

Virtual Reality Teacher Professional Development: Voices from Teachers who Teach Students with Significant Cognitive Disabilities

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Abstract: Virtual Reality (VR) has not been significantly utilized to teach science concepts to students with significant cognitive disabilities (SCD). Part of that is the teacher's need for more knowledge of this technology. This study aimed to describe the teachers of students with SCD's knowledge, attitudes, and instructional practices during professional development and use of VR in the classroom. The study used interviews, training, observations, and document analysis to collect data. Results revealed that the teachers acquired more knowledge, as shown in their engagement and classroom use. In addition, their knowledge gave them insights into VR's impact on students' engagement and experience with the technology. At first, the teachers were apprehensive about their students' reactions and the teachers' abilities. However, as the training went on, they became curious, thorough, confident, optimistic, and excited about it. Finally, they demonstrated instructional practices such as adaptations, lesson planning, and priming and practicing.

Keywords: Virtual Reality, Students with Significant Cognitive Disabilities, Teacher Professional Development, Science Education

Introduction

Teaching science to students with significant cognitive disabilities (SCD), who have substantially below average general cognitive or intellectual functioning and significant deficits in adaptive behavior, have focused on the common understanding of science instead of memorizing and having mastery of science concepts (Miller, 2012). However, the latest mandates of the Every Student Succeeds Act (ESSA) have required a rigorous curriculum with alternate standards that focus on the instruction of science concepts (Wehmeyer 2011). Consequently, the instructional shift caused by the change in standards has resulted in challenges not only for the teachers, but also for the students (Saven et al. 2013). There are some research studies that have examined how students with SCD learn or understand science concepts, but more work in this area is needed (Andersen & Nash 2016, Browder et al. 2012, Courtade et al. 2007). What's promising is that the concept of Universal Design for Learning and other teaching strategies has provided supportive and accessible environments for students with SCD to engage and demonstrate content learning (Coyne et al. 2012). Another area of research of importance is the integration of technology to aid in standards-based teaching for students with SCD. As technological advances have continued to shape our educational system, years of education research suggest that technology use positively affects instruction in math and science (Costley 2014, Delen & Bulut 2011, Gillani et al. 2008, Messinger-William & Marino 2010). One such technology that is gaining popularity in classroom use and education research studies is virtual reality (VR) technology.

Virtual learning using VR technology comes in many forms including augmented reality (AR), which combines real world content with computer-generated virtual content; virtual tours, where teachers can guide their students through explorations of environments and locations such as museums and national monuments that may be far away; immersive VR using head-mounted devices such as goggles; and interactive VR using desktop computers or mobile devices to explore 3D content. Virtual reality technology has shown favorable outcomes for students with SCD with early adoption of classroom use of VR focused on teaching functional skills, including daily living, social,

communication, and community skills (Kagohara et al. 2013, Pantelidis 1993, Standen & Brown 2006). Some recent studies explore the role of VR in teaching science to students with SCD. For example, research suggests that students with disabilities are willing to use augmented reality and that it may enhance their student learning outcomes and promotes positive attitudes towards science (Alqarni 2021, Turan & Atila 2021). The adoption of VR, just like all other education technologies, must have teacher buy-in for there to be more classroom use. Therefore, there is a need to support teachers in understanding how to use VR and exploring best ways to incorporate this technology into their classrooms (Cooper et al., 2019; Fernandez, 2017; Yildirim et al., 2020). This research focuses on teachers of students with significant cognitive disabilities and seeks to describe their experiences relative to knowledge, attitudes, and instructional practices as they engage in professional development focused on the use of virtual reality technology in the classroom.

Methodology

This case study research was anchored on qualitative inquiry as it sought to describe teachers' experiences relative to their knowledge, attitudes, and instructional practices as they participated in professional development and the utilization of VR. It investigated the teachers' experiences within the natural setting over time. Semi-structured interviews were completed prior to professional development training and after the implementation of VR activities. Observations were conducted during the professional development training and lesson implementation. Classroom-based observations were completed using a modified version of the Teaching Dimension Observation Protocol (TDOP) (Hora & Ferrare, 2014). TDOP is a descriptive classroom observation protocol used to assess changes in instructional practices over time due to sustained PD training. Finally, a document analysis of the teachers' lesson plans was also conducted to visually represent the teachers' ways of incorporating Virtual Reality into their instruction.

Findings

Mr. J, Ms. Maja, Ms. Sweetpea, and Ms. Susan were four teachers of students with significant cognitive disabilities who engaged in the professional development series on VR, created lesson plans that incorporated VR activities, and implemented those lessons in their classrooms. Below are some of their voices relative to knowledge, attitudes, and instructional practices.

Knowledge

During the PD series on virtual reality, the teachers learned about the Lenovo virtual reality headsets and the Thinglink virtual reality platforms, where they created a virtual reality environment for a semi-immersive experience and used them in the classroom. During the post-training interview, Ms. Sweetpea said she "now, knows how to create a virtual environment using the Thinglink platform." After creating his virtual environment, Mr. J wanted to "test the environment [he] created." He said he "learned how to use the Thinglink program and take the information from a 2D space and make it immersive." During the lesson implementation right after the training series, the four teachers decided to use the Lenovo virtual reality headsets for their students to engage in a virtual tour, and three teachers used the Thinglink virtual reality platform to create their virtual reality environment to introduce or present their lessons to their classes. Ms. Sweetpea said she "learned how to operate a virtual reality headset and its remote control as a result of the PD." "I now have better knowledge about virtual reality," she added. The teachers also pointed out challenges in using Virtual Reality, an indication that the teachers increased their knowledge of the technology. They discussed the potential challenges of technical glitches and the program or connectivity requirements they might encounter as well as identified problems that their students may face when wearing the virtual reality headset based on the students' sensory needs. Ms. Susan indicated students with Autism are literal, and since this technology is immersive, they "might struggle with it." Finally, they acknowledged the need for more virtual reality training. Mr. J indicated, "I still feel like there is much more to learn, experiment with, and play around with." Ms. Maja expressed, "There is still room for more things to explore, learn, and do to use in the classroom better."

Attitudes

"I was apprehensive with some students at first... they could be completely fine with it, or they could go instantly into a tantrum," shared Mr. J, whose feeling was shared by Ms. Maja, Ms. Sweetpea, and Ms. Susan. The teachers were apprehensive at first about the adverse reaction of the students, but their use of VR in the classroom showed them the contrary. Their apprehension about their students' reactions to the technology was geared toward VR's sensory impact coupled with the teachers' readiness and skill set. This feeling also stemmed from their knowledge about the cognitive levels of their students. With their students in mind, they expressed much curiosity in the beginning stages. Mr. J was mainly wondering how he would use it for a lesson asking, "What will we choose to talk about when we put it in a lesson?" while Ms. Susan asked, "How will I create the environment that will better serve my students in particular?" Since this is a new and advanced technology for them, they wanted to know how they could use it in the classroom and how it could impact their students academically. During the training, they were quick to ask questions geared towards a better understanding of the nature and the use of technology. Ms. Sweetpea asked, "Can I turn on the headsets simultaneously?" "How can I have a smooth discussion on the topic so we will be on the same page?" In terms of the lesson, she inquired, "What is the topic where I could use virtual reality?" "How can I borrow this [set of VR headsets] for the class?" and wanted to know how to control what the students saw. "Since I got my first use of Virtual Reality in the classroom out of the way, I am much more confident now. I know what to expect and what it will take to deliver it the way I want," shared Mr. J demonstrating the confidence that he gained throughout the PD. Ms. Susan expressed that she is much more open to Virtual Reality for her students. "I am much more familiar with it; not afraid and intimidated of it, most importantly," she said confidently. "My level of confidence in teaching science using Virtual Reality has increased. I now have more confidence," Ms. Sweetpea said. As expressed, and demonstrated, they were excited about using VR and seeing their students enjoy the experience. Ms. Maja shared, "I am excited for them [students] to experience what other students in the regular education classroom experience."

Instructional Practices

When they engaged in the PD series on VR, the teachers spontaneously thought of the different instructional practices they needed to implement as they engaged and used VR technology. Then, they leveraged the tools to carry out their student engagement practices. Immersed in it, they realized that they must use varied adaptations with their students, exceptional lesson planning, priming, and practice, as well as collaboration. "I see I will have more control of the skill or the lesson that I would want them to focus on other than just using a Chromebook or watching a video from the computer," Ms. Susan said. Mr. J said, "I can offer more content-centered immersive videos for an immersive experience taking it to the next level while putting the students into the actual lessons. As the teachers engaged in PD, they thought of the different practices, such as guiding questions and follow up activities, they may embark on to foster student engagement while using the technology. The teachers recognized the potential of the virtual reality headset and platform to capture and maintain focus. They used virtual reality tools to increase student engagement and participation. Adaptation was another instructional practice the teachers identified and utilized. "I became more cognizant and more sensitive to the reaction and behaviors of my students and leveraged the technology to adapt to the situation, especially during planning and use of technology," said Mr. J. The teachers also acknowledged and emphasized the importance of priming and scaffolding activities. Mr. J said, "When I use virtual reality for my lessons, I need to have pre-lessons, practice, and priming for the students so that when they get to the virtual lesson, they will not be surprised." Ms. Maja echoed it by saying, "I can practice the students wearing the headsets." Teachers spent days preparing their students, priming them to the new technology, and introducing scaffolding activities leading to the main lesson. They primed their students towards using the virtual reality headset. Priming is an evidence-based strategy for students with Autism and other related disabilities. Lastly, the teachers practiced collaboration and teamwork as they worked with their teacher aides during classroom instruction. One teacher also expressed the need to empower their aides by training them in Virtual Reality. Ms. Sweetpea said, "I will make sure that my teacher aides are trained on virtual reality devices so they can assist me with some challenges," she expressed during the post-training interview.

Conclusion

This study aimed to describe the experiences of teachers of students with significant cognitive disabilities as they engaged in professional development in Virtual Reality. Specifically, it answered how the teachers' knowledge, attitudes, and instructional practices evolved as they engaged in the PD and the use of VR in the classroom. After learning about VR, the four teachers utilized the virtual reality technology. The teachers acknowledged the need for more virtual reality training as there is much more to learn. As Messinger & Marino (2010) determined in their study, enhanced professional development must be provided to the teachers to increase their capacity around technology and UDL. These four teachers' knowledge and awareness of VR and its use in the classroom can address Cooper et al.'s (2019) findings that indicate teachers have low self-efficacy in VR. Having heard about VR, the four teachers were apprehensive about its impact on students and their ability to use it. However, after completing the training and seeing the reaction of their students, this feeling evolved into something different. They became optimistic that this technology could help their students learn science and other concepts. Additionally, the teachers were confident about using the technology and excited about other things this technology can offer. Finally, this study demonstrates that when educators continuously ensure that students, especially those with significant cognitive disabilities (SCD), are given enough support and adaptation to facilitate learning and participation in the classroom they too can use emerging technologies to explore science.

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