Virtual Reality and Open Schooling: Challenges and Opportunities

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Abstract

Virtual Reality (VR) literature exists in relation to education, but the disruption caused by the Coronavirus disease 19 (COVID-19) ensuing in a global pandemic has forced a paradigm shift to online teaching and learning to sustain the educational sector. Due to this, the scope in studying open schooling (OS) needs to be extended to further understand VR in relation to OS. The aim of this paper is to examine virtual reality and open schooling and specifically analyze VR technologies and OS programmes focusing on challenges and opportunities in the context of Africa. This paper applied a literature review method complemented by content analysis. The findings revealed that there are challenges in the use of VR technologies in OS programmes including access, lack of collaboration and policies while opportunities such as education opportunity for women and girls, investment in technology, and spill-over effects of kno-whow in operating VR technologies and OS which use Open Distance Learning (ODL) services. This implies that stakeholders in education should aim at embracing VR technologies in OS programmes to sustain open schooling within Africa.

Keywords: *open schooling, virtual reality, odl, africa*

Introduction

Open schooling was meant to transform schools into innovation hubs within their local communities (Sotiriou, Sotiriou, & Bogner, 2021). A good example of open schooling operating successfully is the National Institute of Open Schooling (NIOS) in India which was established in 1990 (Andrade, 2008). Likewise, African countries in Sub-Saharan Africa such as Mauritius, Namibia, Seychelles, South Africa and Zimbabwe are operating different forms of open schooling for purposes of enabling access and quality education in secondary schools (Komakech, 2017). However, due to the global COVID-19 pandemic, many schools in the world including in Africa were closed (Owolabi, 2020). The closure of schools around the world forced teaching and learning to be completely online and various technologies such as mooKIT were introduced to train teachers on cooperative learning techniques (Garcha, Mkwizu & Sharma, 2021). Thus, the paradigm shift from traditional to online. This kind of shift comes with its own challenges and opportunities.

While technologies like virtual reality are considered niche (Mathysen & Gloriex, 2021) Akaslan (2020) noted that virtual reality in education and training can motivate students. On the other hand, Ornek (2020) shared that the COVID-19 pandemic can use and apply virtual reality technologies for collaborative designs. So, it is inevitable that the scope in studying open schooling needs to be extended to further

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understand virtual reality and open schooling particularly during this pandemic-induced paradigm shift from traditional to online in the education sector. Therefore, the aim of this paper is to examine virtual reality and open schooling and specifically, virtual reality technologies and open schooling programmes focusing on challenges and opportunities in the context of Africa. The significance of this study is for education stakeholders to consider the challenges and opportunities in virtual reality technologies and open schooling programmes to improve open schooling.

Literature Review

Virtual Reality

Virtual Reality describes different technologies (Mathysen & Gloriex, 2021). The term virtual reality is defined as individuals finding themselves in a virtual environment through the use of tools (Carrozzino & Bergamasco, 2010; Çavaş, Cavas, & Can, 2004; Yildirim, Elban, & Yildrim, 2018). Virtual Reality is also described as a simulation of objects or persons that belong to the past, present or future for purposes of being displayed in digital media (Akaslan, Balak, & Ernst, 2020). The description of virtual reality is about computer images and sounds that make people feel an imagined situation is real (Akaslan, 2020). This paper adopts the definition by Carrozzino and Bergamasco (2010), Cavas and Can (2004), and Yildirim, Elban, and Yildrim (2018).

Kandemir et al. (2020) have defined virtual reality as a technology with which users can experience and interact in virtual spaces in two or three dimensions using specialised glasses. Indeed, the concept of virtual reality has been connected to technologies and thus virtual reality technologies as evidenced in the study by Aydin and Akin (2020) and Yildirim, Elban and Yildrim (2018), virtual reality technologies have been developed and are used in the education sector already. In fact, Oyelere et al. (2020) highlighted that virtual reality is a popular teaching and learning tool for different disciplines. A good example of virtual reality technologies includes virtual reality technology glasses (Yildirim, Elban, & Yildrim, 2018).

Open Schooling

Open schooling is when learners study specially designed open learning materials on their own and meet the facilitator regularly whereas open means openness of the system (Rumble & Koul, 2007). According to Komakech (2017), the Commonwealth of Learning (CoL) uses the terminology of open schooling more willingly than open and distance learning for the reason that openness and flexibility are important as opposed to physical separation. This paper defines open schooling by modifying the open schooling definition by Rumble and Koul (2007) to accommodate the virtual world and therefore, open schooling is referred to as learners who study special designed open learning materials on their own and meet facilitators regularly either physically or virtually. Various countries in Africa such as Uganda and Zimbabwe operate open schooling and the open schooling programmes are mainly correspondence programmes (Komakech, 2017).

Theory-framing

The theory guiding this paper is the resource-based theory developed by Barney (1991) with the assumption that a firm's performance is explained by the way its remarkable resources are managed. Zica et al. (2016) further noted that the resource-based theory guides the managers of strategic thinking and explains why some firms are able to expand markets, achieve higher profits and maintain competitive advantage compared to others within the same industry. Due to the COVID-19 pandemic, all sectors have been affected including the education sector and therefore, managing resources is crucial. Schools and particularly open schooling that offer ODL services have programmes and therefore, open schooling programmes are resources.

Equally, technologies can assist firms or the education sector to sustain the teaching and learning activities. For example, Akaslan (2020) emphasised that using virtual reality technologies in education can motivate students. As the resource-based theory is hinged on resources, this study adopts the resource-based theory to guide the analysis of virtual reality technologies and open schooling programmes in terms of challenges and opportunities.

Virtual Reality Technologies and Open Schooling Programmes

Globally, Mystakidis, Berki and Valtanen (2021) noted that there are studies involving virtual worlds based on primary or secondary schools and these include Hew and Cheung (2010), Inman, Wright, and Hartman (2011), Merchant et al. (2014), Pellas et al. (2017), and Pellas and Mystakidis (2020). The study by Pellas and Mystakidis (2020) was interested in game-based learning features, instructional models, effectiveness, benefits and challenges whereas Merchant et al. (2014) concentrated on the effect and impact of instructional design principles. On the other hand, Pellas and Mystakidis studied virtual reality as a social virtual reality in higher learning institutions and found challenges in the use of social virtual reality which include engaging, motivating environments and collaborative interactions. However, this paper is more interested in virtual reality and open schooling in terms of challenges and opportunities.

In furthering the scope of virtual worlds, other studies and reports (Adiguzel, 2020; Akaslan, 2020; Akaslan, Balak & Ernst, 2020; Aydileki, 2020; Aydin & Akin, 2020; Balak & Kisa, 2020; Barteit et al., 2021; Halacoglu, 2020; Holat, 2020; Holder & Bethea-Hampton, 2018; Kaymak & Atac, 2020; Kirbac, 2020; Kocaman, 2020; Lahwal, 2020; Lamb, Lin, & Firestone, 2020; Muzammal, 2020; Ornek, 2020; Oyelere et al., 2020; Sharma, 2020; Sharma, 2020; Sarman, Tucay, & Sarman, 2020; Sariisik, 2020; Setiawan, 2020; Yerden, 2020) investigated virtual reality in computer engineering, education, occupational safety, science, business, movies, nursing, smart grid systems, medical, block chain technologies architecture, open educational resources, and schools. For instance, Kirbac (2020) noted that there are a number of challenges in virtual reality application in businesses and these include technology installation, adaptation costs, lack of specialist professionals and staff, lack of knowledge and management resistance to change against new technologies.

Whilst a plethora of studies in virtual reality exist, there are limited studies on virtual reality technologies and open schooling programmes in the context of Africa. Examples of virtual reality technologies include

virtual reality glasses (Akaslan, Balak, & Ernst, 2020), a project in Turkey designing and implementing virtual reality glasses that are easily accessible, portable, interactive and above all affordable. Subsequently, Sharma (2020) mentioned virtual reality technologies and school education in India and highlighted challenges such as the nascent stage of virtual reality technology which is available only for commercial purposes, and that the cost for development and dissemination of virtual reality content is another factor. The use of cheap virtual reality headsets and the application of cost-effective hardware and software enables learners to capture virtual reality content (Sharma, 2020). Furthermore, Sharma (2020) added that teachers were trained to develop virtual reality content within their surroundings for monuments. Conversely, there are few studies in Africa on virtual reality technologies and open schooling programmes.

Past scholars like Evans and Acosta (2021) stated that education is expanding in Africa. With this expansion, open schooling is inevitably part of the education growth. Use of technologies for open schooling has been documented in the past in studies such as Anita (2010) and noted that among the barriers for open schooling in India included course materials and counseling on choice of subjects. On the other hand, in Africa, those finishing open schooling are able to proceed to both ODL and non-ODL institutions. Examples of ODL institutions in Africa include The Open University of Tanzania in Tanzania, University of South Africa in South Africa, Zimbabwe Open University in Zimbabwe and University of Nigeria in Nigeria (Mkwizu & Ngaruko, 2019, 2020; Musingafi et al., 2015).

In South Africa, Stanfield (2014) stated that Sub-Saharan Africa can learn from NIOS in India. Furthermore, Stanfield (2014) noted that the potential of open schooling in Africa using ODL services at minimum costs is possible provided that the governments for the respective countries manage and can generate a surplus. In Ghana, Tagoe (2014) mentioned that the old paradigm of physical expansion dominates policies of access and the success of open schooling programmes lies on strong policies and commitment from the government as well as huge investment in technology. In Kenya, virtual reality technologies are used to give school children a glimpse into science research (The African Academy of Science, 2020). However, most of the studies like Jantjies, Moodley, and Maart (2018) and Ntaba and Jantjies (2019) on virtual reality in Africa are focused on higher education as opposed to secondary schools with reference to open schooling. For example, Jantjies, Moodley and Maart (2018) examined experiential learning through virtual reality in higher education with emphasis on the role of virtual reality technologies in enhancing experiential learning.

Challenges and Opportunities

From the literature, it is evident that there are challenges and opportunities in virtual reality technologies and open schooling. Table 9.1 summarises the challenges and opportunities of Virtual Reality (VR) and Open Schooling (OS) from some of the African countries.

Table 9.1 : Summary of challenges and opportunities on VR and OS

Author(s)	Country	Challenges	Opportunities
Stanfield (2014)	South Africa		The open schooling in Africa can learn from NIOS
Tagoe 2014)	Ghana	Access, equity, quality, low transition rates from primary to junior high school to senior high school.	Strong policies, government commitment, huge investment in technology.
Siaciwena (nd)	Zambia	Lack of collaboration for OS programmes, lack of staff for development of programmes, and lack of comprehensive policies on OS.	OS programmes can expand and improve educational opportunities for women and girls.
Komakech (2017)	Uganda	OS programmes viewed as second class.	Provides education access and quality. Reduced cost of education. Increase student enrollment. Flexibility in studying and examination.
UNICEF (2018)	Ghana		The Nubian VR has the potential to act as a leveraging technology for education stakeholders to circumvent the physical barriers that prevent children from attaining quality education.
The Africa Academy of Science (2020)	Kenya	Virtual reality technologies are used to communicate research only with school children.	VR technologies can be used beyond science communication.

Source: Compiled from literature

Methodology

The application of a literature review method complemented by content analysis revealed findings which enabled this study to analyse the relevant information gathered on virtual reality and open schooling using journals, conference papers and books. A literature review method is popular in research and has been used in many studies to investigate issues and various phenomena in the education field such as Flavin and Bhandari (2021), Mkwizu and Mtae (2021), Turnbull, Chugh and Luck (2020). For instance, the study by Flavin and Bhandari (2021) on Virtual Learning Environments (VLEs) which deployed a literature review approach as a methodology and found that most of the research on VLE is quantitative and oriented towards students. On the other hand, Turnbull et al. (2020) applied a literature review method and found that the research design deployed by Chinese studies are more quantitative than those conducted by Australians.

Whilst various studies and reports (Flavin & Bhandari, 2021; Mkwizu & Mtae, 2021; Turnbull, Chugh, & Luck, 2020; USAID & Health Communication Capacity Collaborative, 2014) have incorporated the literature review method in conducting research, this study complements the literature review method with content analysis. Solak and Erdem (2015) used content analysis and found that document analysis was the most applied data collection tool in research papers that did study foreign language learning and teaching using virtual reality. This paper also uses content analysis to identify challenges and opportunities emanating from the literature review that has documented virtual reality technologies and open schooling programmes.

Findings and Discussion

The findings reveal that there are limited studies of virtual reality technologies in Africa and open schooling programmes. The literature on virtual reality in Africa is mostly from scholars in South Africa which implies that more research is needed to unveil the challenges and opportunities of virtual reality technologies and open schooling programmes in other countries of Africa. The findings on limited literature echo Mkwizu (2019) that collaborative research is key for Africa to move forward in terms generating knowledge for the continent. The collaborative research through co-authorship is also amplified in a study by Mkwizu and Ngaruko (2020). Furthermore, most of the literature is centered on open schooling in general while few studies covered open schooling programmes. For instance, in Uganda, the study by Komakech (2014) narrated that one of the challenges for open schooling programmes was that it is viewed as second class programmes. Despite the negative view of open schooling programmes, there are many opportunities of open schooling programmes in Uganda which include accessibility, flexibility, reduced costs and increased enrolment.

Siaciwena (nd) and Tagoe (2014) noted that other African countries like Zambia and Ghana have challenges for open schooling programmes which include access, equity, quality, collaboration and lack of staff for development of open schooling programmes as well as inadequate policies. The lack of staff for open schooling progammes signify that there is need to train more staff. By training more staff it means the staff will have the ability to develop new programmes. Interestingly, in Zambia, open schooling programmes serve as an education opportunity for women and girls. Challenges of virtual reality technologies are noted in Kenya as evidenced by The African Academy of Science (2020) that virtual reality is only utilized to communicate research with school children whereas the opportunity of virtual reality can be beyond science communication. In Ghana, the virtual reality technology of Nubian VR as indicated in UNICEF (2018) has the opportunity to overcome the barrier of education quality for children.

From the literature and the lens of resource-based theory, it is also evident that both tangible and intangible resources like lack of staff for development of open schooling programmes and inadequate policies are at play thus preventing the competitiveness of open schooling in Africa. However, there are opportunities for Africa in terms of virtual reality technologies and open schooling programmes and these are; access and flexibility of open schooling programmes, reduced costs, utilisation of virtual reality beyond science communication, formulating strong policies and investment in technology supported by government

commitments. Stanfield (2014) recommended for open schooling in Africa to learn from NIOS in India. Hence, many countries in Africa including Botswana, Ethiopia, Egypt, Nigeria and Tanzania can learn from NIOS. Learning from NIOS imply that there will be spill-over effects in terms of transfer of knowhow in conducting and operating open schooling programmes using Open and Distance Learning (ODL) services.

Conclusion

In examining virtual reality and open schooling, this paper's specific objective was to analyse virtual reality technologies and open schooling programmes focusing on challenges and opportunities for Africa. In the context of Africa, the challenges include lack of collaboration, inadequate policies, access, equity, and lack of staff for development of open schooling programmes. On the other hand, there are opportunities in using virtual reality technologies such as Nubian VR which can assist in education quality for school children. Additionally, the opportunities for open schooling programmes include investment in technology, education for women and girls, and learning from NIOS hence the spill-over effects in terms of transfer of know how in conducting and operating open schooling programmes using Open and Distance Learning (ODL) services.

Implications, limitations and suggestions for future studies

The implication for education stakeholders is that the COVID-19 global pandemic has shifted the paradigm in education from traditional methods to online and therefore, there should be efforts to embrace virtual reality technologies in open schooling programmes in order to sustain open schooling within Africa. Furthermore, guided by the resource-based theory, the lack of staff for development of open schooling programmes provides the opportunity for education stakeholders to roll out training programmes for staff and thus implying investment in staff as an important resource to gain competitiveness of open schooling in Africa. Limitations for this study involved the use of literature review method and content analysis. Future studies may consider the use of qualitative and quantitative methods.

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