ARTICLE

Pre-Service Teachers' Experiences with Virtual Reality Goggles as a Pedagogical Tool for learning Grade 4 Social Sciences (Geography)

André van der Westhuizen, Shaylen Naidoo*, Marietjie Henry and Ansoné Myburgh

Faculty of Education, Varsity College, Sandton, Waterstone Drive, Benmore Road, Sandton, Johannesburg 2196, South Africa

anvanderwesthuizen@varsitycollege.co.za https://orcid.org/0009-0006-7048-6191
shaynaidoo@varsitycollege.co.za https://orcid.org/0000-0001-9291-5176 *Corresponding author
mhenry@varsitycollege.co.za https://orcid.org/0009-0004-7441-5273
amyburgh@varsitycollege.co.za https://orcid.org/0009-0006-2482-5244

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ABSTRACT

This study examines the use of virtual reality (VR) goggles as a pedagogical tool in teacher education, with a focus on the experiences of first-year pre-service teachers learning to teach Grade 4 Social Sciences (Geography). Conducted at a single private higher education institution in Gauteng, South Africa, with a sample of 28 participants, the research integrates three virtual tours of local areas to support learning aligned with the Intermediate Phase Curriculum and Assessment Policy Statement, specifically the Term 1 topic, 'Places Where People Live'. Data were generated through semi-structured focus group interviews, examining the teachers' experiences of incorporating VR into their pedagogical development. Findings indicate that VR's immersive qualities enhance engagement and provide learning experiences that are difficult to replicate through conventional methods, such as map-based instruction. Participants further reported challenges related to the accessibility and usability of VR in school settings, including technical issues, limited equipment availability, and inadequate training.

Keywords: Virtual tours, VR goggles, Intermediate Phase Social Sciences, pre-service teachers, pedagogical tools

INTRODUCTION

In teacher education, virtual reality (VR) affords pre-service teachers simulated real-world contexts in which to refine instructional strategies, deepen subject-matter comprehension and cultivate essential pedagogical competencies that conventional tools may not afford (Penn, 2022). This study investigates first-year pre-service teachers' experiences of employing VR goggles to learn about the Grade 4 Social Sciences (Geography) topic 'Places Where People Live' (Term 1) as stipulated in the South African Intermediate Phase Curriculum and Assessment Policy Statement (Department of Basic Education [DBE], 2011). By conducting virtual tours of local geographical contexts, pre-service teachers can gain experiential insight into spatial concepts that transcend textbook-based didactic approaches characteristic of rote learning (Whitmeyer & Dordevic, 2021; McDaniel, 2022). Such immersive exploration promises to illuminate novel didactic pathways and enrich content-delivery modalities.

National policy frameworks underscore the integration of information and communication technologies (ICT) into teacher training. The *White Paper on e-Education* (Department of Education, 2004) advocates for the systematic incorporation of ICT to enhance pedagogical outcomes and learner engagement. Within this framework, VR can be considered a specialised educational technology that extends traditional ICT tools, offering immersive and interactive learning experiences. The *Minimum Requirements for Teacher Education Qualifications* (South Africa, 2015) mandate that pre-service teachers develop proficiency in educational technologies, which encompass VR alongside other digital tools, thereby legitimising its integration into the teacher training curricula. Embedding VR within these policy parameters aligns with national standards by equipping pre-service teachers with the technological literacies and pedagogical dexterity necessary to deliver high-quality learning experiences.

While Robertson et al. (2019, p.15) maintain that 'people's mapping skills can be developed in a digitally connected realm', Ontong & Kuhle (2020) contend that persistently poor performance in South African school learners' map work necessitates a more robust integration of technology into its teaching. The utilisation of VR goggles in the Social Sciences (Geography) classroom therefore holds considerable promise for both pre-service teachers and school children, as it affords immersive experiences that foster higher-order interpretation and critical thinking in map work (Felix, 2021).

Despite advances in educational technology, there remains a dearth of empirical research on VR's efficacy in specific subject-area contexts such as primary school Social Sciences (Geography) in South Africa. Accordingly, this study examines VR as an immersive pedagogical tool within the framework of South African teacher-education policies. It seeks to evaluate both the benefits and challenges of integrating VR into pre-service teacher training, and to determine how such integration might enhance Geography teaching practices and ultimately improve future teachers' pedagogical practices.

LITERATURE REVIEW

Virtual Reality in Education

Rebbani et al. (2021) define VR as a computer-generated and interactive, three-dimensional environment that users can explore and interact with using specialised equipment such as VR goggles. For Rebbani et al. (2021), VR has moved beyond its use in entertainment and gaming to become a serious educational tool, with applications spanning a wide range of subjects and educational levels. Empirical studies attribute to VR a host of pedagogical benefits, most notably heightened learner engagement, enhanced spatial comprehension and increased motivation (Grewe, 2023; Grewe & Gie, 2023). Such advantages are particularly salient in Geography, where spatial awareness and visualisation underpin mastery of complex phenomena (Mkhongi & Musakwa, 2020; Felix, 2021; Schaab et al., 2022; Cizmre et al., 2024). In teacher education, VR is used for its capacity to bridge theory and practice, enabling pre-service teachers to rehearse instructional strategies within realistic yet risk-free classroom simulations (Marougkas et al., 2023; Walstra, 2023). For Social Sciences (Geography), where spatial reasoning and contextual understanding are paramount, VR offers an experiential depth unattainable by conventional resources (Mejia, 2021).

The incorporation of VR into teacher preparation holds the potential to act as a catalyst for pedagogical innovation, encouraging a move from passive, transmissive models towards more active, learner-centred modalities. However, this is contingent on the technology's integration being supported by robust curriculum design and adequate teacher training to ensure it is not merely a high-tech distraction (Solomon, 2020; Grewe, 2023; Grewe & Gie, 2023; Walstra, 2023; Adetunla et al., 2024; Cizmre et al., 2024; Dembe, 2024). By immersing pre-service teachers in simulated teaching scenarios, VR facilitates these competencies through its affordances of presence, interactivity, and safe repetition. Presence allows pre-service teachers to experience the classroom environment as if physically situated, thereby engaging with realistic learner behaviours and spatial dynamics (Roelofsen & Carter-White, 2022). Interactivity enables them to trial diverse pedagogical strategies and receive immediate feedback without the risks associated with real classrooms (Marougkas et al., 2023). Lastly, the capacity for safe, repeated practice supports the incremental development of problem-solving and adaptability by allowing pre-service teachers to reflect on or refine their approaches in varied simulated contexts (Grewe, 2023; Grewe & Gie, 2023; Walstra, 2023). Moreover, VR's interactive nature promotes deeper cognitive engagement than traditional didactic methods, both in teacher training and in classroom practice. For pre-service teachers, VR supports the rehearsal of pedagogical strategies and the design of innovative Geography lessons. For learners, the same affordances render abstract concepts such as climate zones, landforms, anthropogenic environmental impacts, or settlement dynamics tangible through immersive exploration (Mkhongi & Musakwa, 2020; Schaab et al., 2022). Such experiential learning not only fosters critical thinking

but also strengthens the application of theoretical knowledge in forthcoming classroom practice (Giri & Sharma, 2023). Engaging affectively with virtual environments further enriches pre-service teachers' pedagogical repertoire, cultivating emotional connections to content that underpin more effective instruction. In practice, teachers can harness VR by structuring guided explorations (e.g. leading learners through a virtual tour of diverse landforms), designing inquiry-based tasks (e.g. prompting learners to investigate human–environment interactions in a simulated landscape), and facilitating reflective dialogue afterwards to consolidate affective responses into conceptual understanding (Robertson et al., 2019; Pregowska et al., 2021).

Intermediate Phase Social Sciences (Geography), which covers Grades 4 to 6 for learners aged approximately 10 to 12 years old, presents distinct pedagogical challenges: pre-service teachers, and, thereafter, school learners must cultivate spatial awareness, understand physical and human geography concepts, and grasp the interplay between societies and environments, as mandated through the current iteration of the school curriculum (Iyer, 2018). Conventional resources (e.g. static maps, printed texts and photographs, and graphs) often fail to engender a comprehensive understanding of geographical complexity (Robertson et al., 2019; Naidoo, 2025). VR can address this gap by enabling virtual field excursions to diverse landforms, urban or rural settings, spaces or dynamic human–environment interactions (Mkhongi & Musakwa, 2020; Giri & Sharma, 2023). These excursions are enacted using 360° videos, interactive simulations, or geospatially modelled environments, which replicate real-world sites and afford learners and pre-service teachers immersive, exploratory experiences (Mkhongi & Musakwa, 2020; Whitmeyer & Dordevic, 2021; McDaniel, 2022; Giri & Sharma, 2023). Pre-service teachers may structure these excursions by setting pre-fieldwork tasks such as predicting environmental patterns or formulating enquiry questions, which guide learners through immersive exploration (for instance navigating a virtual river basin, rural or urban settlement, climatic phenomena, or biome), and concluding with post-excursion reflective and analytical activities such as mapping exercises, group discussions, or digital journaling (Robertson et al., 2019; Felix, 2021; Schaab et al., 2022). By integrating these approaches, VR can simulate the experiential learning dimension of fieldwork while overcoming logistical and safety constraints inherent in traditional excursions.

Through VR, learners and pre-service teachers can manipulate virtual maps, by analysing and interpreting geospatial information to observe phenomena, such as urbanisation patterns, river erosion, economic activity, or climate change impacts, within a simulated, real-time environment (Whitmeyer & Dordevic, 2021; McDaniel, 2022). For example, learners can adjust variables on a digital map, such as population density or land-use changes, and immediately visualise the spatial consequences (Robertson et al., 2019; Ontong & Khule, 2020). This hands-on interaction with spatial data allows learners to explore patterns and relationships that would be difficult to observe directly in the physical environment, enhancing both conceptual understanding and geographic literacy. These affordances nurture spatial reasoning and critical analysis, essential for mastering Geography (Ontong & Kuhle, 2020; Felix, 2021; Czimre et al., 2024). While VR has been

presented as a solution for resource limitations, a nuanced view suggests that its high costs and need for significant technical infrastructure can create systemic barriers to equitable implementation within resource-constrained educational settings. This presents a risk of widening the digital divide rather than closing it (Soloman, 2020; Samala et al., 2025). However, implementation is contingent on financial and infrastructural considerations. VR headsets range from approximately ZAR 4000–15,000 per unit, depending on specifications and compatibility (Grewe, 2023; Walstra, 2023). Funding for teacher training institutions may be sourced through university budgets, educational technology grants, or partnerships with private technology providers, while low-cost options, such as smartphone-based VR viewers, can reduce financial barriers for large learner cohorts (Pramanik, 2024; Samala et al., 2024, 2025).

Case Studies on the integration of Virtual Reality in Teacher Training in South Africa

Walstra (2023) highlighted that VR provides an immersive learning environment by simulating realistic classroom scenarios where pre-service teachers can practise classroom management and implement active learning strategies. Features such as interactive role-play, real-time feedback, or the ability to repeat scenarios safely allow them to experiment with different approaches and reflect on their practice in ways that traditional methods may not. Pre-service teachers, enrolled in the Bachelor of Education programme at the University of Pretoria, reported that VR helped them develop new teaching methods and gain valuable insights into how to enhance learner engagement and learning outcomes (Walstra, 2023). Walstra (2023) further emphasised that when pre-service teachers took turns using a single VR headset within small peer groups, the need to observe and learn from their peers' interactions encouraged more attentive engagement, deepening their learning experience. These immersive experiences enabled pre-service teachers to observe and reflect on the potential of VR to transform educational practices, with many reporting that such exposure increased their confidence in designing lessons that incorporate similar strategies, thereby contributing to their preparedness for modern teaching environments (Walstra, 2023).

Penn (2022) explored the experiences of pre-service Natural Sciences teachers at the University of Johannesburg as they engaged with VR and augmented reality (AR) tools in inquiry-based learning contexts. In this study, VR fully immerses users in a simulated environment, whereas AR overlays digital content onto the physical world, allowing learners to interact simultaneously with real and virtual elements. Penn (2022) highlighted that these technologies facilitated a deeper understanding of scientific concepts by allowing pre-service teachers to manipulate interactive 3D models and adjust variables in the virtual environments. For example, chemical reactions could be explored by changing reactant concentrations and immediately observing outcomes, while ecological systems could be investigated by simulating environmental changes and tracking system responses. This hands-on manipulation and real-time visualisation made abstract ideas, difficult to

convey through traditional lectures or static diagrams, more tangible and comprehensible. Penn's (2022) study revealed that engaging with interactive 3D models and manipulating variables in AR allowed pre-service teachers to visualise complex scientific processes and test hypotheses. This active experimentation enabled them to identify effective strategies for guiding learners through inquiry-based tasks, thereby enhancing their lesson design skills and supporting the development of more robust teaching practices.

Barriers to Effective Integration of Virtual Reality in Teacher Education

Despite VR's pedagogical promise, several obstacles impede its adoption within teacher education programmes. Foremost is the scarcity of VR resources in resource-constrained contexts such as in South Africa (Grewe, 2023). Many institutions lack the requisite technological infrastructure to support VR, thereby limiting its widespread implementation (Walstra, 2023). The capital outlay for VR headsets, high-performance hardware such as computers and cell phones and specialised software often exceeds the budgets of rural or underfunded programmes, perpetuating an access gap that disadvantages pre-service teachers (Solomon, 2020; Grewe & Gie, 2023). Even where VR hardware is available, pre-service teachers frequently encounter technical progress (hardware malfunctions, software incompatibilities and a steep learning curve) that undermine effective utilisation (Adetunla et al., 2024). Chen & Wu (2023) emphasised that extended VR use can cause visual fatigue and general physical discomfort. This suggests that users who wear spectacles may experience these effects more intensely. VR integration must be accompanied by careful consideration of user comfort and accessibility to ensure that immersive learning does not become exclusionary or counterproductive (Chen & Wu, 2022). Without structured training and ongoing technical support, pre-service teachers lack the digital literacies necessary to integrate VR meaningfully into their pedagogical repertoire, resulting in frustration and student and/or learner disengagement (Pregowska et al., 2021; Dembe, 2024).

While immersive VR simulations can approximate real-world classroom scenarios, they primarily support the rehearsal of pedagogical skills, such as classroom management and inquiry-based facilitation, rather than the direct teaching of Geography content (Grewe, 2023; Czimre et al., 2024). Consequently, pre-service teachers may face challenges in transferring these skills to conventional classrooms, particularly in managing diverse learner behaviours and responding to spontaneous interactions (Grewe & Gie, 2023; Walstra, 2023). To address this limitation, a blended approach is recommended: VR simulations are coupled with authentic classroom practicum, while separate VR experiences can be designed specifically to teach Geography concepts, supporting both pedagogical competence and conceptual understanding (Mkhongi & Musakwa, 2020; McDaniel, 2022; Roelofsen & Carter-White, 2022; Schaab et al., 2022; Czimre et al., 2024).

METHODS

Research Design

This study adopted a qualitative, interpretivist research paradigm to explore the experiences of a single cohort of first-year pre-service teachers learning to teach Grade 4 Social Sciences (Geography). Within this paradigm, a case study approach was adopted to facilitate the exploration. The design was selected due to its capacity to holistically investigate complex phenomena within real-world teacher training contexts. The participants were 28 first-year pre-service teachers enrolled in a Bachelor of Education programme at a private higher education institution in Gauteng, South Africa. All participants directly engaged with the VR-integrated learning activities and were enrolled in a module that included a unit on teaching Grade 4 Intermediate Phase Social Sciences (Geography) map work.

Data Collection and Analysis

Data were generated through semi-structured focus group interviews conducted in two smaller groups of 14 participants. This method was selected to allow for collaborative reflection and to facilitate the co-construction of meaning through dialogue (Brown & Danaher, 2019). The focus group schedule comprised open-ended questions designed to elicit detailed narratives concerning the pre-service teachers' experiences of using VR goggles to teach the Grade 4 Curriculum and Assessment Policy Statement (DBE, 2011) topic 'Places Where People Live'. The focus group responses were audio-recorded with participants' informed consent, transcribed verbatim, and anonymised to ensure confidentiality. Thematic analysis was employed to identify, analyse, and interpret recurring patterns within the data (Braun & Clarke, 2006). An inductive coding approach was used whereby themes emerged from the data rather than guided by an interpretivist paradigm and inductive coding approach (Fereday & Muir-Cochrane, 2006). The analysis proceeded through multiple iterative readings of the transcripts, during which initial codes were generated and subsequently refined into broader thematic categories. Attention was given to both convergent and divergent perspectives to ensure a nuanced account of the participants' experiences.

Ethical Considerations

Ethical Approval to conduct this study was granted by a University's research committee (ethics clearance: R.0002124). Informed consent was obtained from all participants, who were made aware of their right to withdraw at any stage without penalty. Data were stored securely in a private Microsoft Teams channel and participants' identities were anonymised.

RESULTS

Initial Perceptions and Expectations of VR as a Pedagogical Tool

Participants held a range of initial expectations, from high optimism to complete novelty. Participants' positive perceptions appear to be, at least in part, a transient novelty effect stemming from the technology's immersive and entertaining nature. Participant 3's perspective encapsulated this excitement:

> *'I did have really high expectations because I've not experienced VR goggles before, and I thought they'd be a very good way to get a learner participating in the actual activity within Geography. So, I thought it was quite good in terms of meeting my expectations.'*

Participant 2, who had no prior exposure to VR in an educational context, was surprised by its potential, stating:

> *'I never really knew what to expect because it had never crossed my mind before that something like VR could be used for education and teaching purposes. But then I thought it would be really beneficial and could enhance learning in the future.'*

The consensus was that the technology presented an exciting, novel approach to learning that could enhance a teacher's classroom by making it more learner-centred. Participant 14 reflected on how the technology could empower learners:

> *'The fact that when you move it (referring to the VR goggles), it (the virtual tour) moves, made me think that I could teach Geography in a different way. That would be a great strategy for pedagogy and would make my classroom more learner-centred.'*

Effectiveness in Representing Geographical Concepts

The pre-service teachers overwhelmingly agreed that the VR tour was more effective than traditional tools like textbooks and maps for representing geographical concepts. They noted that VR provided a three-dimensional, lived-in perspective that static materials could not. A key point of discussion was the enhanced understanding of concepts such as scale and landforms. Participant 16 stated:

> *'I feel like you can't really associate with the lessons when you get taught from textbooks and maps and everything. You can't put yourself in that situation, but with VR, I hope you can experience what that area's like on a day-to-day basis.'*

Participant 9 explained the advantage for visual learners:

> *'I feel like textbooks give a very good foundation, and then being able to go into VR helps you build your understanding of what's given in the textbook.'*

Participants also highlighted VR's ability to illustrate the reality of urban versus rural settlements and land use, making abstract concepts tangible. Participant 18 remarked:

'I feel that VR really enhances the teaching because the textbook is like a bird's-eye view – you get one shape or form of an image, picture, or map. But in VR, you can show a place and see its daily life. Kids … cannot experience places just by sitting in a seat, so using a pair of goggles is much more beneficial, I think.'

The immersive quality was seen as a way to overcome safety and financial barriers that prevent physical field trips. As Participant 9 explained, VR

'… gives learners the experience of a place, even though they are not physically there. They get to see not only the place, but also the type of people who live there and how they actually live in those different places they experience.'

Impact on Engagement and Interest of using VR goggles in Intermediate Phase Social Sciences (Geography)

The VR experience significantly changed the participants' level of engagement and interest in the subject matter. The dynamic and interactive nature of the tour made the content more engaging than conventional learning. Participant 2 noted:

'I think it does change my level of engagement. I thought it would be very interesting to explore places beyond this, so I thought I could Google going to Paris for myself after this VR learning, which is quite cool. It was so nice to use it in class for learners to go to places that… they can't afford to visit.'

The tool's ability to facilitate engagement with place was repeatedly cited as a powerful motivator to use the tool in future teaching and learning of Social Sciences (Geography). For learners who may be unfamiliar with different environments, VR provides a safe and accessible way to explore new places and cultures. Participant 24 articulated this benefit:

'A person who has never been to an urban area can be taken there, you know, without leaving the classroom and while staying in a safe environment.'

This experience not only enhanced interest in the specific topic but also had the potential to change perceptions of the broader subject. Participant 13 noted:

'This interested me and made me… engage with what is being learnt, even though I don't usually like it. So, I feel like it's going to change the perception of Social Sciences for learners who don't like it.'

Participant 6 added:

'I just like the fact that you're surrounded by them (referring to humans and animals that were in the VR tour), like it's you. You see them in their daily lives and daily spaces without having changed any of their routines, because your presence isn't intrusive, … but you still get to observe and interact with what they do.'

Ability to Visualise and Retain information after using VR goggles

The majority of participants found that the VR tours enhanced their ability to visualise geographical information, but there was a mixed response regarding its impact on long-term retention of factual content. Many could vividly recall specific scenes and moments from the tours. For example, Participant 19 said:

> *'I still actually remember what I saw in the VR. I remember seeing the animals I noticed, being on top of the mountain, and the blue seas. I can still see everything very clearly. It's still very vivid right now, so it's easier for me to remember what I saw.'*

However, some participants felt the immersive, entertaining aspect of the tour detracted from the core educational content. Participant 4 suggested that this excitement should not be mistaken for sustained pedagogical value. Participant 4 commented:

> *'My ability to visualise was enhanced because I still remember what I saw. But I don't think it helped me retain geographical information, as it felt more like a fun activity than a learning experience. I don't think a teacher can teach content for learners to gain information solely from VR; it's more to enhance what they have already learnt, perhaps from a textbook or in class.'*

This suggests that while VR is a powerful tool for visualisation, it may need to be carefully integrated with other learning activities to ensure knowledge retention.

Challenges and Future Implementation of using VR goggles

Despite the positive feedback, participants identified several challenges and barriers to implementing VR in a classroom setting. Technical issues, such as the difficulty of using the goggles with spectacles, were mentioned. Participant 10 noted:

> *'I wear glasses, and putting on the VR goggles made it difficult to interact with them fully. However, they did fit reasonably well, so that was acceptable. At times, I had to close one eye to avoid experiencing double vision, which made it harder to engage properly. I think one solution could be for the teacher to display the video on a projector – essentially sharing what is being viewed on their phone – so that learners can still gain the perspective without relying solely on their own VR devices, which may present challenges.'*

A significant concern was equity and safety. As Participant 27 noted:

> *'I don't necessarily think it would be easily accessible, as it is quite expensive apparatus and there are underprivileged schools as well. In terms of learner engagement, I don't think it's straightforward... Children are fickle. You get the group that listens and the group that doesn't. Also, with children and phones, there is the threat of theft. So, you can't necessarily say, "Oh, bring your phone," because they might get robbed.'*

Participant 15 highlighted the issue of teacher and learner resistance to change, particularly in rural areas:

> *'There might be resistance to change. Some people don't accept these kinds of tools easily, especially since teachers don't always know how to use them, let alone the learners. So, there might be some resistance when it comes to adjusting and adapting to the change.'*

Other barriers included the physical limitations of a classroom space, the potential for distraction, and the need for adequate teacher training. However, the pre-service teachers remained optimistic about the future of VR in education. They suggested integrating it with traditional methods, using it to show famous landmarks or historical events, and teaching specific topics like settlements and different land uses as outlined by the Curriculum and Assessment Policy Statement (DBE, 2011). As Participant 4 said:

> *'I can see myself using it in future Social Sciences lessons. I feel like it's a very adaptable tool, so you can definitely use it a lot. You can take topics from the curriculum, interpret them, and then use VR.'*

DISCUSSION

The findings of this study highlight that pre-service teachers perceived VR goggles as a pedagogical tool with significant potential for teaching the Grade 4 Social Sciences (Geography) topic 'Places Where People Live'. Participants consistently described VR as more effective than traditional resources in representing geographical concepts such as rural–urban settlement contrasts, landforms, and spatial scale. By providing an immersive, three-dimensional perspective, VR was seen to foster deeper understanding and engagement than static maps and textbooks alone. These experiences resonate with existing scholarship that emphasises VR's capacity to make abstract geographical concepts tangible and to enhance learner motivation (Schaab et al., 2022; Giri & Sharma, 2023). An important insight is that participants envisaged VR as a complement rather than a replacement for conventional pedagogical tools. They noted that textbooks and maps provide foundational knowledge, while VR enables learners to visualise and contextualise these concepts experientially. This suggests that VR may function most effectively when integrated into a blended learning approach, supporting and extending traditional methods of Geography instruction. Such a view aligns with literature that cautions against treating technology as an isolated solution and instead advocates for curriculum-aligned integration (Grewe & Gie, 2023; Czimre et al., 2024).

At the same time, participants raised critical concerns that contextualise the affordances of VR. The novelty effect emerged as a double-edged factor: while the immersive quality heightened excitement and engagement, participants questioned whether this led to sustained knowledge retention. This finding is consistent with broader debates about distinguishing between entertainment value and durable pedagogical

impact (Walstra, 2023). Additionally, participants highlighted barriers such as equipment cost, ergonomic discomfort for spectacle wearers, and risks of theft or damage in South African school settings. These constraints echo systemic inequalities within the education system (Solomon, 2020; Samala et al., 2025) and reinforce the need for resource-sensitive strategies, such as low-cost smartphone-based viewers or shared group activities (Pramanik, 2024; Samala et al., 2024).

Another recurring theme was the need for adequate teacher preparation and ongoing professional development. Participants noted that resistance to technological change, especially in under-resourced or rural contexts, could limit implementation. This aligns with scholarship emphasising that the success of VR in education is contingent on both infrastructure and teacher confidence in its pedagogical application (Pregowska et al., 2021). Without such support, VR risks being underutilised or applied superficially, reinforcing inequities rather than transforming teaching practice (Dembe, 2024).

Taken together, these findings indicate that VR holds promise as a supplementary pedagogical tool in the Intermediate Phase Social Sciences (Geography) curriculum (DBE, 2011), particularly in teaching topics requiring visualisation and spatial reasoning. However, its effectiveness depends on thoughtful curriculum integration, systemic investment, and sustained teacher training. Rather than positioning VR as a technological fix, the evidence underscores its value within a blended approach that balances immersive experience with more traditional instructional strategies (Robertson et al., 2019; Roelofsen & Carter-White, 2022).

CONCLUSIONS

This study explored the pedagogical advantages and challenges of using VR goggles, based on the experiences of pre-service teachers learning to teach Grade 4 Social Sciences (Geography). Findings indicate that participants valued VR for its ability to enhance engagement, provide immersive experiences, and make abstract concepts such as settlement patterns and land use more tangible. However, challenges including equipment costs, ergonomic discomfort, inequitable access, and the novelty effect tempered these positive perceptions. The study contributes to limited South African research on VR in Geography education by foregrounding the voices of pre-service teachers. It suggests that VR is most effective when integrated into a blended approach alongside conventional methods. To ensure meaningful adoption, systemic investment, teacher training, and curriculum-specific VR resources are required. While the study was limited to a small cohort at a private higher education institution, it provides important insights into how future teachers envisage VR as a pedagogical tool in Intermediate Phase Social Sciences (Geography).

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