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Augmented reality for inclusive growth in education: the challenges

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Abstract

Purpose – Inclusive growth in the education sector is still a major challenge in some countries because of limited access to technologies and internet connectivity, among other reasons. However, as a technology, augmented reality (AR) is expected to be widely used in the field of education in the future. The main purpose of this paper is to explore the use of AR for inclusive growth in education as well as identify the challenges, particularly in countries like India and Tanzania.

Design/methodology/approach – This paper applies a systematic literature review by analysing and synthesising relevant documents, mainly journal articles, books and conference papers. Descriptive statistics and cross-tabulation were used for the analysis. Content analysis was used to evaluate the contents of the reviewed literature.

Findings – For the use of AR, it is important to have adequate digital infrastructure, access to universal internet or broadband facilities and the digital empowerment of citizens. Major challenges to inclusive growth in education include the lack of trained teacher educators and students' preference for practical or project-based curriculum.

Practical implications – Practitioners in both countries may consider the use of AR for inclusive growth in education.

Originality/value – This paper specifically examines the use of AR in higher education and the related challenges based on a review of two countries, namely India and Tanzania.

Keywords Augmented reality, Inclusive growth, Education, India, Tanzania

Paper type Research paper

1. Introduction

Higher education can aid inclusive growth by supplying skilled manpower, boosting productivity and expanding job opportunities. Inclusive growth seeks to empower people through employment, skill investment, reducing poverty, modernizing the labour market and providing social protection. Sakamoto (2019, p. 69) advocated for building skills for inclusive growth. Parvin (2018, p. 473) defines inclusive growth from an economic perspective as equitable opportunities. Similarly, inclusive growth in relation to education and skills should focus on developing new programmes that integrate skills for India (Maclean *et al.*, 2017, p. 42). In West Africa, Adeniyi *et al.* (2021, p. 163) opined that attention to quality is important for policy design in order to achieve inclusive growth in education. Technology is critical to advancing the education sector. However, technology has challenges too. Bozkurt (2023, p. 200) commented that there are prospects in generative artificial intelligence (AI) like ChatGPT for advancing the field of language. Within the education literature, Koutromanos *et al.* (2023, p. 1) argued that the acceptance of mobile augmented reality for future teachers is

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dependent on perceived enjoyment and usefulness. On the other hand, Rachman *et al.* (2024, p. 170) advocated for more studies to be done in order to shed light on the impact of AR technologies on education. Open and distance learning (ODL) institutions are no exception; therefore, this study considers ODL institutions with reference to the use of AR.

Augmented reality (AR) enhances ODL by integrating virtual elements into educational experiences and offering interactive and immersive learning environments remotely. ODL and AR have been studied by Altinpulluk *et al.* (2020, p. 303), and the recommendation was for more studies to understand the use of AR in ODL institutions. Based on the challenges of technology and concerns about inclusive growth in education as well as the impact of AR on education, this paper is motivated to expand the literature on education by exploring the use of AR for inclusive growth in education and identifying its challenges. Hence, guided by social constructionist theory, the specific objective of this paper is to explore the use of AR and the challenges of inclusive growth in education in two countries, namely India and Tanzania. The findings of this paper will be significant to educational practitioners in both countries in integrating AR for inclusive growth in education.

2. Augmented reality

The term AR has been defined by different scholars. According to Avila-Garzon *et al.* (2021, p. 2), AR is a technology that complements the real-world environment by overlaying digital objects onto it. Mayilyan (2019, p. 1) defined AR as a technology having the ability to augment the real world with realistic virtual information in various forms, like multimedia contents and provide new possibilities for educational outcomes. Mkwizu (2023, p. 45) referred to AR as the combination of the virtual and real worlds using devices such as mobile phones. This paper adopts the definition of AR provided by Mayilyan (2019, p. 1).

3. Inclusive growth in education

Inclusive growth mostly refers to the equitable opportunities and direct links between macro- and microeconomic determinants of the economy and economic growth (Parvin, 2018, p. 473). The concept of inclusive growth, as discussed by Cerra (2021, p. 8), implies three major components, which are strong economic growth, inclusivity and sustainability. Furthermore, inclusive growth in education in relation to technology integration, particularly AR, in universities is considered to have challenges and positives. For instance, Al-Ansi *et al.* (2023, p. 8) referred to the challenges of technology implementation, which include accessibility, scalability and high costs. On the other hand, Hajirasouli and Banihashemi (2022, p. 1) confirmed AR application in the fields of architecture and construction education. In terms of self-efficacy in higher education, the study by O'Connor and Mahony (2023, p. 1) shows that AR positively impacts students' academic self-efficacy. Other positive uses of AR in higher education include the application of AR games to enhance self-learning and promote active engagement among students (Rios *et al.*, 2023, p. 343). More research by Rachman *et al.* (2024, p. 170) examined AR and its benefits to improve learning, but the study was confined to high schools and not higher education. However, technological advancement, particularly AR, means that higher education needs to integrate such technologies into its teaching–learning activities. The integration of technologies for teaching-learning purposes implies that both teachers and learners are required to have the ability to use these technologies, including AR. With the challenges of technology implementation already mentioned by Al-Ansi *et al.* (2023, p. 8), this paper seeks to define inclusive growth in education in relation to the ability to use AR within higher education.

4. Theory framing

In 1991, Berger and Luckman, the originators of the social constructionist theory, assumed that people engage and construct their everyday communication with each other (Zhao, 2020,

p. 98). Therefore, developing the social-constructionist theory entails an understanding of how humans communicate using the two key concepts – engagement and construction. With reference to the social constructionist theory in relation to AR use and inclusive growth in education, this paper considers that higher education needs to continuously integrate technology into its teaching–learning activities. Therefore, using technologies like AR can be socially constructed for the purpose of inclusive growth in the field of education. While the goal of Phillips (2023, p. 174) was to use social constructionist theory to examine specific knowledge systems, this study focuses on exploring the use of AR and inclusive growth in education. Similarly, educational communities are engaging socially in the growth of higher learning institutions through myriad modes of communication. However, this paper calls for more engagement in AR usage for inclusive growth in education. In addition, previous scholars such as Rapp and Corral-Granados (2021, p. 427) mentioned that in theoretical framing, the understanding of inclusive education can stem from social constructionist theory. In this paper, the application of the social constructionist theory is connected not only with inclusive education but also with inclusive growth in higher education in relation to the ability to use AR given the constraints of the existing digital disparities in education.

The application of social constructionist theory is evident in a number of studies, some of which include Akpan *et al.* (2020, p. 49). Interestingly, Akpan *et al.* (2020, p. 49) applied the social constructionist theory and revealed the different aspects of active interaction among the learners, teachers and other components of the teaching–learning process. Besides, taking Akpan *et al.* (2020, p. 49) into account, this paper applied the social constructionist theory to explore the use of AR and identify the challenges of inclusive growth in higher education in the context of India and Tanzania.

5. Use of AR and challenges of inclusive growth in education for India and Tanzania

From a global perspective, previous studies on AR in education are already available. In 2021, Taskiran stated that mobile language learning with AR indicated positive results academically in Turkish higher education (Taskiran, 2021, p. 25). Likewise, Batra (2021, p. 29) noted that combining AR and education is a way of enhancing and shaping experiences and effectiveness in the teaching–learning processes. However, Hajirasouli and Banihashemi (2022, p. 1) stated that the application and usage of AR in higher education are yet to be fully explored. Due to the call for more studies, this study expands the literature on AR by exploring the use of AR for inclusive growth in education and identifying the challenges in India and Tanzania.

5.1 India

In India, AR is one of the most rapidly evolving technologies being adopted in retail. However, its connection to inclusive growth in education, including in the ODL mode, needs more emphasis. For India to accelerate the digital transformation, the use of AR and VR has become a reality. Because of the increasing use of different VR devices, such as head-mounted displays (HMDs), in different industries and also for gaming and entertainment purposes, the progression in technology use and mounting digitisation processes and large investments in AR and VR technologies, these are going to be the key drivers of the growth of AR and VR markets across India. In addition to that, the surge in the penetration of smartphones in the Indian economy is expected to further push the demand for AR and VR solutions in the coming days. Besides, considering the emergence of AR across the world, India is planning to build AI research labs for AI genomics, drug discovery, oncology and stem cell therapy, healthcare and delivery of medication, elderly care, etc.

However, in the 21st century technology-mediated learning environment; large-scale digital illiteracy is the biggest challenge in gaining actual success in digitising India. Pappu Rajan (2021, p. 202) stated that participation by all people in the digital economy is crucial for the growth of technologies in India. Massive Open Online Courses (MOOCs) must have been widely introduced in most universities across India as part of their curriculum. The government should introduce more courses in areas like cybersecurity to improve skills. But poor internet networking, limited Wi-Fi facilities and inadequate IT infrastructure have become barriers. With the emergence of new technologies, in order to compete globally, digitisation is required. But as all the surveys and indices show, India is lagging behind in terms of ICT adoption, although campaigns such as Digital India, Start-up India and Skill India showcase the focus of the Indian government to capitalise on the emerging digitisation across the country. But, due to the limited growth of technological institutions, the government is forced to use primitive methods of technology whose productivity is very low. Therefore, there is a need for more and effective participation of all people in the digital economy, which will help in the growth of technology in the country.

5.2 Tanzania

Scholars like Raphael (2022, p. 36) focused on investigating digital transformation in higher education. In Tanzania, from an open schooling perspective, the study by Mkwizu (2022a, p. 97) concentrated on VR and not AR. Hence, there is a need for more research on AR in education so that the educational institutions of the country, including ODL institutions, can benefit from these technologies. Raphael (2022, pp. 38–39) used a quantitative approach with descriptive analysis and confirmed that students from higher education institutions have a low opportunity to experience digital technologies in the teaching–learning process. He examined the basic digital skills with a focus on digital transformation, besides adding the dimensions of AR, VR and AI to quantify the scale in terms of the opportunities in the teaching–learning processes. The findings from Raphael (2022, p. 42) revealed that most of the students had experienced low opportunities in VR and AR (59%), AI (75%) and the internet of things (50%). This clearly shows that there are very few opportunities, as experienced by the students in higher education, in relation to the digital transformation, particularly through the use of AR, VR and AI within the selected higher education institutions for the particular study conducted by Raphael (2022).

There is also a recommendation by Raphael (2022, p. 44) for more studies to be conducted in Tanzania for generalisation purposes on the issue of digital transformation. Adding to the literature on AR, Mkwizu and Bordoloi (2022, p. 1) mentioned AR in education for India and Tanzania, but the focus was on girls in schools and not higher education *per se*. Due to the existence of limited studies on this phenomenon within Tanzania, the studies by Raphael (2022) and Mkwizu and Bordoloi (2022) emphasised the need for more studies in order to understand and fully utilise the potential of AR in education. Hence, this paper explores the use of AR for inclusive growth in education in India and Tanzania.

5.3 The use of AR for inclusive growth in education for India and Tanzania

Inclusive growth in education using AR is crucial in higher education. For instance, AR can enhance ODL by offering immersive, interactive experiences, improving students' engagement and facilitating practical skill development. The whole world had experienced how technologies played a significant role in making it possible for education to continue and grow amidst the COVID-19 pandemic. Hence, enabling the learners to carry on with education, for example, teaching–learning through the Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) of India and the use of other technologies such as Zoom in both India and Tanzania was remarkable. Moreover, in the post-pandemic period, the

SWAYAM courses enabled online learners not only in India but globally to access education, thereby exercising access, equity and quality as preached by the Ministry of Education, Government of India (2023). Similar efforts could probably be applied in the context of the use of AR for inclusive growth in education. However, there are still relatively few published articles on AR in relation to inclusive growth in education.

Technologies such as AR can assist inclusive growth in education by enabling both learners and teachers in higher education institutions to have various experiences, such as enhancing positive attitudes and decision-making through extensive use of technology. There are also a number of ways in which AR can be included in education and can contribute to inclusive growth within the education sector. Studies beyond India and Tanzania, like Sirakaya and Sirakaya (2018, p. 60), revealed that AR utilisation is possible with the assistance of not only head-mounted-displays but also with other devices such as computers and mobile phones. Besides, the application of technologies such as AR to inclusive growth in education can be used to achieve the SDGs in education and therefore, this paper emphasises the need to use AR in higher education.

6. Methodology

This study applied systematic literature review (SLR) as a research method by reviewing and synthesising relevant papers from conferences and journals in order to address this paper's specific objective of examining the use of AR as well as identifying the challenges of inclusive growth in higher education for India and Tanzania. SLR is a popular research method and is defined as a review of an existing body of literature that follows a transparent and reproducible methodology through searching, assessing its quality and synthesizing the findings with a high level of objectivity (Kraus *et al.*, 2020, p. 1024). Kraus further advised that where there is limited literature, it is best to ensure that all identified sources of the relevant reviewed literature are analysed. On the other hand, this paper also adopted an SLR approach but focused on exploring AR impact and inclusive growth in education and identifying its challenges. Hence, the concentration period for the review of literature was from 2021 to 2023.

6.1 Search, screening, selection and data extraction

This paper's SLR involved planning the review, searching, analysing literature and preparing the result report. In planning the review, this paper addressed the specific objective of examining the use of AR as well as identifying the challenges of inclusive growth in higher education by formulating the question: *When using AR, what are the challenges of inclusive growth in higher education?* In terms of the search step, which used Google Search, this paper identified and selected four journals due to their focus on published articles with issues related to education in India and Tanzania. Therefore, this paper used a contextual basis for selecting these journals. The selected journals are the *Asian Journal of Distance Education (AsianJDE),* the *Journal of Adult Education in Tanzania (JAET),* the *Journal of Issues and Practice in Education (JIPE)* and the *International Journal of Open Schooling (IJOS).* In addition, three conferences were also selected for accessing peer-reviewed papers related to technologies such as AR. Another reason for selecting these three conferences was that some of the papers extended the theme of VR to cover AR in various fields, including education. Hence, the selection of the three conferences was theme-based. This strengthened the reliability of the selected papers for analysis. The three conferences are the 3rd International Conference on Virtual Reality held in 15–16 November 2021, the 4th International Conference on Virtual Reality held in 15–16 November 2022 and the 5th International Conference on Virtual Reality held in 15–16 November 2023.

The screening and selection process considered the inclusion and exclusion criteria to obtain relevant papers from the selected journals and conferences. For the literature review,

the inclusion criteria were based on papers with key words such as "augmented reality", "use of augmented reality", "inclusive growth", "inclusive education", "higher education", "India" and "Tanzania" in 2021, 2022 and 2023. Papers that did not capture the selected search words were excluded. There were 245 papers from the selected journals and conferences. Of these, only 14 were relevant and deemed sufficient for the intended analysis. For the extraction of data, sources (authors), study titles and countries, methods and findings were considered for analysis, as displayed in Table 1.

India

No	Source	Method	Findings
1	Gope *et al.* (2021, p. 54)	Quantitative using survey approach	Students' views on re-opening of institutions differ with majority preferring practical or project-based curriculum
2	Batra (2021, p. 29)	Literature review	AR enables learning to be more engaging despite the challenges such as trained teacher educators, lack of resources and teaching models
3	Chander (2021, p. 53)	Quantitative method using online Google Forms	Among the usefulness of AR in coaching is improved lesson planning
4	Maebell and Lawrence (2021, p. 121)	Literature review	AR should be encouraged in education for experiencing vibrant hues, exciting times of real-world experience in the learning process
5	Garcha (2021, p. 31)	Literature review	AR technology such as AR games have new features that can be effective in cooperative learning
6	Attri and Dahiya (2022, p. 23)	Literature review	Teachers can use assistive technologies when teaching special needs children
7	Soumya and Madhusudan (2022, p. 147)	Systematic literature review	VR in distance higher education has positive impact in improving students' achievement, participation, imagination and interaction
8	Rajeswari and Madhusudan (2022, p. 135)	Systematic literature review	Both AI and AR have positive effect on students' academic performance and learning, field trips, thinking skills, etc. and helps in inclusive classroom
9	Hooda and Kumari (2022, pp. 70–71)	Descriptive method	62.7% of faculty and students are aware of AI and 80.6% never attended any AI/VR training programme
10	Punia (2022, p. 27)	Applied pre-test quasi-experiment method	Elementary school children were satisfied with learning activities that were integrated with AR
11	Sharma and Gupta (2023, p. 1)	Descriptive	AR through assistant apps can be used for English speaking practices. Among the challenges are skills gap for teachers

Tanzania

No	Source	Method	Findings
1	Mkwizu (2021, p. 20)	Literature review	There are opportunities of AR for destinations
2	Mkwizu (2022b, p. 21)	Literature review	Minimum usage of AR and VR to improve tourist experiences
3	Mkwizu and Kimeto (2023, p. 1)	Literature review	Mixed reality integration in sustaining national park experiences is limited

Table 1. Summary of selected reviewed papers

Source(s): Table compiled by authors from reviewed relevant literature

6.2 Analysis

In addition, the analysis of the literature involved descriptive analysis and cross-tabulation to describe the reviewed papers in terms of authors, countries, studies, methods and findings, while a content analysis approach was applied to analyse the content from the reviewed literature for better data extraction and coding. Content analysis was also used by previous scholars like Heiser (2022, p. 256) to arrange the concepts and capture the quality indicators when investigating quality education. The final step was the creation of the report, which basically involved interpreting the results and producing the report.

7. Findings and discussion

The descriptive analysis indicated that the majority of the papers were written by co-authors (57.1%), indicating that there is research collaboration among scholars. The country-wise distribution of the reviewed papers shows that most of the academic papers were from India (78.6%) compared to Tanzania (21.4%). These results implied that although the scores vary between India and Tanzania, the overall academic research on AR and higher education is still inadequate, as evident in Rachman *et al.* (2024, p. 170), who advocated for more research on the use of AR in higher education. The most applied method in the reviewed papers was the literature review method (64.3%), which suggests that it was the most preferred methodology by the authors of the reviewed papers. The findings support Kraus *et al.* (2020, p. 1024) by showing that literature review as a research methodology is popular amongst the authors of the papers that were reviewed. It also contradicts a similar study by Sirakaya and Sirakaya (2018, p. 60), which found that quantitative methods are mostly used in educational AR studies.

A cross-tabulation to compare the distribution of author(s) and methods between India and Tanzania is displayed in Table 2. For India, the finding reveals that the author distribution score indicates the highest for co-authors (87.5%), while for Tanzania, it is mostly single authors (33.3%). The distribution in terms of methodology reveals the literature review method for India at 66.7%, compared to 33.3% for Tanzania. The findings on methods for

Country			India	Tanzania	total
Method	Literature review	Count	6	3	9
		%	66.7%	33.3%	100.0%
	Descriptive method	Count	2	0	2
		%	100.0%	0.0%%	100.0%
	Survey	Count	2	0	2
		%	100.0%	0.0%	100.0%
	Quasi experiment	Count	1	0	1
		%	100.0%	0.0%	100.0%
Total		Count	11	3	14
		% of Total	78.6%	21.4%	100.0%

Country			India	Tanzania	total
Author	Single	Count	4	2	6
		%	66.7%	33.3%	100.0%
	Co-author	Count	7	1	8
		%	87.5%	12.5%	83.3%
Total		Count	11	3	14
		%of Total	78.6%	21.4%	100.0%

Source(s): Table computation by authors

Table 2. Cross-tabulation of authors and methods by country

Tanzania are not in line with the study by Kraus *et al.* (2020), since the literature review method was not found to be popular there compared to India. This variation is attributed to the fact that in Tanzania, there were more single authors than co-authors in the reviewed papers.

The content analysis method used for the reviewed papers based on Table 1 reveals the use of AR and the challenges of inclusive growth in higher education for both India and Tanzania, as indicated below.

7.1 India

In the context of India, the use of AR is still minimal with most studies that were reviewed for India, such as (Garcha, 2021, p. 31; Maebell and Lawrence, 2021, p. 121) recommending the implementation and integration of AR in education. In particular, Garcha (2021, p. 31) advocated for AR-based cooperative learning through AR games. From the AR perspective, this implies that digital infrastructure like AR games is needed in India to facilitate the use of AR effectively in connection with learning activities in higher education. These views are in line with the previous studies by Angelina *et al.* (2019) that advocated the use of AR in improving and enhancing interactive learning. Although Chander (2021, p. 53) and Punia (2022, p. 27) mentioned AR, the focus was mostly on sports and elementary schools. For instance, Chander (2021, p. 53) noted the usefulness of AR in relation to coaching during sports activities, which was found to have improved lesson planning. This implies that AR allows the digital empowerment of citizens for related activities that utilise AR. In terms of access to universal internet or broadband facilities, other scholars and specifically Batra (2021, p.), commented that even though AR for teacher education enables learning engagements, there are many challenges, like "lack of resources," which implies that resources like accessibility to universal internet or broadband facilities are a barrier while considering the use of AR in higher education. In terms of higher education, the existing reviewed papers like Hooda and Kumari (2022, pp. 70–71) and Rajeswari and Madhusudan (2022, p. 135) done in India concentrated on AR and this corroborates and supports previous studies like Hajirasouli and Banihashemi (2022, p. 1) that recommended more research in education in terms of the use of AR. In addition, Soumya and Madhusudan (2022, p. 147) examined technology in ODL, but the focus was on VR and not AR, which further supports the call for more research to be done on the phenomenon of AR in higher education in general and that imparted through the ODL institutions.

Challenges of inclusive growth in higher education are inevitable, as revealed in studies like Hajirasouli and Banihashemi (2022, p. 1), citing that the usage of AR in higher education is not fully explored, while Sharma and Gupta (2023, p. 1) stated that there are skill gaps for teachers with reference to AR. On the other hand, Attri and Dahiya (2022, p. 23) mentioned inclusive education, but this was related to VR as opposed to AR, and this further affirms the recommendations by Hajirasouli and Banihashemi (2022, p. 1) on the limited studies on AR in education. In fact, Hooda and Kumari (2022, pp. 70–71) found that 80.6% of faculty and students in higher education have never attended any training programme on the use of AR, while Gope *et al.* (2021, p. 54) commented that students seemed to prefer practical or project-based curriculum more after the pandemic. Hence, this shows that when using AR, there can be challenges to inclusive growth in education such as "trained teacher educators", "lack of resources", "teaching models" and a preference for practical or project-based curriculum.

7.2 Tanzania

In the case of Tanzania, the studies on AR in relation to inclusive growth in education are also minimal. The existing studies that have been reviewed show that AR was mentioned in relation to tourism. This implies that more research is needed in the education field,

particularly in higher education. Mkwizu (2022b, p. 21) and Mkwizu (2023, p. 1) focused on AR for destinations and tourists' experiences and mixed reality for sustainability of national park experiences, which means that other fields such as education should explore more about the use of AR. Interestingly, from the perspective of education in Tanzania, the findings by Raphael (2022) revealed that students have experienced low opportunities in VR and AR (59%), AI (75%) and the Internet of Things (50%), and this suggests that there is limited access to digital infrastructure, access to universal internet or broadband facilities and a lack of digital empowerment among the students as citizens of the country. Furthermore, this clearly shows that there are low opportunities that have been experienced by students in higher education in relation to digital transformation, particularly for AR, VR and AI, within the selected higher education institutions for the particular study conducted by Raphael (2022, p. 42). This finding aligns with Rachman *et al.* (2024, p. 170), who found that AR is still an area that requires more research, especially in the field of higher education.

7.3 India and Tanzania in summary

To summarise, the reviews for both India and Tanzania regarding AR and the challenges for inclusive growth in education revealed that certain views are socially constructed with reference to the impact of AR on inclusive education, whereby the use of AR is noted as minimum. The challenges of inclusive growth in education can be traced to the lack of trained teacher educators, a lack of resources and teaching models and students' preference for practical or project-based curriculum, thus confirming the use of the social constructionist theory to guide this study's specific objective. Besides, accessibility, uncertainties, regional disparities within the country and lack of resources and infrastructure in a country like India remain the barriers to implementing AR or even VR in the teaching–learning processes. For inclusive growth and providing equity in education, the potentials of AR are yet to be harnessed in the context of developing and underdeveloped countries as a whole, including India and Tanzania.

The predictive practical implications of this paper are focused on how to realise inclusive growth in education based on the findings using SLR. The first practical implication is for educational practitioners in both countries to place high regard on the use of AR for inclusive growth in education. Secondly, those practitioners may consider that in post-pandemic contexts, teachers are well-acquainted with the appropriate skills for using AR but can also add AI or VR as part of their teaching–learning transactions. Thirdly, the practitioners in the education sector should ensure that there are capacity-building or training programmes that can be arranged by the educational institutions of both countries for their faculty members so that they can feel confident in using the proper technological pedagogy in teaching. Fourthly, governments and educational policymakers should also develop suitable policies, laws and regulations with regard to using AR in education, but not limited to AR use only. For example, one way is to include AI or VR in course transactions so that a proper learner-centred or self-directed learning opportunity could be provided for the greater interest of the learning communities. The fifth practical implication is for equal access not only to AR but also to AI and VR in countries like India and Tanzania for inclusive growth in education, particularly in the context of higher education.

Regarding the theoretical implications, it is clear that the reviewed papers indicated socially constructed views based on the use of AR being minimal in relation to inclusive growth in higher education, besides hinting at the challenges. The socially constructed challenges include lack of trained teacher educators, lack of resources, lack of teaching models and students' preference for practical or project-based curriculum, which confirm the use of the social constructionist theory in guiding this study to explore the use of AR and also

in identifying the challenges of inclusive growth in higher education in the context of India and Tanzania.

8. Conclusion

The findings of this paper reveal that there have not been enough studies on the use of AR in relation to inclusive growth in education for both countries, and those that are already available, particularly for ODL, are focused on VR. Interestingly, the findings for India regarding the use of AR and the challenges for inclusive growth in education reveal that there is inadequate digital infrastructure and access to universal internet or broadband facilities, besides a serious lack of digital empowerment among the citizens, while for Tanzania there are similar findings, including low opportunities for AR technologies for students in the teaching and learning processes. This also implies that when renewing the curriculum in the ODL institutions, the focus should be on improving technology usage by ensuring that there is adequate digital infrastructure in terms of technologies like AR, which have the ability to provide enhanced learning experiences.

Therefore, this paper can conclude that the use of AR for inclusive growth in education in India and Tanzania has challenges. For practical implications, it is important to have adequate digital infrastructure, access to universal internet or broadband facilities and the digital empowerment of citizens to harness the potential of AR in higher education, including ODL institutions. The challenges of inclusive growth in education in terms of integrating AR usage are socially constructed and therefore can include the lack of trained teacher educators, a lack of resources, a lack of teaching models and students' preference for practical or project-based curriculum, which pose theoretical implications for this paper.

However, this paper was limited to the use of SLR, which favoured peer-reviewed papers from journals. Therefore, to strengthen the SLR, it is advisable to use a mixed-methods approach to literature review by combining an SLR with an integrative literature review. Moreover, another direction for future studies can be to explore an integrative literature review that considers not only journal articles or conference papers that are peer reviewed but also other documents such as reports and unpublished materials in order to better understand the phenomenon of implementing AR in higher education in post-pandemic contexts for countries like India and Tanzania. Future research may also explore AI as well as virtual and mixed reality. In addition, future studies can use both quantitative and qualitative methods to enrich the understanding of AR and inclusive growth in higher education in countries like India and Tanzania.

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