A Review of Virtual Reality from Primary School Teachers' Perspectives

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Abstract: Virtual reality (VR) is used across the educational spectrum (higher education, high school, primary school, and even pre-school); however, primary school teachers' perceptions of using VR in their classrooms require further research. A brief review of the literature of 100 existing articles related to teaching within the primary school context was conducted. The articles were obtained by performing a word search within Google Scholar, with the keywords 'virtual reality primary school teachers 2018 - 2023'. Teachers indicated both hesitance and enthusiasm for incorporating VR. The findings of this study indicated that only a low number of articles (n = 11) addressed VR and primary school teachers, compared to the total number of articles reviewed (n=100). Researching VR and teaching assists in supporting the wider fringe aspects of e-learning practices, such as VR. It advances the compass of e-learning knowledge by integrating immersive learning tools into the primary school classroom.

Keywords: Virtual Reality (VR), Primary school teaching, VR resources, Immersive, Learning, Teachers

1. Introduction

'Virtual reality is the first step in a grand adventure into the landscape of the imagination' (Biocca and Levy, 2013, p. 184). Multimodal virtual reality (VR) resources influence teachers' teaching. These VR resources take learners into environments they may not be able to go into, by wearing a VR headset or goggles. It creates a visual and auditory display for the learners to experience. This paper highlights the limited amount of research that has been conducted with primary school teachers and their opinions on the use of VR as a teaching resource. Articles about pre-service teachers being exposed to VR were also included to extend the scope. The focus is on primary school teachers' perspectives of VR in research conducted between 2018 and the beginning of 2023. The research is based on previous studies and research on learning in VR (Bricken and Byrne, 1992) and integrating VR into specific learning areas (Stojšić, et al., 2016). To assist in obtaining articles on virtual reality within the primary school, the Internet was used as an exploration tool, specifically Google Scholar. After an analysis of 100 articles, thirteen were identified to address the following question: What are the perspectives of teachers on virtual reality in the classroom? (Eleven articles were about teachers teaching and three articles were student teachers still studying.) The review explores the influence of virtual reality as an educational resource in the primary school context, across a range of countries and various types of virtual technologies (Mukasheva, et al., 2023). Teaching professionals determine the educational value and relevance of the e-learning tools they use in their teaching and learning environments. They motivate the inclusion or rejection of digital technologies, such as VR, in their lessons, as well as the connection to the designated curriculum and the professional knowledge of the teacher (Fransson, Holmberg and Westelius, 2020; Li, Liu and Chen, 2022). The importance of understanding teachers' perceptions about VR (Alalwan, et al., 2020) helps to demonstrate viewpoints related to technology and provides considerations for when to include it. This review highlights the importance of engaging researchers with teachers to understand their points of view related to VR technology. These findings might influence policymakers toward benefits of access and availability for technologies such as VR into the primary school classroom. These VR devices and scenarios are not a solution to all educational needs, but are effective teaching tools (Nesenbergs, et al., 2021), while teachers' attitudes affect the level of confidence and comfort with incorporating VR technology into lessons (Yıldırım, Yıldırım and Dolgunsoz, 2019; Li, Liu and Chen, 2022). The next section addresses the current understanding of what VR technology is.

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2. What is Virtual Reality?

VR is a digitally created multisensory immersion that allows participants to perceive the 'virtual' experience (Franchi, 1995). VR development of head-mounted displays with two tiny stereoscopic screens positioned close together in front of the eyes resulted in the potential for VR to be created (Woodford, 2007). VR integrates computer graphic images, interactive buttons, and sounds (Cochrane, 2016; Fuchs, Moreau and Guitton, 2011) absorbing the user in an immersive artificial, sensory, digital environment (Massis, 2015). As technology companies developed VR products, these virtual worlds became more accessible and their impact on education increased (Jowallah, Bennett and Bastedo, 2018; Rudran and Logishetty, 2018). The virtual scenario (Jowallah, Bennett, and Bastedo, 2018) provides an immersive environment in which students may interact and work. VR substitutes the user's reality as they wear the headset, while augmented reality (AR) enhances the physical world with an augmented digital image (Rogers, 2017). Multisensory, authentic VR learning experiences within interactive environments (Al Farsi, et al., 2021; Philippe, et al., 2020) are potentially beneficial for teaching and learning in schools (Craddock, 2018).

3. Literature Survey

As new and innovative technologies such as VR emerge, so do ideas for incorporating them into classrooms to enhance learners' interactions and learning. VR provides opportunities for primary school teachers to explore different technologies. VR is seen as an immersive (Jowallah, Bennett, and Bastedo, 2018) and accessible resource (Billingsley, et al., 2019; Rudran and Logishetty, 2018; Makransky and Lilleholt, 2018), capable of being used in different school contexts (Craddock, 2018; Dick, 2021), within learning theories such as the theory of experience (Parong and Mayer, 2018), experiential learning (Asad, et al., 2021) and constructivism (Niţu, et al., 2018). Teachers consider VR scenarios as useful teaching resources (Nesenbergs, et al., 2020) which digitally replicate learning environments (Abdullah, Mohd-Isa and Samsudin, 2019; Makransky and Lilleholt, 2018; Peltekova and Stefanova, 2016), and may potentially deepen learners' understanding of concepts (Parong and Mayer, 2018; Wu, et al., 2021). Virtual reality allows learners to feel as if they are immersed in a situation. VR applications enable learners to gain experience in dangerous situations or situations that are impossible to reach in real life (Serin, 2020). The factors to be considered when integrating technology are the perceptions of learners and teachers, institutional support, potential integration barriers, the reason for integrating technology, and the previous experience of using VR (Alfalah, 2018). Teachers' perceptions of educational VR solutions determine how effectively these technologies are incorporated into lessons (Albirini, 2006).

The eleven articles reviewed provided insights into VR in primary school situations.

- Alalwan et al. (2020) addressed the challenges and prospects of VR and augmented reality by primary school science teachers. Their findings highlight teachers' lack of practice in mastering VR technology, suggesting that teachers should be trained in educational technologies.
- Garcia, Nadelson and Yeh (2023) explored 360° virtual field trips for primary school learners, working with teachers and parents during the Covid pandemic lockdown, to take learners on virtual outings. They found that learners were positively engaged and actively participative.
- Hui, et al. (2022) explores virtual reality technology for teaching art in primary school. The experimental group of learners demonstrated a slightly better command of the details in the creation procedures, based on teachers' feedback. The study advocates using technology to lead teaching reform by investigating strategies for integrating virtual reality into teaching.
- The study by Khukalenko, et al. (2022) obtained their findings through a large-scale survey of more than 250,000 teachers and reports on their attitudes toward the use of VR for education, their relationships between the level of VR integration of teachers, their teaching approaches, and the frequency of VR use.
- Li, Liu and Chen (2022) explore the use of Immersive Virtual Reality (IVR) in science lessons and its influence on the learning performance of six graders and a teacher**.** The research suggested that investing in teacher training in VR would result in successful integration of VR into school classrooms.
- Maher and Buchanan (2021) researched the effectiveness of 360-degree video, on desktop virtual reality combined with analytics software, with eye tracking and chat features in the primary school classroom. The study indicated that teachers could access engagement information about learners using the analytics tool.
- Mukasheva, et al. (2023) researched a contextual framework for a VR learning environment to interpret the expectations of teachers and students, living in rural areas, regarding how VR should be included in the learning process. The teacher participants see VR as a beneficial technological

opportunity for humanity; however, approximately half of the participants expressed concerns about the potential negative health effects of VR. Most of the teacher participants expected schools to purchase VR headsets in the next five years and use them for teaching learners.

- Patterson and Han (2019) provide reflections on observations and interviews with one teacher who taught his learners by integrating VR into the curricula, and thereby enhancing his teaching practices and learner interaction. The study found that the individual teacher participant embraced innovative technology integration, suggesting that it would be beneficial for teachers to participate in collaborative lesson creation for effective technology integration.
- Rodríguez, Romero and Codina (2021) explores teachers' and learners' reactions to the interactive, manipulative geometry VR software, as they create and configure 2D and 3D shapes. The VR software was a new teaching tool for teachers, to be used to improve learners' 3D visualisation and the understanding of geometry. The findings illustrate how the teachers applied strategies to include all the students in building their geometrical knowledge.
- Serin (2020) gained teachers' perspectives about VR in education when they submitted a survey. The research recommended that VR be introduced as a teacher training course in education technology for preservice teachers to see the benefits of the technology and be motivated to integrate VR technologies into their lessons.
- Wu, et al. (2021) explored the teaching of elementary school students using VR for scientific enquiry. The teachers taught the lessons. These findings expressed that VR may promote learners' cognitive levels and abilities. The observations of the teachers were not presented, but suggestions of how they might teach and integrate VR, are.

In addition to the above articles, there were three preservice teacher research articles, which involved students who wanted to teach in primary schools.

- The research of Lin and Sumardani (2023) explored VR in science classrooms as *preservice teachers* implemented the technology. The study identified that VR helps build scientific concepts by provoking learners to expand on their VR learning content. This demonstrated the need for the teacher to guide the learners during the lesson.
- Thohir, et al. (2023) explored the effects of TPACK and the acceptance of VR in science education with *preservice teachers* from various Indonesian universities as participants. The participants' involvement in the VR training course was highly recommended.
- Li, Liu and Chen (2022) conducted a study in a rural area to establish the acceptance of VR among undergraduate *preservice teachers* as participants who intended to teach in preschools or elementary schools. These participants expressed hope in VR as a resource to help overcome educational inequality for future learners, as well as to demonstrate equal access to educational resources in both rural and urban settings. The projects referred to in the articles used a range of virtual technologies, from less immersive to highly immersive, as well as virtual desktop experiences. The selection of these articles is described in the research method.

4. Method of Analysis

The question addressed in this paper is: What are the perspectives of teachers on virtual reality in the classroom?

The researcher conducted the research using the Internet and searched within the Google Scholar website for academic articles and articles within the search keyword 'virtual reality primary school teachers', and decided to analyse the first 100 results within this query. With results on each page, the researcher meticulously worked through pages one to ten. Each paper was opened and briefly reviewed, and then categorised according to the following headings. The headings were developed as the papers were assessed in relation to virtual reality and the primary school teacher.

The Google Scholar search groupings after reviewing:

- VR and primary school teachers
- VR and preservice / teacher training
- VR and Primary school learners
- VR and other educational fields
- VR and secondary / high school learners
- VR and preschool learners

- VR in Higher Education
- VR literature review / Research VR to enhance learning
- Software development / evaluation in schools
- Comparison / Analysis between VR and Ar.
- AR and education
- AR and learners

The table below(Table 1) provides the breakdown for each of the headings.

Table 1: One Hundred Articles from Google Scholar Search - Virtual Reality primary School Teachers 2018 - 2023

Google scholar search: virtual reality primary school teachers 2018 - 2023	Search 1	Search 2	Search 3	Search 4	Search 5	Search 6	Search 7	Search 8	Search 9	Search 10	Total / Sub-Totals
VR & Primary school teachers	2	1	0	0	3	2	1	0	0	1	10
VR preservice / teacher training	0	0	0	0	0	1	0	0	2	0	3
VR & Primary school learners	7	5	3	3	1	3	3	2	3	2	32
VR, learners & other educational fields	0	0	0	0	0	0	1	1	1	0	3
VR & secondary / high school learners	0	0	1	1	2	1	0	0	1	1	7
VR & preschool learners	0	0	0	0	0	0	0	1	1	0	2
VR in Higher edu	0	0	0	1	0	0	0	0	0	0	1
VR lit review / Research VR to enhance learning	1	1	1	0	0	0	0	0	0	1	4
VR software development / evaluation in schools	0	0	1	0	0	2	2	0	0	0	5
Comparison between AR & VR	0	0	1	1	1	1	0	1	0	0	5
AR & education	0	0	0	1	2	0	2	1	1	1	8
AR & learners	1	3	3	3	1	0	1	4	1	3	20

Google scholar search: virtual reality primary school teachers 2018 - 2023	Search 1	Search 2	Search 3	Search 4	Search 5	Search 6	Search 7	Search 8	Search 9	Search 10	Total / Sub-Totals
Total / Sub-Totals	11	10	10	10	10	10	10	10	10	9	100

An interesting observation was the number of articles per year that appeared in the search from 2018 to 2023 (see Figure 1) . Forty-seven articles emerged from 2023, with twenty-six of them on VR in education.

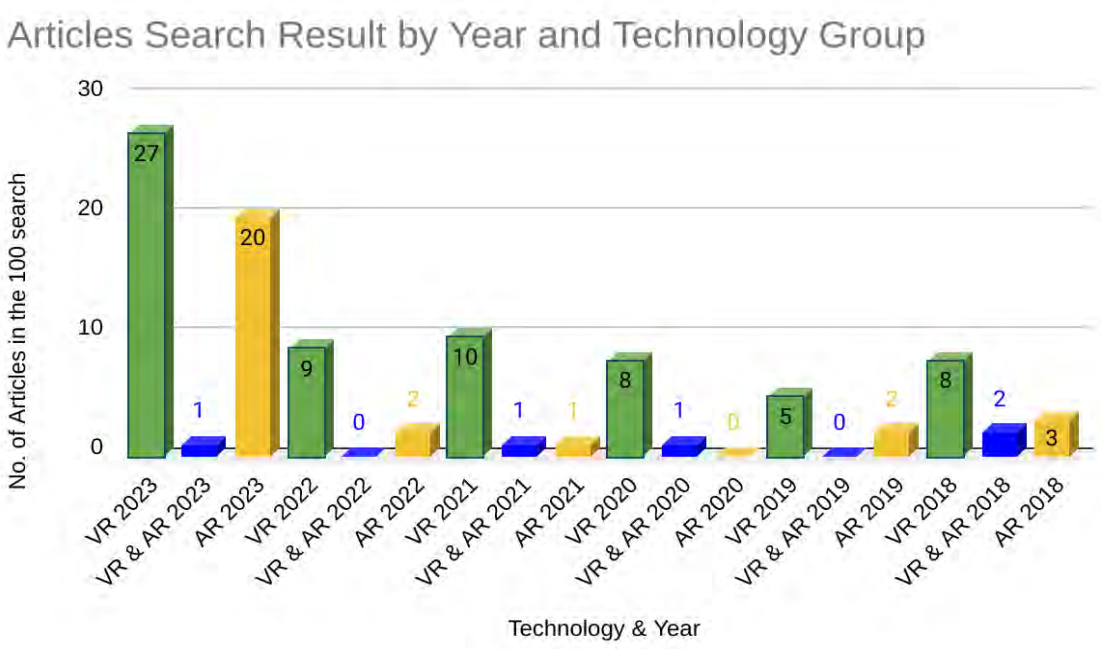

Figure 1: One Hundred Articles Search Result by Year and Technology Group

In this review, the term 'primary school' is interpreted from a South African perspective, where primary school is from grade 1 to grade 7. The target audience was teachers within primary schools using VR. The vast majority of articles related to VR (n=67) across a range of topics, and augmented reality (AR) (n=28) was the next group of articles. The final small group of articles was comparisons, combinations, or analyses of VR and AR (n=5). The papers related to virtual reality but were not all primary school teachers focused. These papers focused on

- 31 papers: VR and learners, and no teacher voice was provided.
- 3 papers: VR and other educational fields, which included:
    - The effects and emotions on learners when participating in a creative performance (Huang and Chang, 2023)
    - Exploring a World Heritage Site as a VR Experience (Zhu, et al., 2023)
    - Using VR to identify risky pedestrian behaviour in children (Luo, et al., 2020)
- 7 papers: VR in secondary or high school education
- 2 papers: VR and preschool learners
- 1 paper: VR and Higher Education
- 4 papers: Review of the VR literature or general research related to VR
- 5 papers: VR Software Development or Evaluation within Primary Schools
- 4 papers: VR related to Higher Education

This left 13 papers that included the views of primary school teachers, qualified teachers (10 papers) and pre-service teachers (3 papers) within their research. These articles either focused entirely on the teachers or included teacher views within the research.

Each article was analysed and the information was categorised under the following headings:

- Alignment of the curriculum and lessons with VR resources (n=14 comments)
- Teachers' concerns about VR (n=18 comments)
- Positive views and observations (n=17 comments)
- Challenges the teachers referred to with respect to their students (n=10 comments)
- Prospects and opportunities that teachers referred to with respect to their students (n=28 comments)
- Positive perceptions of pre-service teachers of VR integration in lessons (n=5 comments)

The VR devices used in these studies varied greatly, from head-mounted devices (HMD), such as Google cardboard or other similar headsets, such as the Xiaomi head-mounted display (Patterson and Han, 2019; Yıldırım, Yıldırım and Dolgunsoz, 2019), powered by mobile phones (Alalwan, et al., 2020; Serin, 2020) to high-immersion virtual reality (VR) technology for education (Khukalenko, et al., 2022; Li, Liu and Chen, 2022; Lin and Sumardani, 2023; Mukasheva, et al., 2023). One project had individual VR Neotrie equipment consisting of a VR visor and controllers, with a standard videogame computer (Rodríguez, Romero and Codina, 2021). Another had ten immersive virtual reality (IVR) devices, which were high-performance computers, an HMD, and two controllers for each user, as well as a mobile tablet containing the IVR teaching system with the set of systematic IVR lessons (Liu, et al., 2020). Another was a group of desktop virtual reality computers, containing 360-degree video footage, and an analytics platform (Maher and Buchanan, 2021). Wu, et al. (2021) used a spherical video-based VR (SVVR) system. Finally, a full VR classroom equipped with 30 sets of PICO VR integrated headset displays and a series of HTC VIVE VR headsets connected to the teacher's equipment and a teacher machine was used. The teacher was able to manage the devices of the learners as these technologies were used to explore immersive VR in lessons, across a range of countries.

The projects were carried out in twelve countries. The countries where the selected research articles were conducted were two European countries, Poland and Spain; two countries in the Middle East namely Saudi Arabia and Iraq; two projects in Southeast Asia, one in the Philippines and one in Indonesia; eight Asian sites, one in Russia, Kazakhstan, Taiwan, and four projects in China (Jinhua City, Shanghai, Beijing, and rural China among minority groups of people). Figure 2 indicates the places on the map.

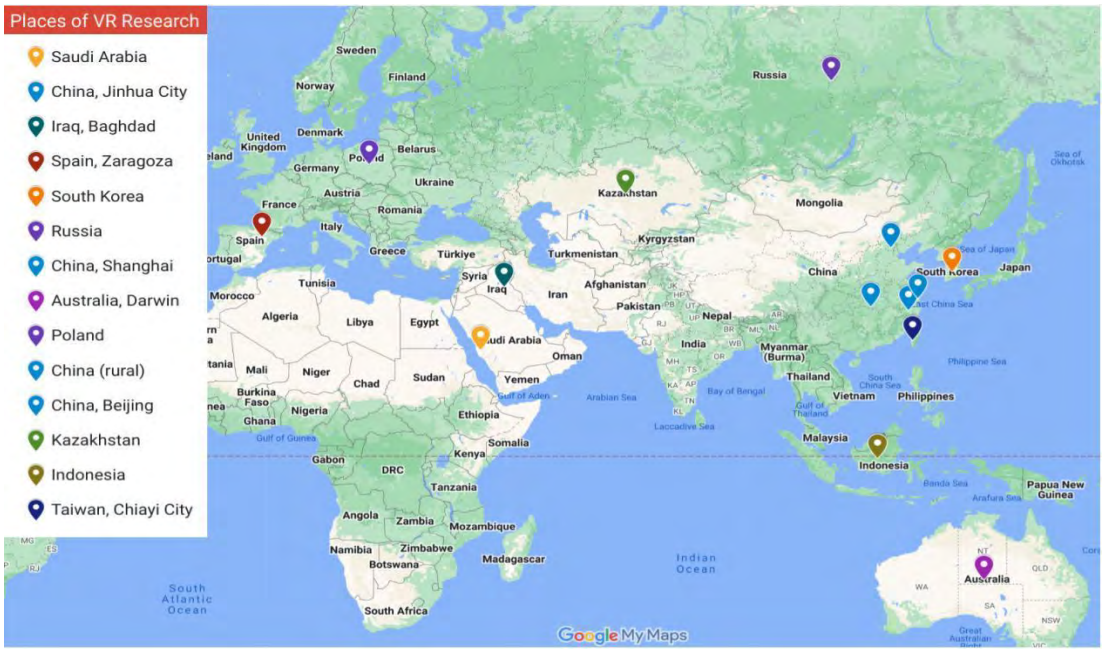

Figure 2: Map of Research Areas

These articles were related to primary school teaching and the incorporation of VR within lessons. Subjects that these studies focused on were science (Alalwan, et al., 2020; Liu, et al., 2020; Wu, et al., 2021), mathematics (Rodríguez, Romero and Codina, 2021), language, specifically Korean literacy (Patterson and Han, 2019), and art (Hui, et al., 2022), geography (Maher and Buchanan, 2021). Three of the articles had a range of subjects that teachers taught, as these were large surveys. The one took place in Iraq, where 14 middle school and 15 high school teachers received the information and the link to the online questionnaire to complete (Serin, 2020). The second article was a survey that took place in Russia, where more than 20,000 teachers answered the survey

(Khukalenko, et al., 2022). Participants taught subjects such as computer science, chemistry, physics, biology, technology, mathematics, social science, Russian (as the first language), foreign languages, and literature (Khukalenko, et al., 2022). The subjects taught are related to the curricula in those countries. The teachers' thoughts and points of view are explored in the next section.

5. Teachers' Perspectives

5.1 Curriculum Alignment

Exploring teachers' perspectives of VR in the classroom further begins by addressing curriculum affiliation. A subject-based curriculum consists of various subjects, such as Mathematics, Science, or Social Sciences, to be taught within a grade. A curriculum outlines the teaching and learning content, outcomes, and performance criteria (Schmidt, et al., 1997). Six of the articles were associated with lesson content, which was aligned with specific curricula. In turn, the VR activity supported curriculum learning. 360-degree VR assisted learners to meet the geography outcomes (Maher and Buchanan, 2021). VR immersive resources are integrated into the science curriculum and used to help meet national curriculum standards (Liu, et al., 2020). When planning the lesson, the content of the VR resource was aligned with the curriculum topic. The teacher created a technology-enhanced social studies curriculum lesson (Patterson and Han, 2019). When planning lessons with VR resources, the teacher must understand how to align the lesson content with the curriculum and must ensure that the lesson addresses learning needs (Khukalenko, et al., 2022). VR technologies, Neotrie, enhance familiar subject curriculum content and provide additional relevant mathematical information (Rodríguez, Romero and Codina, 2021). In this instance, the technology is seen as an amplifier of learning material and a learning context reorganiser (Rodríguez, Romero and Codina, 2021). Contrary to this, the use of VR in primary school science curriculum was hindered due to the limited VR instructional materials (Alalwan, et al., 2020). One study aligned with Vygotsky's sociocultural theory (Vygotsky, et al., 1978), where a social process is mediated through interactions with tools, describing their 360 images and analytics platform as a sociocultural-multimodal framework (Maher and Buchanan, 2021). Developing students' problem-solving skills as an aspect of using VR resources aligned to the curriculum involves engaging them in diverse modalities and a variety of strategies (Wu, et al., 2021). Integrating VR resources into lessons, implies that policymakers, teachers, and e-learning developers must align the merging of pedagogy and technology (Jowallah, Bennett, and Bastedo, 2018). Participating in these VR lesson activities resulted in the teachers expressing their concerns.

5.2 Concerns Integrating VR

Some teachers were concerned about costs and budget constraints, and other teachers were requesting a VR-equipped environment for their schools (Hui, et al., 2022). Others found the cost reasonable, as VR devices were included in the lesson, learners' mobile device, and no additional costs for application usage (Patterson and Han, 2019). Teachers were concerned about informing parents about the need for learners to bring mobile phones to school (Patterson and Han, 2019), or that learners may not be able to acquire devices (Alalwan, et al., 2020). Concerns were highlighted about the limited number of immersive VR devices (Liu, et al., 2020) in a lesson, or an unreliable Wi-Fi connection (Patterson and Han, 2019) which meant that the VR application would not function. From a technical perspective, with learners using their personal mobile devices, even when they have installed the VR application at home, there were issues related to the individual phone settings of the range of devices (Patterson and Han, 2019). The time constraint due to timetabled lesson times was also raised (Alalwan, et al., 2020). When preparing the lessons, teachers raised the concern of the limited range of VR content (Alalwan, et al., 2020). Being prepared and knowing how to use technology is important, as explained in the next section. Raising concerns resulted in the teachers expressing positive views.

5.3 VR as a Good Teaching Tool

Teachers valued VR as good teaching tools, helping learners learn science content, believing that these resources are capable of explaining abstract concepts and stimulating learners' interest (Alalwan, et al., 2020). VR was positively correlated with learning engagement, which contributes to understanding knowledge (Hui, et al., 2022) and promoting independent learning (Alalwan, et al., 2020). The teacher observed that the learners who struggled to learn, became more interested when using the VR resource (Hui, et al., 2022; Rodríguez, Romero and Codina, 2021). Teachers modified their initial lesson plans from more traditional methodology to integrate VR resources (Patterson and Han, 2019). These changes result in an inductive learning approach that affects spatial reasoning (Rodríguez, Romero and Codina, 2021), where traditional lessons were altered to become interactive. Teachers adapted existing lessons with VR-infused learning resources, accommodating learner needs (Patterson and Han, 2019) and improved classroom teaching engagements (Hui, et al., 2022). VR learning

environments can be used to present the attractiveness of science and STEM education, can improve learning outcomes, increase motivation, and create an interest in learning (Mukasheva, et al., 2023). Virtual reality environments promote an alternative to traditional classroom learning. A teacher expressed the impact of using an immersive, interactive VR activity to teach geometry that radically changed the way geometry was taught. VR assisted in teaching the difficult spatial geometry topic in an easy and attractive manner (Rodríguez, Romero and Codina, 2021).

It is important to know how technology works. The value of professional development was noticeable, since one teacher received three months of VR training prior to conducting the study (Liu, et al., 2020) and was comfortable in planning and presenting the lessons. There are benefits in personal development for teachers with regard to educational VR technologies (Billingsley, et al., 2019). In preparing prospective teachers for the integration of viable and affordable technology into their lessons, it is relevant to identify the important aspects of VR for effective adoption (Thohir, et al., 2023). For teachers to understand the potential technical difficulties and to know how to use the technology, they must be trained (Hui, et al., 2022). These ideas were reinforced by the notion that teachers who were comfortable and familiar with VR technology attempted to use it more often in lessons (Khukalenko, et al., 2022). Teachers understanding and using the analytics platform linked to the virtual experience began to understand the online behaviour of their learners, using the eye tracking information to appropriately adapt future lessons and assess the online behaviour of learners (Maher and Buchanan, 2021). Teachers also expressed potential challenges during lessons.

5.4 Challenges Regarding Students

Some teachers were concerned about the adaptation of VR lessons. Khukalenko, et al. (2022) detected that most teachers had a low level of confidence using VR technology in their lessons. Teachers were perturbed about learners viewing other content, not related to lesson, therefore they selected guide mode (Patterson and Han, 2019). Another teacher was sceptical about the effectiveness of VR, from finding relevant resources to create a structured VR lesson that flowed well and did not create chaos in the classroom (Patterson and Han, 2019). Other teachers were not convinced about teaching science using VR technology (Alalwan, et al., 2020). Teachers also considered the health risks for their learners when using VR (Alalwan, et al., 2020); a few learners felt minor dizziness. However, none removed their headsets nor stopped to take a rest during the class (Patterson and Han, 2019). Teachers felt that young learners could use Google Cardboard head-mounted devices safely, with adult supervision, remaining seated while viewing, and for a limited time (Patterson and Han, 2019; Alalwan, et al., 2020). Lin and Sumardani (2023) suggest that teachers need to be aware that learners may have phobias such as a fear of heights, and learners should be informed that they can stop the experience if they feel uncomfortable or concerned. Teachers should preview the content and know what learners will experience. The lack of technology competency among students made teachers think training programmes need to be revamped, to improve VR learning skills (Alalwan, et al., 2020) Teachers raised these concerns and saw opportunities in relation to their learners.

5.5 Prospects and Opportunities for Students

The benefits of VR for learning are described as interesting and encouraging learners to be active (Serin, 2020) in an immersive, exploratory, interactive experience (Alalwan, et al., 2020; Hui, et al., 2022; Rodríguez, Romero and Codina, 2021), building schematic and visual thinking (Serin, 2020). Providing learners with a general idea of the subject (Serin, 2020), VR provided 3D real-time experiences worldwide, providing the user with the sensation of being in another place (Hui, et al., 2022). Other teachers considered VR to provide learning opportunities for learners to understand concepts across a wide range of resources (Alalwan, et al., 2020). Learners solved problems analytically and developed 2D and 3D concepts by manipulating and creating shapes (Rodríguez, Romero and Codina, 2021). The teachers felt the knowledge learners gained assisted in underpinning learning and drove discussions in the follow-up class lesson (Maher and Buchanan, 2021). VR was also found to increase the creativity of learners and assisted them in creating procedures and details of art (Hui, et al., 2022). The VR device was considered very easy for elementary learners to use (Patterson and Han, 2019). Preservice teacher participants described their VR experience as feeling real, expressing that they felt as if they were in space (Lin and Sumardani, 2023). The assumption was that this feeling would be experienced by their learners as well.

6. Conclusion

After exploring these primary school studies and asking the question 'What are teachers' perspectives on virtual reality in the classroom?', the following inferences are made. Teachers have both concerns and see the value of

integrating VR into their lessons. The VR environments and resources do influence teachers' teaching practices, both positively and negatively. For effective inclusion of VR as a teaching resource, one needs to consider the teaching strategy to be used (Alalwana, et al., 2020). The value of the VR-infused lesson plan correlated with curriculum topics with the considered classroom management organisation (logistics, time constraints, and planning) (Graeske and Sjöberg, 2021) result in a relevant and meaningful learning experience. However, the range of research from the teaching perspective of teachers when integrating VR technology into the primary school is limited. The need for both in preservice and in-service professional development in VR is required for building knowledge on how to integrate the VR resources into lessons, as well as upskilling teachers' understanding and confidence in utilising VR in their teaching practices. To integrate VR effectively into lessons, teachers must see the value of their subject and their students. Potential areas of research include VR professional development to assist primary school teachers in using technology and sourcing content; VR and classroom management in the primary school classroom; and long-term research focusing on primary school teachers' assessment of VR resources to facilitate learning outcomes achievement and improve learning outcomes. The wide variety of VR resources offers opportunities for continued research into all these technological areas of virtual learning to drive integration within the classroom.

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