Augmented Reality and Education for Girls: An Inclusive Approach

Abstract

Education has been shaken globally due to the 2019 novel coronavirus (COVID-19) pandemic causing schools to close and thus constraining many learners with limited access to the traditional way of learning by attending classes physically. UNESCO revealed that school closures and learning loss across the globe from the pandemic reached 54 million in January 2022. Girls worldwide have limited access to education and the pandemic has made it extra difficult because of school closures. The school closures and the transition to online learning necessitated the use of technologies. The application of virtual technologies, like augmented reality (AR), in education can improve and sustain online learning to reach and engage girls in education. With the rise in the importance of AR, this paper is motivated to explore AR and education for girls with a focus on the inclusive approach. Literature review and content analysis are the methodologies used for a comparative study between the Indian and Tanzanian education systems with findings indicating that AR technologies particularly AR mobile technologies could be a valuable technology for girls’ education to make the learning process fun, interactive and educative. The findings of this paper can assist education practitioners to use AR in education as an inclusive approach to widen the provision of education for girls.

Keywords: augmented reality, education, girls

Introduction

Education has been disrupted globally by the 2019 novel coronavirus (COVID-19) pandemic causing schools to close and thus constraining many learners with limited access to the traditional way of learning by attending classes physically (Charles, 2022; Deshmukh & Shrouty, 2022; Singh et al, 2022). The disruption of education from closure of schools and higher education institutions has also been documented by many scholars as well as in reports and books including Aheto (2021), Bhandigadi et al. (2021), Byker (2021), Daniel (2021), Figueroa and Michel (2022), Junio-Sabio (2021), Mkuzw (2022), Ola and Osiah (2022), Panigrahi and Bhandigadi (2022), Singh et al. (2022) and Ugur and Kurubacak (2021). Other scholars and particularly Bordoloi and Das (2021) noted that open education is one of the most viable means to cater to the needs of the learners. In fact, Daniel (2022) stated that the COVID-19 pandemic has reversed the years of progress for children to compete their primary and secondary education. The study by Deshmukh and Shrouty (2022) added that during the lockdowns, the learners’ homes became schools as the learners attended online classes through delivery modes like Zoom, Google meet, Webex and Microsoft teams.

On the other hand, the United Nations Educational, Scientific and Cultural Organization (UNESCO) revealed that the school closures and learning loss across the globe from the pandemic reached 54 million learners in January 2022 (UNESCO, 2022). Pre-pandemic, girls worldwide have had limited access to education. The global pandemic has escalated this problem further by making it extra difficult to fully access education because of the closed schools. Bao (2020) noted that students faced many challenges during the self-isolation period as a result of COVID-19 pandemic. According to Singh et al. (2022), Zoom and WhatsApp were identified as the most effective online tools of digital technologies that were adopted for purposes of online teaching and assessment during the pandemic in Africa. Additionally, other digital technologies to assist education can include augmented reality.

Augmented reality is also used in education (Gaol & Prassolova-Forland, 2022; Hincapie et al., 2021), and can increase academic success (Tosik & Atasey, 2017). The use of augmented reality has shown to significantly increase students’ achievement and attitudes towards science courses (Cetin & Turkcan, 2021). Therefore, with the rise in the importance of augmented reality, this paper is motivated and guided by the inclusive theory to explore augmented reality and education for girls in India and Tanzania. The education system in these two countries were also disrupted by the COVID-19 pandemic leading to schools being closed. Therefore, the developed research question for this paper is: Are augmented reality technologies and education for girls inclusive? The significance of this paper is for practitioners in the education sector to improve online learning through the use augmented
reality in education as an inclusive approach for purposes of widening the provision of education for girls.

**Literature Review**

**Education for Girls**

Gezer (2017) stated that at the moment the education system does not prepare students for citizen opportunities that are awaiting them in the 21st century. Naziev (2017) referred to education as the socially organized and regulated process of continuous transference of socially significant experience from previous to the following generations. From the dictionary perspective, the Dictionary.com (2022) has defined the concept of education as the act or process of imparting knowledge especially at a school, college or university. In this paper education is connected to girls and therefore, the term education for girls refers to imparting knowledge to girls in a school setting.

**Augmented Reality**

Augmented reality is described by Yilmaz (2021) as virtual objects that can be identified by their behaviour. Previous scholars like Akçayır and Akçayır (2017) and Dalim et al. (2017) defined augmented reality as a computer-generated image that overlays virtual objects into the real world. In 2020, Leung and Blauw defined augmented reality as three-dimensional technology that supports individuals to understand and perceive the real world surrounded by objects created in a virtual environment. This study adopts the definition of augmented reality by Leung and Blauw (2020). An example of augmented reality technologies is the augmented reality mobile technology which is a self-learning technology (Uymaz & Yilmaz, 2022). For instance, in clinical nursing, the augmented reality technology allows students study virtual organs and that students do not just passively receive knowledge as well as actively practice it (Uymaz & Yilmaz, 2022). Additionally, the augmented reality technology is a structural tool which helps to improve multiple skills, attitudes and behaviours (El-Ghandour et al., 2020; Fernández-García, 2021; He et al., 2018).

**Theory frame**

The social-constructionist theory is connected to inclusive education (Rapp & Corral-Granados, 2021). The social-constructionist theory was developed by Berger and Luckman (1966) which assumes that people socially construct institutions through their everyday communication with each other. Various scholars (Armstrong, 2019; Carrington et al., 2020; Jamero, 2019; Rapp & Corral-Granados, 2021) have applied the social-constructionist theory to investigate issues such as childhood education, inclusion, inclusive education, professional practices, social norms and tools. Rapp and Corral-Granados (2021) applied the social-constructionist theory and suggested that social systems are socially constructed by norms and institutions like policies.

From a social-constructionist theory, the schools by the sheer presence of COVID-19 pandemic measures of lockdown and closures meant that children were excluded from their education delivered in a traditional way. Corbett (1999) stated that schools are obliged to ensure inclusive education. Therefore, in the pandemic, the schools as institutions of education were forced to go completely online thus applying various technologies to sustain education like augmented reality.

Augmented reality does provide unique learning experiences and offers new forms of interactivity with content, improved visualisations of scientific phenomena and reduced cognitive load (Avila-Garzon et al., 2021). In view of the statement by Avila-Garzon et al. (2021), and also the adverse effects of the COVID-19 global pandemic on learners, this study was motivated and guided by the inclusiveness from a social-constructionist theory to explore augmented reality and education for girls focusing on inclusive approach.

**Augmented Reality and Education for Girls**

A report by GSM Association (GSMA) documented that female ownership of mobile devices was 23% in South Asia and 13% in Sub-Saharan Africa (GSMA, 2020). The two countries investigated in this study are India in South Asia, and Tanzania in Sub-Saharan Africa. Yilmaz (2021) stated that the effective use of augmented reality is dependent on good integration with the learning environment. This paper explores augmented reality and education for girls with a focus on inclusive approach by comparing India and Tanzania.
**Augmented Reality and Education for Girls in India**

India’s schools and higher education were heavily affected by the COVID-19 Pandemic (Panigrahi & Bhandigadi, 2022). According to Panigrahi and Bhandigadi (2022), there are a number of challenges for online education such as infrastructure and connectivity, engaging e-learning content and interactive platforms as well as integrating SWAYAM with already existing popular platforms.

Sarkar and Pillai (2019) conducted a study on augmented reality using the sample of parents, teachers and students in India. The 34 students were private schools in standard 4 to 9 and where 17 were male students and 17 were female students. From the students, it was found that only 4 students from the higher classes were familiar with augmented reality technology. However, the four students had not explored augmented reality-based mobile applications. The some of the characteristics from the augmented reality experience include informative, visual cues, dynamic, developing interest, creative instances, playfulness, and immersive. They advocate using the augmented reality experience from the three user groups in the Indian school education to develop educational augmented reality applications.

**Augmented Reality and Education for Girls in Tanzania**

The education system in Tanzania was adversely affected by the COVID-19 pandemic and this caused the problem of school closures (Charles, 2022; Manyengo, 2021; Mkwizu, 2022; Urio et al., 2021). One of the projects at the Institute of Adult Education in Tanzania is the implementation of the Secondary Education for Out of School Adolescent Girls (SEOSAG) in Tanga region (Institute of Adult Education, 2022). These are commendable efforts by the Institute of Adult Education towards enabling education for girls in Tanzania. Despite the efforts by the Institute of Adult Education, studies like Manyengo (2021) conducted in Tanzania during the emergency remote learning which was induced by the COVID-19 pandemic revealed that some girls missed radio or TV lessons due to household responsibilities while others were victims of early pregnancies as well as early marriages. The barriers highlighted by Manyengo signify that girls faced educational challenges during the pandemic.

Tanzania national digitalisation policy supports a conducive digital environment with affordability and accessibility issues (Kommers et al., 2021). However, Manyengo (2021) stated barriers in accessing education during the COVID-19 pandemic for school children included limited access to electricity, digital divide, digital devices, internet connectivity, computers and smart phones. Additionally, Kommers et al. (2021) reported that 34% of Tanzanian students had access to a computer. Angelina et al. (2019) found that majority of their study’s respondents (87.4%) agreed that virtual and augmented reality can be adopted to improve interactive learning.

**Methods**

Literature review and content analysis are the methodologies used for a comparative study between India and Tanzania. The literature review method constituted gathering literature involving augmented reality and education for girls. The information was reviewed from books, journal articles, conferences and reports. The content gathered from the reviewed literature was analysed using content analysis for purposes of a vailing information on exploring the augmented reality and education for girls from the inclusive approach perspective.

**Findings and Discussion**

From the reviewed literature, Table 1 represents some of the relevant information on augmented reality and education for girls for India and Tanzania.
Table 1: Augmented reality and education for girls India Vs Tanzania

<table>
<thead>
<tr>
<th>India</th>
<th>Tanzania</th>
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<tr>
<td>4 students were familiar with augmented reality technology but had not explored augmented reality-based mobile application (Sarkar &amp; Pillai, 2019).</td>
<td>Some of the girls missed radio or TV lessons due to household responsibilities while other girls were victims of early pregnancies and early marriages (Manyengo, 2021)</td>
</tr>
<tr>
<td>Challenges for online education are infrastructure, connectivity, engaging e-learning content, interactive platforms, integrating SWAYAM in popular platforms (Panigrahi &amp; Bhandigadi, 2022).</td>
<td>Barriers in accessing education during the COVID-19 pandemic for school children included limited access to electricity, digital divide, digital devices, internet connectivity, computers and smart phones (Manyengo, 2021).</td>
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<tr>
<td>Gender gap in mobile ownership in South Asia 23% (GSMA, 2020).</td>
<td>Gender gap in mobile ownership in Sub-Saharan Africa 13% (GSMA, 2020).</td>
</tr>
</tbody>
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Source: Compiled from GSMA (2020), Manyengo (2021), Panigrahi and Bhandigadi (2022) and Sarkar and Pillai (2019).

Findings from the literature on India has shown that augmented reality technologies are used however, the some of the students are not familiar with augmented reality based mobile applications. This implies that there should be efforts to ensure that augmented reality is made familiar in education for girls. From the reviewed literature in respect to Tanzania has shown that education for girls was disrupted during the COVID-19 pandemic and although efforts were made to assist delivery of education through radio and TV lessons, issues of “digital divide”, “early pregnancies” and “early marriages” were noted by scholars. However, in the digital divide, there is limited studies or no research on augmented reality technologies as digital tools that can be included to enhance education for girls.

Therefore, in comparing India and Tanzania, it is clear that the findings indicate a similarity in that there is less use of augmented reality technologies in education for girls for both countries. Some of the challenges and barriers posed by scholars such as GSMA (2020), Manyengo (2021) and Panigrahi and Bhandigadi (2022) could perhaps contribute to less use of augmented reality in the education for India and Tanzania. This further shows that there is need to use and apply augmented reality technologies particularly augmented reality mobile technologies in education for girls to make the learning process fun, interactive and educative.

Based on the GSMA (2020) regional data, this implies that the differences between India and Tanzania in the digital divide gender-wise in mobile ownership is higher in India than in Tanzania which means that India needs to put more efforts to realize the use of augmented reality mobile technologies for purposes of education for girls which is inclusive.

From the inclusive perspective of social-constructionist theory, the findings reveal that augmented reality and in particular augmented reality technologies such as augmented reality-based mobile applications can provide experiences of learning that fun and interactive in education for girls. However, its inclusiveness in the pandemic faced barriers such as limited access to mobiles, electricity, infrastructure and connectivity among others.

Conclusion

Augmented reality technologies are less used although its potential has been documented past scholars in India and Tanzania. Therefore, augmented reality technologies and education for girls need to be inclusive in order to improve education in the post COVID-19 pandemic. The use of augmented reality
technologies such as augmented reality based mobile application may be hindered due to differences in terms of the digital divide gender-wise in mobile ownership which has been shown by GSMA (2020) to be higher in India than in Tanzania which means that India needs to put more efforts to realize the use of augmented reality mobile technologies for purposes of education for girls which is inclusive thus aligning with the inclusive perspective guided by the social-constructionist theory.

This paper has practical implications which are for the respective countries to invest in infrastructure to support technologies such as augmented reality, and for the education practitioners to use augmented reality in education as an inclusive approach to widen the provision of education for girls. This study was limited to literature review and content analysis. Future studies may apply quantitative and qualitative approaches.

References


