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Comparison of virtual reality perceptions of teachers working in Türkiye and South Africa

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With the study reported on here we aimed to determine and compare teacher perceptions of the concept of virtual reality between Turkish and South African teachers using metaphors. We adopted a phenomenological approach, and a questionnaire was administered to a total of 100 teachers in both countries, using random sampling. The study included 4 schools – 2 secondary schools selected from each country. The data obtained were analysed and categorised into themes using the metaphor mismatch technique. The following themes were identified and interpreted, learning, entertainment, technology, art, travel, and imagination. Teachers presented metaphors based on relevance to their area of practice and perceived potential use of virtual reality in teaching and learning. Based on the number of metaphors identified, teachers held a narrow perception in the categories, entertainment, technology, and travel, while more metaphors, with varied sample explanation responses were identified in the categories of learning, art, and imagination. The findings of this study can be used to develop a user road map for teacher professional development and to inform policy on the use of virtual reality in teaching and learning.

Keywords: metaphor; teachers; virtual reality

Introduction

The continuous advancement in virtual education technologies has necessitated the need to explore the pedagogic value of these applications in enhancing teaching and learning. The concept of virtual reality (VR) in teaching and learning in South Africa and Türkiye has not been extensively explored. Mhlanga and Moloi (2020) report that there are few pockets of adoption and use of virtual technologies for teaching and learning in South African schools. On the other hand, B Yildirim, Sahin-Topalcengiz, Arikan and Timur (2020) explored teacher perceptions of the use of VR in teaching and learning in Türkiye and their findings reveal that there was limited pedagogical use of VR despite the abundance of digital resources. The use of VR in teaching and learning appears to be an area that has not been extensively researched in South Africa and Türkiye (Mhlanga & Moloi, 2020; Sancar & Atal, 2023; Yildirim, B et al., 2020) with most studies focusing on teacher perceptions while being silent on exploring empirical pedagogic use of VR in teaching and learning.

The depth of this problem can be traced back to the early 1990s. S Yildirim (2007) reports that the Ministry of Education in Türkiye introduced information and communication technologies (ICTs) as part of the Basic Education Project in 1997, which was aimed at increasing the number of years that learners spend in primary education from 5 to 8 years. In South Africa, Ndlovu (2015) indicates that the first draft of the policy on the use of ICTs in education was developed in 2004. The motivation to promote the use of ICTs in South African schools was to improve teacher engagement through active learning (Sekwena, 2014). Padayachee (2017) concurs with the policy environment in South Africa but argues that not all schools have been resourced with digital technologies. This comparative study of Turkish and South African teachers on VR has been motivated by the two countries' active participation and use of the United Nations Educational, Scientific and Cultural Organization's (UNESCO) Information Communication Technology Competency Framework for Teachers (ICT CFT) in developing teacher professional development programmes. VR promises (Jantjies, Moodley & Maart, 2018) to innovate teacher pedagogic practices by offering tools and features that improve the presentation of learning content and environments that allow for simulated learning experiences. The gap identified in the literature has to do with the unavailability of empirical studies that focus on teacher perceptions and experiences on the use of virtual reality in teaching and learning.

The following research questions were used to guide this study:

- What are the metaphors that teachers put forward regarding the concept of virtual reality?
- Under what conceptual categories can the metaphors put forward by teachers be collected in terms of their common characteristics?
- What are the differences and similarities in terms of the metaphors put forward by teachers in Türkiye and South Africa?

The significance of the study was its ability to identify metaphors that were used to gauge teacher perceptions of the concept of VR. The results can be used to develop a user road map for teacher professional development programmes and to inform education policy on the value and use of VR for teaching and learning.

Literature Review

Virtual reality and its application in education

The concept of VR has found prominence in education, initially through distance and online learning (Alqirnas, 2020), and thus virtual classrooms enable students and teachers to interact as if they were face to face. This approach to teaching is relatively new to basic education in Türkiye and South Africa and has found prominence due to the coronavirus disease (COVID-19)-induced learning environment that resulted in several regulations such as social distancing. Social distancing limited the number of learners in a classroom resulting in face-to-face classes being suspended in favour of remote and online teaching and learning. VR utilises the concept of abstraction (Sprague & Schahczenski, 2001) in that certain tools and devices are used subconsciously by different individuals with access to digital technologies, hence the need to test teacher understanding of this concept. Lund and Wang (2019) argue that studies around VR in education tend to focus on the opportunities provided by virtual learning technologies as opposed to their effectiveness in teaching and learning. The trend has denied education practitioners the ability to fully explore the pedagogic value of VR.

Teacher perceptions on the use of virtual education

Studies by Fidan, Debbag and Cukurbasi (2021), Gibson (2013) and Sarigöz (2019) have explored teacher perceptions of the use of VR for teaching and learning focusing on teacher behaviour and the use of VR resources. In their study on augmented learning and VR, Akgün, Instanbullu and Avci (2017) endeavoured to identify a target group that was likely to use VR technologies effectively. They attempted to identify the learning domains (cognitive, affective, psychomotor) where these technologies were most useful. Their results were interpreted through technical concerns, learning materials and instructional methods, educators, and researchers for using VR effectively for education. The literature on teacher perceptions of VR (Fidan et al., 2021; Gibson, 2013; Sarigöz, 2019) appears to focus more on teacher needs and expectations and has limited scope about teacher emotions, preferences, and challenges experienced using VR resources. Averbukh, Averbukh, Vasev, Gvozdarev, Levchu, Melkozerov and Mikhaylov (2019) are of the view that the significance of teacher perceptions is their ability to provide essential information that can be used to create model outcomes in this case, for teacher professional development programmes that are linked to user road maps. These are important in setting goals, understanding context, and developing learning resources for teachers.

Understanding virtual reality

Arnaldi, Guitton and Moreau (2018) assert that a lot of research has been done about VR at both a scientific level (by research teams) and at an industrial level (by companies), yet its use and application in teaching and learning remains a neglected area. These authors argue that the concept of VR is not new, since for thousands of years humans have used paintings and art to represent reality. In their study, Arnaldi et al. (2018) postulate that the objective of VR is to allow the user to execute a task while believing that they are executing it. This understanding is shared by Craig, Sherman and Will (2009) who have described VR as a medium by which humans can share ideas and experiences. Gibson (2013) and Solomon, Ajayi and Raghavjee (2017) investigated the concept of VR, with Gibson (2013) outlining VR as a computer-simulated reality or fictitious environment which interacts through a human-computer interface so that users experience immersion. Conceptually, his understanding of VR is like the one posited by Solomon et al. (2017) who assert that VR is a collection of technological hardware and software that aids in the creation of immersive environments.

Methodology

In this study, a phenomenological design was used as one of the qualitative research methods. The phenomenology pattern focuses on phenomena that we are aware of but do not have an in-depth and detailed understanding of. Phenomenology constitutes a suitable research ground for studies that aim to investigate facts that are not completely foreign to us but, at the same time, we cannot fully grasp. With phenomenological studies the general aim is to reveal and interpret individual perceptions about a phenomenon (Yıldırım, A & Şimşek, 2016). In other words, the phenomenological pattern is the experience of a person or group in the world. It deals with the meaning, structure, and essence of experiences (Mulveen & Hepworth, 2006).

Individuals approach the object or events they encounter within the framework of their knowledge, skills, and attitudes and, especially if this event or object contains abstract concepts, they try to establish metaphorical structures in expressing their thoughts by establishing a relationship between this abstract concept and known concrete things (Saban, 2005). The use of metaphors as a qualitative data collection method is a more descriptive role. Thus, a rich content and visual picture can be presented about the subject, event, phenomenon, or situation (Yıldırım, A & Şimşek, 2016). Levine (2005) proposes that metaphors reflect individuals' past experiences, present ideas, and hopes for the future. Metaphors represent what people perceive as everyday reality. Saban (2005) insists that metaphors allow for the mapping of knowledge and experience of users and are essential in this case for the design of virtual learning artifacts.

Working Group

This case study was based on four schools – two from Türkiye and two from South Africa. A total of 100 teachers in both countries participated in the research during the 2020–2021 academic year and teachers were randomly selected. The sample size represented 83% of the teachers in the four identified schools. The teachers from South Africa were between the ages of 31 and 35 and those from Türkiye between 36 and 40. The profile characteristics of the participants are given in Table 1.

Table 1 Demographic characteristics of the participants

Demographic characteristics	Groups	*f*	%	*f*	%
Country		Türkiye		South Africa	
Gender	Male	35	70	18	36
	Female	15	30	32	64
Age	20–25	1	2	3	6
	26–30	3	6	13	26
	31–35	10	20	15	30
	36–40	17	34	5	10
	41–45	13	26	4	8
	46–50	5	10	6	12
	51–56	1	2	4	8
School	Primary	6	12	9	18
	Middle	22	44	3	6
	High	22	44	38	76
Working years category	0–5 years	4	8	12	24
	6–10 years	8	16	20	40
	11–15 years	13	26	8	16
	16–20 years	13	26	3	6
	21–25 years	8	16	5	10
	26–30 years	4	8	2	4
Highest qualification	Bachelor of Education	39	78	43	86
	Master of Education	11	22	7	14
Branch	Commercial	2	4	8	16
	Information Technologies	23	46	5	10
	Languages	11	22	16	32
	Mathematics	2	4	8	16
	Sciences	4	8	9	18
	Social Sciences	8	16	4	8
Total		50	100	50	100

Data Collection

Teachers participating in the research were asked to complete the sentence "Virtual reality is like a ... because ..." to reveal their perceptions of the concept of VR. An online form consisting of two parts was used to reveal the teachers' views on the concept of VR and had been prepared in two languages, Turkish and English. The first part of the online form consists of questions aimed at obtaining the participants' demographic information and the second part includes a metaphor question to determine the perceptions of the teachers regarding the concept of VR. Firstly, a data collection form was developed. The developed form was shared with 120 teachers working in Türkiye and South Africa. The metaphors given by the participants were evaluated by two experts responsible for developing teacher professional development programmes in Türkiye and South Africa. An online form in Turkish had been prepared for teachers working in Türkiye. The answers given in Turkish were translated into English by a university professor in Türkiye.

Secondly, the metaphors developed by 20 teachers were excluded from the scope of the research. Using the data collection tool, data were collected from 62 teachers from Türkiye and 58 teachers from South Africa. The collected data were analysed in terms of metaphor mismatch. The metaphors of 12 teachers from Türkiye and eight teachers from South Africa were eliminated. Thus, a total of 100 teachers' metaphors were included in the study. The number (*f*) and percentage (%) of teachers representing a metaphor were calculated.

The process of analysing and interpreting the metaphors developed by the teachers was carried out in stages. Firstly, coding and extraction. The metaphor sentences presented by the participants on the online data collection form were entered into Microsoft Excel with the information of the other participants. Secondly, metaphors were written in a separate column and the metaphors were sorted from A to Z. Teachers working in Türkiye were coded as TT1, TT2, TT3, etc. and teachers working in South Africa were coded as SAT1, SAT2, and SAT3, etc. Participants who did not specify metaphors were

eliminated.

To ensure reliability of the research, one expert from each country, Türkiye and South Africa were considered to verify whether the metaphors gathered under the six conceptual categories in the research represented the mentioned conceptual category. Both the researchers took an active role in all stages. To ensure the reliability of the research, the researchers' codes and the categories related to the codes were compared to confirm whether the codes included in the categories represented the conceptual categories in question. After the research data were coded separately by the researchers, the resulting codes and category list were finalised.

Findings

Teachers working in Türkiye produced 32 valid metaphors. Teachers working in South Africa produced 33 valid metaphors. Turkish participants produced the following metaphors: dream (f = 14), ocean (f = 3), illusion (f = 2) and metaphysics (f = 2), while South African participants produced the following: movie (f = 4), computer (f = 3), digital world (f = 3) and dream (f = 3). The fact that the teachers participating in the research worked in different countries resulted in different metaphors to be produced. When we looked at the metaphors produced about VR, the participants in both countries produced similar metaphors – mirror, dream, game, painting, and space.

The metaphors on the concept of VR produced by the participants are presented in Table 2.

Table 2 Metaphors of teachers in Türkiye and South Africa

Teacher metaphors							
Türkiye				South Africa			
Teacher code	Metaphor name	*f*	%	Teacher code	Metaphor name	*f*	%
TM1	Book	1	2	SAM1	Abstract fiction	1	2
TM2	Bridge	1	2	SAM2	Airplane	1	2
TM3	Cartoon	1	2	SAM3	Another world	1	2
TM4	Digital world	1	2	SAM4	Binoculars	1	2
TM5	Dream	14	28	SAM5	Brain	1	2
TM6	Game	1	2	SAM6	Computer	3	6
TM7	Glasses	1	2	SAM7	Consciousness	1	2
TM8	Illusion	2	4	SAM8	Digital world	3	6
TM9	Infinity	1	2	SAM9	Door	2	4
TM10	Ivory tower	1	2	SAM10	Dream	3	6
TM11	Imaginary and real	1	2	SAM11	Freedom	1	2
TM12	Lamp	1	2	SAM12	Game	2	4
TM13	Life	1	2	SAM13	Helmets	1	2
TM14	Magic	1	2	SAM14	Human	1	2
TM15	Metaphysics	2	4	SAM15	Imitation	2	4
TM16	Mine	1	2	SAM16	Learning tool	2	4
TM17	Mirage	1	2	SAM17	Mirror	1	2
TM18	Mirror	2	4	SAM18	Movie	4	8
TM19	Moon	1	2	SAM19	Observation	1	2
TM20	Ocean	3	6	SAM20	One-way street	1	2
TM21	Painting book	1	2	SAM21	Painter	2	4
TM22	Park	1	2	SAM22	Perfect vision	1	2
TM23	Photo	1	2	SAM23	Picture	2	4
TM24	Picture	1	2	SAM24	Rain	1	2
TM25	Scene	1	2	SAM25	Real-life situations	1	2
TM26	Sculptor	1	2	SAM26	Resourceful school	1	2
TM27	Shadow	1	2	SAM27	Revolution	1	2
TM28	Space	1	2	SAM28	Satellite	1	2
TM29	Steamboat	1	2	SAM29	Sea of knowledge	1	2
TM30	Teleportation	1	2	SAM30	Space	1	2
TM31	Traveller's book	1	2	SAM31	Spaceship	1	2
TM32	World	1	2	SAM32	Sunshine	1	2
				SAM33	Time machine	3	6
Total		50	100			50	100

In the next section we present and discuss the metaphors in six conceptual categories: 1. Learning, 2. Entertainment, 3. Technology, 4. Art, 5. Travel, 6. Imagination.

Virtual Reality as Learning

This category includes metaphors and expressions related to VR (see Table 3) given by teachers about the learning category. This includes statements by three Turkish and 12 South African teacher participants.

Table 3 Metaphors and expressions related to the learning category

	Learning				Sample expressions
	Türkiye		South Africa		
Metaphor	*f*	%	*f*	%	Because
Book	1	33.3			"*We make up the contents*" (TT21).
Brain	-	-	1	8.3	"*Contains deep knowledge*" (SAT26).
Consciousness	-	-	1	8.3	"*It is unseen and very influential*" (SAT3).
Door	-	-	2	16.7	*"It takes you to a new experience"* (SAT7).
Human	-	-	1	8.3	"*Human doing of things*" (SAT2).
Learning tool	-	-	2	16.7	"*Supports the learning process*" (SAT43).
Rain	-	-	1	8.3	"*It is very disturbing and people avoid it and seek comfort, but we can find a long-term solution to many problems*" (SAT41).
Resourceful school	-	-	1	8.3	"*Facilitates and motivates potential*" (SAT15).
Satellite	-	-	1	8.3	"*Everything is here when we need it*" (SAT28).
Sea of knowledge	-	-	1	8.3	"*Does not limit how and when one can use it for an endless range of teaching and learning*" (SAT32).
Space	1	33.3	1	8.3	"*Very comprehensive*" (TT25). "*We learn new things on the new satellite*" (SAT12).
Traveller's book	1	33.3	-	-	"*It tells you places you don't see like you've been*" (TT22).
Total	3	100	12	100	

One participant in each country compared VR with space. South African participants produced more metaphors in the learning category than Turkish participants.

Virtual Reality as Entertainment

This category includes metaphors and statements related to VR in the entertainment category (see Table 4) produced by two Turkish and six South African participants.

Table 4 Metaphors and expressions related to the entertainment category

	Entertainment				Sample expressions
	Türkiye		South Africa		
Metaphor	*f*	%	*f*	%	Because
Cartoon	1	50			"*Makes it fun*" (TT18).
Game	1	50	2	33.3	"*Makes it fun*" (TT18).
Movie	-	-	4	66.7	"*It is to live what is not*" (SAT33). "*Is an actual representation of life*" (SAT17). "*It's creations that are made real even though they never exist*" (SAT40).
Total	2	100	6	100	

South African participants produced more metaphors in the entertainment category than Turkish participants.

Virtual Reality as Technology

This category includes metaphors and expressions related to VR given by teachers in the technology category (see Table 5). The metaphors in this category were produced by one Turkish and eight South Africa participants.

Table 5 Metaphors and expressions related to the technology category

	Technology				Sample expressions
	Türkiye		South Africa		
Metaphor	*f*	%	*f*	%	Because
Computer	-	-	3	37.5	"*It also emulates human beings*" (SAT16). "*It's a digital world. Whereby technology is the centre of everything*" (SAT44).
Digital world	1	100	3	37.5	"*You can do activities that are very similar to reality*" (TT28). "*It makes us live what we can't live*" (SAT36). "*It allows us to create a new world*" (SAT 23).
Helmets	-	-	1	12.5	"*The computer-generated simulation of three-dimensional images*" (SAT20).
Real-life situations	-	-	1	12.5	"*Allows interaction through 3D* [three-dimensional] *interactions*" (SAT42).
Total	1	100	8	100	

South African participants produced more metaphors in the technology category than Turkish participants.

Virtual Reality as Art

This category includes metaphors and expressions related to VR given by teachers to the art category (see Table 6) produced by six Turkish participants and four South African participants.

Table 6 Metaphors and expressions related to the art category

	Art				Sample expressions
	Türkiye		South Africa		
Metaphor	*f*	%	*f*	%	Because
Mine	1	16.7	-	-	"*Valued as processed*" (TT50).
Painter	-	-	2	50	"*We draw our dreams*" (SAT47).
Painting book	1	16.7	-	-	"*You can animate any scenario*" (TT37).
Picture	1	16.7	2	50	"*It invigorates life*" (TT34).
Photo	1	16.7	-	-	"*It depicts the environment*" (TT39).
Scene	1	16.7	-	-	"*It allows us to create the world we dream of*" (TT29).
Sculptor	1	16.7	-	-	"*It gives new shapes*" (TT45).
Total	6	100	4	100	

Most participants produced different metaphors in the art category of which one participant in Türkiye and two in South Africa compared VR to a picture. Turkish participants produced more metaphors in the art category than South African participants.

Virtual Reality as Travel

This category includes metaphors and expressions related to VR in the travel category which includes metaphors produced by one teacher from Türkiye and five from South Africa (see Table 7).

Table 7 Metaphors and expressions related to the travel category

	Travel				Sample expressions
	Türkiye		South Africa		
Metaphor	*f*	%	*f*	%	Because
Airplane	-	-	1	20	"*We can go anywhere in the world*" (SAT37).
Spaceship	-	-	1	20	"*It takes us to the time and place we want to go*" (SAT46).
Steamboat	1	100	-	-	"*It allows us to sail the great seas*" (TT15).
Time Machine	-	-	3	60	"*It takes us back to the time we dreamed of*" (SAT14).
					"*We can go wherever and whenever we want*" (SAT38).
Total	1	100	5	100	

Participating teachers in South Africa produced more metaphors in the travel category than teachers in Türkiye.

Virtual Reality as Imagination

This category includes metaphors and expressions related to VR in the imagination category produced by 37 Turkish and 15 teacher participants from South Africa.

Table 8 Metaphors and expressions related to the imagination category

Imagination					Sample expressions
	Türkiye		South Africa		
Metaphor	*f*	%	*f*	%	Because
Abstract fiction	-	-	1	6.7	"*It allows us to see things that can't happen*" (SAT19).
Another world	-	-	1	6.7	*"It takes us from where we are to another environment*" (SAT4).
Binoculars	-	-	1	6.7	"*Makes things afar seem closer*" (SAT29).
Bridge	1	2.7	-	-	"*It carries you to the other world*" (TT46).
Dream	14	37.8	3	20	"*It creates the feeling of being where you're not. It's like a dream that's thought out and lived instantly*" (TT11). "*It brings a lot of things of your dreams to you as if they were alive*" (TT8). "*Anything imaginable can be accomplished*" (SAT30). *"Makes dreams come true*" (SAT1).
Freedom	-	-	1	6.7	"*Acts out our deepest desires*" (SAT48).
Glasses	1	2.7	-	-	"*Allows us to see our environment more clearly*" (TT38).
Illusion	2	5.4	-	-	"*It misled the human brain*" (TT27). "*It makes it look like there's something that's not real*" (TT7).
Imitation	-	-	2	13.3	"*It is a real-life scenario*" (SAT21). "*It reflects the unreal*" (SAT27).
Infinity	1	2.7	-	-	"*There's no limit to your imagination*" (TT10).
Ivory tower	1	2.7	-	-	"*Makes everything feel real in an intangible world*" (TT43).
İmaginary and real	1	2.7	-	-	"*When the two merge, the virtual reality occurs*" (TT3).
Lamp	1	2.7	-	-	"*Opens our horizons*" (TT45).
Life	1	2.7	-	-	"*Allows us to look at the world from different angles*" (TT19).
Magic	1	2.7	-	-	"*It makes what doesn't exist*" (TT32).
Metaphysics	2	5.4	-	-	*"It allows us to create a reality beyond the laws of physics*" (TT48).
Mirage	1	2.7	-	-	"*It looks like it exists, but it doesn't exist"* (TT33).
Mirror	2	5.4	1	6.7	"*It reflects real life in a virtual environment*" (TT2). "*It creates the same of life*" (SAT22).
Moon	1	2.7	-	-	*"It helps to explain the events around us*" (TT30).
Observation	-	-	1	6.7	"*Seeing things it's easier to remember*" (SAT13).
Ocean	3	8.1	-	-	"*Offers an infinite imagination*" (TT14). "*It carries you to the other world*" (TT47).
One-way street	-	-	1	6.7	"*It leads to a single goal*" (SAT35).
Park	1	2.7	-	-	"*We can walk around in*" (TT41).
Perfect vision	-	-	1	6.7	"*We have a perfect vision that was never conceived*" (SAT10).
Revolution	-	-	1	6.7	"*We can change the facts*" (SAT11).
Shadow	1	2.7	-	-	"*Similar to the shape of reality*" (TT42).
Sunshine	-	-	1	6.7	"*No one can avoid it*" (SAT5).
Teleportation	1	2.7	-	-	"*It beams us into a cartoon where we're heroes*" (TT26).
World	1	2.7	-	-	*"We can get lost in it"* (TT1).
Total	37	100	15	100	

The metaphors "dream' and "mirror" were produced by participants in both countries. However, the dream metaphor was produced most by participants in Türkiye who produced more metaphors in the imagination category than South African participants (see Table 8).

Discussion

According to Solomon et al. (2017), teachers develop perceptions through their observations and experiences about the concept of VR during their pre-professional education and in-service teaching experiences. Thus, the VR perceptions they develop are constantly changing with new experiences and observations. The teachers in this study appear to have adopted the criteria of presenting metaphors based on relevance to teaching and the perceived potential use of VR in teaching and learning. The results of the data collected reflect an assumed transition from the social life of teachers to the area of teaching practice. Conjecture based on metaphor mismatch has been used to explore and draw an understanding of teacher metaphoric perceptions of VR through the research questions discussed below.

What are the Metaphors that Teachers Put Forward Regarding the Concept of Virtual Reality?

The above question depends on the technological progression in both countries to promote the use of technologies in teaching and learning (Adukaite, Van Zyl, Er & Cantoni, 2017; Ndlovu, 2015; Yildirim, S 2007). However, it is also reliant on the teacher's ability to adapt and use virtual resources at a personal and social level, as reported by Sprague and Schahczenski (2001) who argue that individuals are exposed to VR subconsciously through other technological devices such as television, 3D technologies, and other handheld digital tools through the concept of abstraction mentioned in the literature review. Therefore, assumptions, claims, and silences about VR transcend from these experiences which are derived from the immersive abilities (Jones, Hite, Childers, Corin, Pereyra, Chesnutt & Goodale, 2015) of virtual technologies.

Participants' responses in this study appear to be limited to educational use, as observed in sample explanations for the metaphors given above. Based on the number of metaphor examples given in each category, teachers appear to have had a narrow view of VR in entertainment, technology, and travel as minimal metaphor examples were presented in this category compared to the categories of learning, imagination, and art, in which several metaphor examples were given. The data collected contribute to a clearer understanding of teacher perceptions as indicated below.

Under what Conceptual Categories can the Metaphors Put Forward by Teachers be Collected in Terms of their Common Characteristics?

The process of unpacking metaphors was guided by the following principles discussed as part of the process of analysing metaphors (Shaw, Parsons & Vasinda, 2021) and adapted in this study to include (i) item relevance, (ii) ease of response and (iii) item ambiguity. The data analysis revealed six focal categories by discipline as identified by the two data analysts. These conceptual categories emphasise the role of VR in the teaching and learning process. The categories are next discussed under the conceptual headings of item relevance, ease of response, and item ambiguity.

Item relevance

VR appears to be the dominant metaphor in the context of digitally supported learning (Arnaldi et al., 2018; Choi, Dailey-Hebert & Estes, 2016; Gülbahar, 2008). The results of the data analysis confirm this assertion in that in both countries learning as a metaphoric category had the highest mode in terms of responses. The responses focused on the capabilities of VR to promote active learning as noted in the responses by TT1 and SAT1, the ability to engage and motivate learning.

Item ambiguity

The metaphors in the technology category reveal both physical and abstract phenomena; a computer and a helmet represent physical phenomena, while the metaphor of the digital world and real-life situations represent abstract phenomena (see Table 5). There appears to be an inclination to associate the technology category with the ability to create a new world. This may be about the ability of technology to support new ways of individual and collaborative learning (Lund & Wang, 2019). On the other hand, the entertainment category had limited responses and revealed fewer diverse forms of entertainment which have been restricted to cartoons, games, and movies. These responses reveal the motivational ability of VR in teaching and learning.

Responses in the travel category appear to be suppressed as only four metaphors were identified. Instead, a fusion of forms of travel can be observed from steamboat, spaceship, airplane, and time travel. Based on the naive responses by South African participants as opposed to the varied responses by the Turkish participants, there is a deficit in the art category. The sample explanations regard art as value-processed and draw mostly on dreams as a metaphor. The perception here assumes that VR can identify emerging needs. A wide array of metaphors was presented under the imagination category and the teachers perceived VR as a connected immersive network (Fidan et al., 2021; Penn & Umesh, 2019; Rwodzi, De Jager & Mpofu, 2020).

Ease of response

The frequency and number of metaphors generated (Shaw et al., 2021) in each category were used to determine ease of response. Responses in the learning, entertainment, and technology categories were universally common and frequent in both countries while the responses in the art, imagination and travel categories were few and less varied. The metaphors produced in this study were the teacher participants' own creations as they were not provided choices to select from.

What are the Differences and Similarities in Terms of Metaphors Put Forward by Teachers in Türkiye and South Africa?

The metaphors produced by participants in both countries show more similarities than differences. The metaphors presented are different but the explanations thereof lack diversity as they are limited to educational use. The limitation of this study was an inability to find an instrument through which convergence analysis could be done to examine similarities and differences with the intention of identifying patterns in the characteristics of the metaphor responses. This was influenced by the purpose of the study which focused mainly on contributing to further understanding of teacher

metaphors as opposed to evaluating the validity of the metaphors.

Conclusion

With this study we aimed to identify teacher metaphoric understanding of the concept of VR. We also sought to identify similarities and differences between metaphors produced by Turkish and South African teacher participants whose understanding was sifted using the conceptual categories based on (i) item relevance, (ii) ease of response, and (iii) item ambiguity. We used a phenomenological approach through the administration of a questionnaire to 100 teachers in Türkiye and South Africa, through which six categories of metaphors, namely, learning, entertainment, technology, art, travel, and imagination were identified.

Limitations and Recommendations

This study had a limited scope of four schools and 100 participants in two countries and its findings might not be enough to draw generalised conclusions. We recommend that the sample type be expanded to focus on a district or a province in each country. The sample size will need to be increased to be more representative of each country's dynamics. We also recommend the use of qualitative instruments to collect data as the questionnaire used in the study limited participants' responses and feedback which could provide better explanations about collected metaphors and perceptions.

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Authors' Contributions

HK contributed to the research questions, introduction (inputs), literature review (inputs), development of the research instrument (participant questions), data collection (Türkiye), data analysis (Türkiye and South Africa) and reviewed the final manuscript. Handson Fingi Mlotshwa contributed to the abstract, research question (inputs), development of Google form (survey), introduction, literature review, data collection (South Africa), data analysis (inputs), discussion section of the article, conclusion, limitations of study, recommendations and review of the final manuscript.

Notes

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References

Adukaite A, Van Zyl I, Er Ş & Cantoni L 2017. Teacher perceptions on the use of digital gamified learning in tourism education: The case of South African secondary schools. *Computers & Education*, 111:172–190. https://doi.org/10.1016/j.compedu.2017.04.008

Akgün ÖE, Instanbullu A & Avci SK 2017. Augmented reality in Turkey with researchers' comments for educational use: Problems, solutions and suggestions. *Journal of Education and Training Studies*, 5(11):201–218. https://doi.org/10.11114/jets.v5i11.2690

Alqirnas HR 2020. Students' perception of virtual classrooms as an alternative to real classes. *International Journal of Education and Information Technologies*, 14:153–161. https://doi.org/10.46300/9109.2020.14.18

Arnaldi B, Guitton P & Moreau G (eds.) 2018. *Virtual reality and augmented reality: Myths and realities*. London, England: John Wiley & Sons.

Averbukh V, Averbukh N, Vasev P, Gvozdarev I, Levchuk G, Melkozerov L & Mikhaylov I 2019. Metaphors for software visualization systems based on virtual reality. In L de Paolis & P Bourdot (eds). *Augmented reality, virtual reality, and computer graphics: 6th International Conference, AVR 2019, Santa Maria al Bagno, Italy, June 24–27, 2019, Proceedings, Part I*. Cham, Switzerland: Springer. https://doi.org/10.1007/978-3-030-25965-5_6

Choi DH, Dailey-Hebert A & Estes J 2016. *Emerging tools and applications of virtual reality in education*. Hershey, PA: Information Science Reference.

Craig A, Sherman WR & Will JD 2009. *Developing virtual reality applications: Foundations of effective design*. Amsterdam, The Netherlands: Morgan Kaufmann.

Fidan M, Debbag M & Cukurbasi B 2021. Metaphoric perceptions of pre-service teachers about 'LEGO robotic instructional practices,' 'augmented reality' and 'flipped classroom' concepts. *Research in Comparative and International Education*, 16(1):83–99. https://doi.org/10.1177/1745499920982761

Gibson D 2013. Assessing teaching skills with a mobile simulation. *Journal of Digital Learning in Teacher Education*, 30(1):4–10. https://doi.org/10.1080/21532974.2013.10784720

Gülbahar Y 2008. ICT usage in higher education: A case study on preservice teachers and instructors. *The Turkish Online Journal of Educational Technology*, 7(1):32–37.

Jantjies M, Moodley T & Maart R 2018. Experiential learning through virtual and augmented reality in higher education. In *Proceedings of the 2018 International Conference on Education Technology Management*. New York, NY: Association for Computing Machinery. https://doi.org/10.1145/3300942.3300956

Jones MG, Hite R, Childers G, Corin E, Pereyra M, Chesnutt K & Goodale T 2015. Teachers' and students' perceptions of presence in virtual reality instruction. In K Psarris (ed). *Recent researches in*

engineering education. WSEAS Press.
Levine PM 2005. Metaphors and images of classrooms. *Kappa Delta Pi Record*, 41(4):172–175. https://doi.org/10.1080/00228958.2005.10532066
Lund BD & Wang T 2019. Effect of Virtual Reality on learning motivation and academic performance: What value may VR have on library instruction? *Kansas Library Association College and University Libraries Section Proceedings*, 9(1):4. https://doi.org/10.4148/2160-942X.1073
Mhlanga D & Moloi T 2020. COVID-19 and the digital transformation of education: What are we learning on 4IR in South Africa? *Education Sciences*, 10(7):180. https://doi.org/10.3390/educsci10070180
Mulveen R & Hepworth J 2006. An interpretative phenomenological analysis of participation in a pro-anorexia internet site and its relationship with disordered eating. *Journal of Health Psychology*, 11(2):283–296. https://doi.org/10.1177/1359105306061187
Ndlovu NS 2015. The pedagogical integration of ICTs by seven South African township secondary school teachers. PhD thesis. Johannesburg, South Africa: University of the Witwatersrand. Available at https://wiredspace.wits.ac.za/server/api/core/bitstreams/ae754fa8-6fbb-45f3-bf09-b632333735f6/content. Accessed 1 August 2024.
Padayachee K 2017. A snapshot survey of ICT integration in South African schools. *South African Computer Journal*, 29(2):36–65. https://doi.org/10.18489/sacj.v29i2.463
Penn M & Umesh R 2019. The use of Virtual Learning Environments and achievement in Physics content tests. In *Proceedings of the International Conference on Education and New Developments*. https://doi.org/10.36315/2019v1end112
Rwodzi C, De Jager L & Mpofu N 2020. The innovative use of social media for teaching English as a second language. *TD: The Journal for Transdisciplinary Research in Southern Africa*, 16(1):a702. https://doi.org/10.4102/td.v16i1.702
Saban A 2005. *Çoklu zeka teorisi ve eğitim* [Multiple intelligence theory and education]. Ankara, Türkiye: Nobel Yayınları.
Sancar R & Atal D 2023. Eğitimde sanal gerçeklik teknolojisi: Türkiye'deki eğilimin belirlenmesi [Virtual reality technology in education: Trends in Turkey]. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, 24(2):1253–1284. https://doi.org/10.29299/kefad.1201788
Sarigöz O 2019. Augmented reality, virtual reality and digital games: A research on teacher candidates. *Educational Policy Analysis and Strategic Research*, 14(3):41–63. https://doi.org/10.29329/epasr.2019.208.3
Sekwena GL 2014. Active learning in a high school Economics class: A framework for learner engagement. MEd dissertation. Bloemfontein, South Africa: University of the Free State. Available at https://scholar.ufs.ac.za/server/api/core/bitstreams/4743fda8-b6b4-423e-9bc1-324340422ef9/content. Accessed 1 August 2024.
Shaw D, Parsons SC & Vasinda S 2021. Collaborative metaphor analysis research methodology: A retrospective self-study. *The Qualitative Report*, 26(10):3091–3111. https://doi.org/10.46743/2160-3715/2021.4743
Solomon Z, Ajayi N & Raghavjee R 2017. *Lecturers' perceptions of virtual reality as a teaching and learning platform*. Paper presented at the 46th Annual Conference of Southern African Computer Lecturers Association, Magaliesburg, South Africa, 3-5 July.
Sprague P & Schahczenski C 2001. *Abstraction is the key to CSI*. Butte, MT: Montana Tech Department of Computer Science, University of Montana.
Yıldırım A & Şimşek H 2016. *Sosyal bilimlerde nitel araştırma yöntemleri* [Qualitative research methods in the social sciences] (10th ed). Ankara, Türkiye: Seçkin Yayıncılık.
Yildirim B, Sahin-Topalcengiz E, Arikan G & Timur S 2020. Using virtual reality in the classroom: Reflections of STEM teachers on the use of teaching and learning tools. *Journal of Education in Science Environment and Health*, 6(3):231–245. https://doi.org/10.21891/jeseh.711779
Yildirim S 2007. Current utilization of ICT in Turkish basic education schools: A review of teacher's ICT use and barriers to integration. *International Journal of Instructional Media*, 34(2):171–186. Available at https://users.metu.edu.tr/soner/InternationalJournals/8.pdf. Accessed 30 July 2024.