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Development of VR-based Music instrument Learning Materials

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Abstract: This study developed VR-based music learning materials for junior high students using the ADDIE model. Two teachers and 23 students participated. Results from interviews and questionnaires showed that VR enhanced students' interest, focus, and confidence. Teachers supported its use for self-paced learning but noted the need for initial device training. The study suggests VR's potential in enriching music education.

Keywords: Virtual Reality (VR) Music Education Instructional Design, ADDIE Model

1. Introduction

The use of virtual reality (VR) provides learners with an interactive 3D environment, enhancing engagement through sensory and spatial presence, and offering immersive experiences that traditional teaching methods cannot provide (Hamilton et al., 2021). VR has emerged as an innovative educational tool and has shown potential in music learning as well (Innocenti et al., 2019). However, its application in music education remains limited.

This study developed VR-based learning materials to help junior high school students recognize and understand musical instruments. The development process followed the ADDIE model and aimed to support music teachers in their instructional practices. The research questions of this study are as follows: 1) How can the ADDIE process be used to develop a VR-based music learning environment? 2) How do music teachers and students perceive the developed VR-based music learning materials?

2. The processes of developing the VR-based learning materials

In this study, the VR-based learning material was designed following the ADDIE model, a framework used for developing educational resources (Branch, 2010). It includes five steps: Analysis – understanding learners' needs, goals, and learning environment, Design – planning learning objectives, content, activities, and assessments, Development – creating the actual learning materials, Implementation – delivering the materials and integrating them into instruction and Evaluation – assessing the effectiveness of the instruction. Following the ADDIE model ensures that instruction is well-planned, effective, and focused on learners' needs.

In the analysis phase, two junior high school music teachers were invited to participate in interviews to identify their needs for using VR technology in their music classes. After two rounds of interviews, the topic of "learning about musical instruments from various countries" was selected. The teachers noted that they typically rely on textbooks or 2D media to present diverse musical instruments, which they felt did not effectively spark students' interest or promote meaningful interaction. Then, it took about four months to develop the VR-based learning materials using the CoSpaces Edu platform. Throughout the development phase, the two teachers continued to be involved as consultants. After the development was completed, the two music teachers and 23 junior high school students participated in a trial class using the VR learning materials as part of the implementation phase. Feedback from teacher interviews and student questionnaires was collected during the evaluation phase.

3. Methodology

The study adopted both qualitative and quantitative methods for data analysis. Two junior high school music teachers were invited to participate in interviews to provide feedback on the developed music learning materials. Questionnaires were administered to 23 junior high school students before and after the course to collect learners' feedback on their experiences using the VR-based learning materials.

4. Pilot Results

The interview data from the two music teachers were generally positive. The teachers reported that the VR-based learning materials supported students' self-directed learning and allowed them to adjust their learning pace based on individual needs. However, the teachers also noted that students required time to familiarize themselves with the VR devices before fully engaging in the learning process.

Regarding the questionnaire data collected from students, the results showed increased mean scores in their interest in learning music. Students reported that they were able to stay focused and felt more confident when learning the targeted music content. Furthermore, students indicated they were more willing to engage in discussions with music teachers when encountering difficult course content.

5. Conclusions and future work

This study explored the development and implementation of VR-based learning materials for junior high school music education using the ADDIE model. The results indicated that both teachers and students responded positively to the immersive learning experience. Teachers appreciated how VR supported student-centered learning and enabled flexible pacing, while students showed increased engagement, interest, and confidence in learning about musical instruments. However, initial unfamiliarity with the VR device highlighted the need for technical orientation before instruction.

For future work, it is recommended to expand the study to include a larger and more diverse group of teachers and students to further validate the effectiveness of VR-based learning in music education. Additionally, future developments could incorporate interactive quizzes, gamified elements, and collaborative features within the VR environment to enhance student engagement and support formative assessment. Lastly, long-term studies could investigate the impact of VR-based learning on students' music knowledge retention and performance outcomes.

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