

# Suggestions for Special Education Teachers to Practice Spherical Image-based Virtual Reality Instruction in Classrooms: A Case Study

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**Abstract:** The benefits of learning by spherical image-based virtual reality (VR) have been reported in the field of formal education. However, there was limited VR research in practice for the instruction in special education. By implementing a series of spherical image-based VR instruction for English vocabulary learning in a special education class (i.e., participants including an experienced teacher and five students with cerebral palsy), this study aimed to provide instructional suggestions for special education teachers. Based on the qualitative results by thematic analysis of the teacher's interview transcripts and the researcher's field observation, this study discussed the practical issues for the instruction with the aid of spherical image-based VR technology for special education, such as learning process monitoring, adaptive worksheets design, incorporation of co-teachers, and adoption of VR assets for learning in daily situations.

**Keywords:** Virtual reality, special education, teacher, instruction

## 1. Introduction

Previous studies have documented the benefits of learning by virtual reality (VR) (e.g., enhancement of motivation, engagement, and experiential learning) with its capability of immersing students in situational learning contexts and facilitating interactivity between learners and computers (Dalgarno & Lee, 2010). However, these results were mostly generated in formal education environments. Scarce research explored the application of VR on special education, for example, teaching adaptive skills for adults with autism by VR (Schmidt et al., 2019). Therefore, there was limited VR research in practice for special education teachers to adopt in classrooms.

Considering the increasingly educational applications of immersive VR presenting spherical image-based or video-based virtual materials through low cost headsets such as Cardboard (e.g., Cheng & Tsai, 2019; Wu et al., 2019), there is a need to explore the affordance of low-cost VR in special education. Since a recent study (Geng et al., 2019) suggested the necessity to probe pedagogical use of VR in practice for teacher professional development, this study aimed to implement spherical image-based virtual reality instruction in special education fields and further provided instructional suggestions for special education teachers.

## 2. Method

This study invited a special education experienced teacher to implement a series of spherical image-based VR instruction for English learning in her class. Five eighth grade students (two females and three males) with different disability and handicaps of cerebral palsy in a special education school participated in this study. This study adopted an VR system, namely *Google Expeditions*, to immerse the students in spherical image-based virtual learning contexts. This system allows an instructor playing the role of a "tour guide" (using tablet PCs) to take his/her students playing the role of "tourists" (wearing VR headsets) to virtually visit some scenes such as historical sites or scenic spots with the presentation of 360° panoramic images (see Figure 1).

In this study, the two VR learning materials including *San Diego Zoo* (showing many animal exhibits and the natural environment in the San Diego Zoo) and *Underwater Galapagos* (presenting the underwater in the Galapagos Islands) in the *Google Expeditions* were adopted. Through observing the specific elements in the two virtual scenes such as sharks, sea lions, polar bears, or giraffes, the teacher guided her students to learn English vocabulary of animals.

The research trials consisted of three classes for three weeks (one class per week). In the first week, the researcher introduced how to setup the hardware and further demonstrated the virtual field trips in the classroom. The teacher implemented the VR learning activities in the second and third weeks. After the research trials finished, the teacher was interviewed in-depth for understanding her perceptions of the applications of spherical image-based VR learning for special education and the influences of VR technology on the students with cerebral palsy. The duration of interview was approximately 2 hours. In addition, the field observation on the teaching and learning in the classroom was conducted by the researcher.



Figure 1. The Implementation of Virtual Field Trips in the Classroom

### 3. Results and Discussion

Through the thematic analysis of the interview transcripts of the teacher, there were several themes yielded. In general, the teacher expressed highly positive attitudes toward immersive VR learning for special education, particularly for enhancing the students' perceived presence and learning motivation. Based on these findings of the themes and the researcher's field observation, this study discussed the practical issues when implementing spherical image-based VR learning activities for special education.

- Teachers could monitor students' learning process according to individual differences through the functions of the *Google Expeditions* for managing their head tracking.
- Designing adaptive worksheets for English vocabulary learning based on the scaffolding information of the VR scenes provided by the system could be helpful for the evaluation of learning effectiveness.
- It was suggested to incorporate co-teachers to assist the students with different disability (e.g., poor coordination or stiff muscles) to adequately use the VR headsets.
- With the affordance of VR for the senses of presence, there were opportunities for special education teachers to adopt appropriate spherical image-based VR assets for the practice of English conversation in daily situations.

- In addition to domain knowledge learning, applying immersive VR learning for the training of life skills should be more important for special education.

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