

Chapter

Lecturers' Experiences in Teaching Using VR Resources at a Selected University, South Africa

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Abstract

Globally, academics have reconnoitered the various benefits of virtual reality (VR) in education. This study explored the lecturers' experiences with VR resources in teaching and learning environments with pre-service teachers at one of the selected universities in South Africa. The study engaged a qualitative method, comprising of semi-structured face-to-face interviews with 6 lecturers. The data from the interviews were evaluated by hand and the findings from this study were precisely described as given by the interviewees. These findings specified that the lecturers acknowledged the effectiveness of the use of VR resources in teaching and learning since all activities become more concrete. However, the lecturers indicated that there were some challenges that hindered them from employing VR resources into their teaching and learning environments and these included a lack of adequate lecturer development for the use of VR tools for teaching; inadequate VR tools for teaching and learning in their departments; VR resources were not tailor-made for their current curricula; and inadequate funding for VR resources. Hence, this study recommended that this university should immediately provide all the support required to facilitate the lecturers' use of VR resources for teaching to avoid the use of traditional teaching and learning methods.

Keywords: virtual reality resources, challenges, traditional teaching and learning methods, ripple effect

1. Introduction

Fourth industrial revolution tools are being increasingly integrated into teaching and learning in education [1]. Globally, people are exploring the potential of these emerging technologies, which among many other mobile devices include virtual realities (VR) [2–4]. Furthermore, research also maintains engagement with VR enhances the experience or a sense of 'being there' in the environment [5]. Virtual reality enhances knowledge of abstract concepts, thus making impossible tasks to undertake in the real world possible [6]. In other words, VR allows participants to experiment with objects virtually more easily 'making the unseen seen', machines [7].

Even though VR is not new, the recent advances in immersive technologies in terms of visualization and interactions have made VR increasingly attract attention by researchers. The use of VR enhances immersion of a user in a virtual environment, thus providing a sense of "being" in the task environment instead.

The immersion of a being in a virtual reality as the perception of being physically present in a non-physical world through the creation of images, sound, or other inducements so that a participant feels he or she is actually “there” [8]. However, this is not the case at the selected departments of university involved in this study as the pre-test study on the use of 4IR tools to equip pre-service teachers indicated ineffective preparation of students for the 4IR world. It is in this regard that the researchers embarked on this study as an intervention in order to enhance the lecturers’ experiences with VR resources to enable pre-service teachers bridge the physical distance in teaching and learning environments at one of the selected universities, South Africa.

2. Review of literature

The general concept of immersive VR was developed back in the late 80s in which participants interact with a world completely generated by [9]. One of the main characteristics of VR is that the environment is a full scale replica of the real world and it relates to human size. Hence, the participants get the feeling as if they are interacting with the real environment or subject, and that VR applications include either real or abstract worlds [10]. In addition, through engaging in virtual reality, we can enter and interact with a world that either does not exist or it is difficult to access due to costs or safety reasons [9].

Virtual reality has been described as one of the most effective and necessary teaching and learning resources of the 4th industrial revolution [11]. Moreover, research argues that students tend to retain more information and gain more practical skill through their engagement with VR tools [12]. Virtual reality allows us to scrutinize all matter through touching, moving and manipulating it [13]. In other words, the use of VR allows participants to be totally engrossed in a self-contained artificial or simulated environment while experiencing it as real [14]. Hence, these tools can offer rich and complex content-based learning, as well as enhance students’ technical, creative, and problem-solving skills [14].

A substantial body of researchers acknowledge that there are many potential benefits of introducing VR in education and training that would not be possible in traditional methods, and that these include: education which is not possible in reality, will be possible in virtual reality; virtual game-based experience increases students’ motivation; collaboration in virtual reality classroom fosters social integration of learners; learning is achieved by direct interaction, not by mouse clicks; the results from the learning process are truly assessed [15–17].

Moreover, the use of VR is said to have advantages in teaching and learning that are not experienced when traditional pedagogy is practiced for delivering curricula [18]. This researcher points out that these advantages include enhanced motivation on the part of students; improved communication between lecturers and students; more comprehension of seemingly abstract concepts; and more individual learning needs are accommodated [18].

Despite the substantial benefits that the use of VR tools are said to have in the classroom, educational institutions are not free of significant challenges. Due to financial constraints many educational institutions are reluctant to invest in fourth industrial tools [19]. Furthermore, one of the biggest challenges faced by the use of these tools, including VR resources is the lack of relevant content. Developing more content can be very costly, and not every educational institute has the means to hire a software development company to help them produce content [19].

Echoing similar sentiments, it has been noted that cost is the primary challenge of 4IR tools, in this case VR tools in most markets, and especially so in education,

hence funding is one of the primary barriers for massive adoption of VR solutions within educational systems, due to the high cost of relevant tools as there are limited financial resources in many educational institutions [20].

Moreover, knowledge about how to integrate VR technology in courses and the lack of time for learning and planning how to do this has also been identified as a challenge for pedagogical VR use at university level [21]. It has also been highlighted that opportunities to enact VR technologies is limited due to shortcomings in practitioners' continuing professional development opportunities [22].

3. Research methodology

This study used a qualitative research methodology to explore the experiences of 6 lecturers on their use of VR resources to teach pre-service teachers. Qualitative researchers assume that everyone views the world in their own way [23]. Hence, a qualitative approach was preferred for the reason that it shows a great potential value to this study for the researcher to get comprehensive and rich data on the experiences of lecturers in the use of VR resources for teaching. Since a qualitative approach assumes that the world cannot be viewed as a single reality, it was suitable to be used in this study because the way the participants give different accounts of their experiences on the use of VR resources depended on their natural setting. In this study, convenience sampling was used to select the participants. In this regard, convenience sampling is a type of sampling that involves the selection of the most accessible subjects, it is the least costly to the researcher, on terms of time, effort and money [24]. Hence, the researchers engaged face-to-face interviews with the six selected lecturers from various departments at the faculty of humanities in order to elucidate responses on their experiences with VR resources in teaching activities. In this qualitative study, the researchers were obliged to ensure that the research findings were credible and trustworthy so that they could be interpreted, applied in the field and benefits researchers and other interested parties.

Validity in qualitative research refers to the degree of resemblance between the explanation of the phenomenon and the realities of the situation in the given contexts [25]. Hence, in this study the four trustworthiness criteria which include credibility, transferability, dependability and confirmability were applied [26]. These criteria and their peculiar activities were adhered to in this study. Prior to the study, the researchers ensured that all the participants were informed about the purpose of the study. Participation in the study was voluntary as participants were informed of their rights to withdraw from the study at any time. Consent forms were be to participants to confirm or decline their participation in this study. Confidentiality and anonymity was ensured by using avoiding participants' real names.

4. Results and discussion

The demographic information of the lectures who participated in this study was elicited through the first part of the interview schedule. This was done in order to better contextualize the results. **Table 1** below represents the profiles of the participants:

The study reconnoitered the lecturers' views under the following themes which emerged from their responses:

Gender	Female		Male	
	2		4	
Age	20–30 years	31–40 years	50 years and above	
	2	3	1	
Level taught	Level 1	Level 2	Level 3	
	1	3	2	
Lecturing Experience at university	1–5 years	6–10 years	11–15 years	16 years and above
	2	2	1	1

Table 1.
Profiles of the lecturers.

5. The adequacy of VR resources to equip students with required skills

The lecturers were requested to explicate their experiences on whether or not there were adequate VR resources to equip pre-service teachers with required skills? Some of the lecturers’ views are presented below:

- The department does not have adequate VR resources to use during and outside lecture rooms;
- If lecturers do not even have the resources, you can imagine the challenge relating to students’ access to VR resources;
- VR resources are inadequate;
- I have not seen any except the personal smart phones that we have, but absence of Wi-Fi makes it impossible to use VR resources in classes;
- The department is not yet ready for the use of VR resources for teachers;
- There are not adequate VR resources, our line managers must procure for all of us.

Although globally, 4IR tools are increasingly being integrated into teaching and learning in education [1], the findings in theme 1 above indicate that this is not the case at the institution involved in this study. The lecturers stress that there is a lack of adequate VR resources, hence they are not yet ready to use these tools in their teaching and learning environments.

6. Benefits of using VR resources for teaching

The researchers explained to the participants how VR resources work (google expedition sites and googles), as well as allowed them to experience their use. Lectures were then requested to indicate any experienced benefits of using VR resources for teaching. In this regard, the following are some of the responses from the interviews:

- VR resources have great effect as the add to the current conversations of 4IR;
- Learning becomes concrete through the use of VR resources; and the interaction would arouse interest in students because of the current generation being the digital-age generation
- VR resources help to bring real-life realities into the classroom
- These tools eliminate challenges as students are able to see or view real-life videos in which concepts are clarified easily
- I think VR resources have a positive effect as they enhance knowledge in teaching and learning
- Through the use of VR tools, the students will be able to relate their academic work to the outside real world

The lecturers' perceptions on the benefits of using VR resources for teaching are supported by a substantial body of researchers who acknowledge that there are many potential benefits of introducing VR in education and training that would not be possible in traditional methods, and that these include: education which is not possible in reality, will be possible in virtual reality; virtual game-based experience increases students' motivation; collaboration in virtual reality classroom fosters social integration of learners; learning is achieved by direct interaction; and the results from the learning process are truly assessed [15–17].

Moreover, knowledge about how to integrate VR technology in courses and the lack of time for learning and planning how to do this has also been identified as a challenge for pedagogical VR use at university level. It has also been highlighted that opportunities to enact VR technologies is limited due to shortcomings in practitioners' continuing professional development opportunities [22].

7. Challenges of using VR resources for teaching

Lecturers were requested to elucidate their perceptions on the challenges of using VR tools for teaching and learning. In response, the following are some of the views from the interviews with the concerned lecturers:

- Like any other learning resources, VR resources have their own vocabulary and failure for the individuals to understand their operational aspect, therefore challenges would persist;
- The use of VR might be a problem to implement them if these resources are not tailor-made for the current curricula;
- These resources may only be used effectively if they are compatible with the users' abilities, otherwise trying to use them in the existing syllabi would not be effective;
- A lot of adaptability needs to be done for these tools to make a positive impact in education;

- Issued relating to professional development, funding and curricula alignment to the use VR tools need urgent consideration;
- Affordability and the feasibility of procuring of VR tools for all subjects need to be well planned for, otherwise we will not be able to use these resources anytime soon.

As indicated in lecturers' perceptions on the challenges of using VR tools for teaching and learning, operating with the realities of tight budgets and competing demands for funds, many educational institutions are reluctant to invest in what seem like expensive gadgets with no immediate tangible benefits [24]. Furthermore, he adds that one of the biggest challenges faced by VR education is the lack of content. The fact is that developing more content can be very expensive, and not every educational institute has the means to hire a software development company to help them produce content [19].

8. The influence that the use of VR has in the enhancement of teaching and learning compared to the traditional methods

The lecturers were asked to elucidate their experiences on whether or not the use of VR has any influence in the enhancement of teaching and learning compared to the traditional methods. Some of the lecturers' views are presented below:

- Yes, the VR resources may enhance teaching and learning only if the subject content is well researched and well aligned to the curriculum;
- Since these resources enable students to be practically engaged, they should enhance teaching and learning in a better way compared to the traditional methods;
- Yes, since the VR resources bring the world to the teaching and learning environment, they enhance teaching and learning activities more than traditional methods;
- The use of VR resources responds to the needs of the students, who are digitally savvy;
- VR tools enhance teaching and learning since students will learn through seeing and touching, hence become totally in control of their learning;
- VR resources give more meaning to learning content since abstract concepts can explained in a simpler manner than in traditional methods.

The lecturers' responses to whether or not the use of VR has any influence in the enhancement of teaching and learning compared to the traditional methods are in line with views echoed in literature. Moreover, the use of VR is said to have advantages in teaching and learning that are not experienced when traditional pedagogy is practiced for delivering curricula [18]. These advantages include enhanced motivation on the part of students; improved communication between lecturers and students; more comprehension of seemingly abstract concepts; and more individual learning needs are accommodated [18].

9. The possible solutions to any perceived challenges that hinder VR tools from being used in some classes

The lecturers were asked briefly provide their own views of the solutions to any perceived challenges that hinder VR tools from being used in some classes. Some of the lecturers' views are presented below:

- All lecturers in the department urgently need more training on the use of these resources;
- I personally need to catch up with latest trends but it starts with training and procurement of VR resources which are still at a very low level now;
- There is need for intensive lecturer development in the use of VR resources;
- All lecturers and students must be provided with VR tools and Internet access;
- The department must provide adequate VR tools and equipment, as well as align curricula to the use of resources such as these;
- There should be adequate resources and training, as well as continuous support on the use of these modern tools for teaching and learning.

The lecturers' views on the solutions to any perceived challenges that hinder VR tools from being used in some classes are supported in research which indicates that knowledge about how to integrate VR technology in courses and the lack of time for learning and planning how to do this is a challenge for pedagogical VR use at university level [21]. It has also been highlighted that opportunities to enact VR technologies is limited due to shortcomings in practitioners' continuing professional development opportunities [22]. Hence, the effective use of VR tools in teaching and learning environments can only be realized once the said challenges are dealt with.

10. Conclusions and recommendation

The findings indicated there were various benefits that VR resources have in education, and these included the following: 1. they add to the current conversations of 4IR; 2. learning becomes concrete through their use and the interaction would arouse interest in students because of the current generation being the digital-age generation; 3. They help to bring real-life realities into the classroom; 4. they eliminate challenges as students are able to see or view real-life videos in which concepts are clarified easily; 5. they have a positive effect as they enhance knowledge in teaching and learning; 6. VR resources may enhance teaching and learning only if the subject content is well researched and well aligned to the curriculum; 7. VR resources have the potential to enhance teaching and learning in a better way compared to the traditional methods; 8. VR resources bring the world to the teaching and learning environment hence, they enhance teaching and learning; 9. the use of VR resources responds to the needs of the students, who are digitally savvy; 10. VR tools enrich teaching and learning since students learn through seeing and touching, hence become totally in control of their learning; 11. VR resources give more meaning to learning content since abstract concepts can explained in a simpler manner than in traditional methods; and 12. Students are able to relate their academic work to the outside real world.

However, the findings also indicated that: 1. there was lack of adequate lecturer development for the use of VR tools for teaching; 2. There was inadequate VR tools

for teaching and learning; 3. the use of VR was a problem to implement since these resources were not tailor-made for the current curricula that the lecturers were expected to effectively deliver; 4. Lectures were not compatible with the use of VR tools as they lack adequate training; and 5. There was a lack of adequate funding for the procurement of 4IR resources.

It was evident that there were significant dynamics that prevent some lecturers from the use of VR tools to equip pre-service teachers. Lecturers need ongoing support to be able to use 4IR tools, in this case, VR resources for teaching, which are described as some of the most effective and necessary teaching and learning resources of the this revolution [11]. To add on to this view, it is also suggested that students retain more information and can better apply what they will have learned after participating in VR exercises [12].

Based on these findings, the study recommends that the departments in which the participants of this study belong to should urgently provide all the support required to facilitate the lecturers' use of VR resources for teaching. This should be done through engaging intensive professional development at all levels; and through the procurement of all relevant VR tools; as well realigning the current curricula to suit the use of VR resources. It is highly recommended that the lecturers and students in this institution urgently access the opportunities of VR resources as this would provide lifelike and collaborative teaching and learning environments. Moreover, the use of VR resources would enhance students' concrete experience and active experimentation with phenomena. Without VR resources, lecturers would have no choice but continue to use traditional pedagogy, which hinders the comprehension of abstract concepts, as there would be no room for concrete experiences and reflective observation by students.

It is therefore, of utmost importance that VR be employed within teaching and learning environments as it provides new forms and methods of visualization, drawing on the strengths of visual representations [27]. Furthermore, this researcher maintains that the use of VR provides an alternate method for presentation of material, and in some cases, it can more accurately elucidate some configurations and processes than by other means, allowing extreme close-up examination of an object, observation from a great distance, and observation and examination of areas and events unavailable by other means [27]. Hence, this study strongly recommends use of VR resources by lecturers and students in their teaching and learning environments in order to effectively prepare the novice teachers to infuse these resources in their practices as expected in this 4IR era.

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Conflict of interest

We do hereby declare that there is no conflict of interest for the following reasons:

- i. All forms of financial support are acknowledged in our contribution.

- ii. There is no commercial or financial involvements that might present an appearance of a conflict of interest related to the Contribution.
- iii. We have not signed an agreement with any sponsor of the research reported in the Contribution that prevents us from publishing both positive and negative results or that forbids us from publishing this research without the prior approval of the sponsor.
- iv. We have checked the manuscript submission guidelines to see whether the journal requires a Declaration of Conflicting Interests and have complied with the requirements specified where such a policy exists.

Declarations

We hereby declare that this study titled, “Lecturers’ experiences in teaching using VR resources at a selected university, South Africa” is our original work and it was never used or undertaken anywhere else. All the sources that the study employed have been mentioned and acknowledged by way of complete references. This study has been supported through a partnership between the South African Department of Higher Education and Training and the Tshwane University of Technology’s Department of Research and Innovation.

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