional and global development*. Springer.

Yuan, E. R. (2017). Exploring university-based teacher educators' teaching beliefs and practice: A Hong Kong study. *Teaching in Higher Education*, *22*(3), 259-273.

Yusuf, M. A., & Zakari, L. (2023). Non-Formal Education Options for Addressing Security Challenges in North-East and North-West Nigeria. *IJIET (International Journal of Indonesian Education and Teaching)*, *7*(1), 121-135.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators? *International Journal of Educational Technology in Higher Education*, *16*(1), 1-27.

Zhang, X., Chen, Q., Ng, R., & Koltun, V. (2019). Zoom to learn, learn to zoom. Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition,