Through the eyes of Teachers or Students? Evaluating the Impact of Perspective Changing on a Smartphone VR Application for Teacher Training

Abstract

The use of Virtual Reality (VR) in teacher education can revolutionize the way teachers are trained and developed. This paper presents the development and evaluation of a dedicated VR application that aims to enhance teachers' competencies through practical training in a safe and controllable virtual environment. More than 200 teachers from five different countries evaluated the VR application. Results indicate that perspective changing allows teachers to better experience the problems faced by students, supporting the cultivation of empathy skills.

Keywords: virtual reality, teacher training, perspective change, evaluation

1. Introduction

Virtual Reality (VR) technology has the potential to transform and revolutionize the teacher education sector by offering unique, memorable, immersive, and interactive learning experiences that can improve retention and understanding [1][2]. Equally important, is that VR can be used to simulate real-world scenarios in a safe and controlled environment and provide experiences that are otherwise difficult or impossible to access [3][4]. By providing immersive and interactive learning experiences, VR can help teachers to develop their skills and competencies in a way that traditional teaching methods cannot.

This paper presents a VR application for teacher training that provides immersive and interactive learning experiences depicting extreme and real-life based classroom scenarios. Active teachers participated in all stages of the application design and development cycle, ensuring that the use of the application provides valuable opportunities for reflection and professional growth. The key feature of the application is the ability of users to experience the scenarios both through the eyes of teachers and students. The VR application was evaluated by more than 200 in-service and pre-service teachers from five countries allowing the derivation of comprehensive conclusions related to the effectiveness and impact of the application, and in particular, the impact of perspective changing. Preliminary results validate the promise of the VR application, as a highly useful tool for teacher training.

2. Methodological Framework

The methodological framework used (see Figure 1) during the application development process was carefully designed to ensure that the end application was relevant and effective in meeting the needs of real teachers. The use of participatory design ensured that the VR application was user-friendly and met the needs of teachers in different educational contexts.

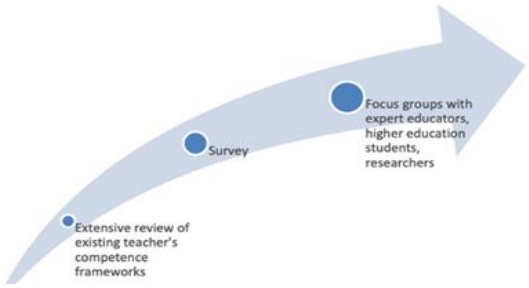

Figure 1 : Block diagram of the methodological design process

During the design process, an online survey was conducted to identify the specific needs of teachers, providing valuable insights into the challenges they face, the impact of COVID-19 pandemic on their daily work, and the types of training and support they need. This information was used to inform the design of the scenarios for the VR tool. Focus groups were also conducted providing an opportunity to explore teachers' expectations of the VR tool and to gather feedback on its potential usefulness. By engaging teachers in this way, the project team was able to identify any potential barriers to adoption and address these in the design of the VR application.

3. VR Application

The VR application features three different scenarios, each focusing on a different topic that teachers may encounter in classes, including distance education and domestic verbal abuse, phobias related to COVID-19 and panic attacks, and classes with refugee students who don't speak the language of instruction of the class. The main feature of the application is the ability to view crisis situations as seen from the eyes of the teacher, and the eyes of the students involved in the events, while a follow-up session with a virtual tutor provides feedback and guidelines for the teacher. The VR application is publicly available to educators.

3.1 Technical setup

The application runs on any Android mobile device with Android version 7.0 (API level 24) or newer and requires 604 MB of the device storage. The application was developed using UNITY (version 2020.3.22). Apart from UNITY, Autodesk Maya, Adobe Photoshop, Autodesk Character Generator, mixamo.com, the SALSA plug-in for UNITY, and the Google Cardboard XR plugin for UNITY were used for creating the virtual environment, the assets, the animated humans, and the interaction.

3.2 The application

By starting the application for the first time, the user is prompted to select basic settings such as language (among English, Spanish, and Greek), username, and country. In the main menu, the user can navigate through different menus, and select one of the three VR scenarios (see Section 3.3 for a description of the scenarios). When the user launches a VR scenario, a message appears on the screen indicating that the smartphone must be placed in a VR headset. After a few seconds, the virtual environment appears, and the scenario starts. The user can explore the virtual environment using gaze movements and interact with the 3D user interface using a gaze-controlled cursor. As the scenarios progress, various questions appear which must be answered by the user in order to continue the scenario. After the scenario completes, the user is prompted to remove the headset and taken back to the "Scenarios" menu. At this stage, the user's answers to the questions are stored in an online data set. The answers to these questions can be used for assessing the impact of the VR tool.

Figure 2 : Typical screenshots from the VR application showing the teacher perspective (top left), and the student perspectives for scenarios 1 (top right), 2 (bottom left), and 3 (bottom right)

3.3 Scenarios

In the current version, the VR application offers three scenarios that simulate real-world classroom scenarios, each with its own set of challenges and learning outcomes.

Scenario 1 - Distance education and domestic verbal abuse: This scenario simulates a situation in which a teacher is conducting a lesson during which a student is connected

online. During the lesson, the student is experiencing domestic verbal abuse by his mother.

Scenario 2 - Phobias related to COVID and panic attacks: This scenario simulates a situation in which a teacher confronts a student who is experiencing a panic attack and anxiety related to COVID-19.

Scenario 3 - Refugee Students: The third scenario focuses on the challenges that teachers may encounter when working with refugee students who don't speak the language of instruction. This scenario provides teachers with an opportunity to practice their skills in communicating with students from different cultural backgrounds and develop their understanding of the unique challenges in multicultural classes.

For all three scenarios, the VR tool offers teachers the ability to experience the scenario both from the perspective of the teacher, but also from the perspective of the virtual student involved in the incident. This feature aims to provide teachers with a deeper understanding of the student's experiences and challenges and to experience the impact of their teaching methods from the student's point of view. Furthermore, perspective change aims for the development of a more empathetic and student-centered approach to teaching, which can lead to better student engagement and learning outcomes. Typical screenshots from the scenarios are shown in Figure 2, and the student avatars in Figure 3.

Figure 3 : The avatars of the students involved in the crisis situation in scenario 1 (left), 2 (middle), and 3 (right)

4. Evaluation and Results

The VR application was evaluated by in-service and pre-service teachers from five countries. During the process, participants had the chance to use the application for about 30 minutes, and during this process, they were requested to answer questions within the virtual environment in the context of each scenario and each perspective (as a teacher and as a student). Gathering user input while being inside the virtual world can provide valuable insights into the user experience and inform improvements to the application tool. It should be noted that in addition to data collected during the experience, data was also collected using analytic pre- and post-questionnaires. The results presented in this paper refer only to data collected within the application, as the results from pre- and post-questionnaires are still under analysis.

In total 223 participants evaluated Scenario 1, 184 participants evaluated Scenario 2, and 185 participants evaluated Scenario 3. For all three scenarios, the participants had to indicate whether their experience in the virtual environment was consistent with a real-world experience (scale 1 to 5, where 1 means maximum consistency, and 5 means minimal consistency). For scenario 1 the results indicate that in both teacher and student perspectives, the vast majority of the participants claimed that their experience was consistent with a real-world experience. No statistically significant difference was found between the two perspectives (t-value=1.62, $p>0.01$). According to the results, the participants experienced scenario 1 as something that was happening and not as observed ($M=1.35$, $SD=0.48$) as a teacher and ($M=1.27$, $SD=0.44$) as a student. The results revealed a statistically significant difference in the question of whether the participants could place themselves in the position of the student attending the class with teleconferencing (t-value=3.708, $p<0.01$), indicating that entering the virtual body of the student allowed end-users to live a faithful experience from the student perspective.

For scenario 2 the results indicate that in both perspectives (teacher and student) the vast majority of the participants claimed that their experience was consistent with a real-world experience. No statistically significant difference was found between the two perspectives. According to the results, the participants experienced scenario 2 as something that was happening and not as observers ($M=1.37$, $SD=0.48$ as a teacher and $M=1.27$, $SD=0.46$ as a student). The results revealed a statistically significant difference in the question of whether the participants could

place themselves in the position of the student facing the COVID-19 related panic attack (t-value=16.98, $p<0.01$), which indicates that entering the virtual body of the student allowed end-users to better experience the student's problem.

For scenario 3 the results also indicate that the majority of the participants found the experience consistent with a real-world experience. No statistically significant difference was found between the two perspectives. Additionally, the participants experienced scenario 3 as something that was happening and not as observers ($M=1.39$, $SD=0.49$ as a teacher and $M=1.17$, $SD=0.47$ as a student). The results revealed a statistically significant difference in the question of whether the participants could place themselves in the position of the student refugee (t-value=10.13, $p<0.01$) indicating that entering the virtual body of the student allowed end-users to experience the problems of students who don't speak the language of instruction of a class.

Overall, preliminary results show that in all three scenarios, the participants felt part of the virtual world and found their experience consistent with a real-world experience regardless of the perspective that they experienced. The most significant insight deals with the effect of perspective change as according to the results entering the position of the student in all three scenarios had an impact on the participants, allowing them to experience the scenarios through the eyes of their students, promoting in that way empathetic behavior among the teachers who participated in the experiments.

5. Conclusions and Future work

Based on the results of the evaluation, the VR application presented is a valuable training resource for teachers that leverages the power of VR technology to provide immersive and interactive learning experiences. The tool was designed based on a participatory design model, where active teachers had a clear role in the design process. By simulating real-world classroom situations, the application allows teachers to develop their skills and competencies in a safe and controlled environment, and to see the impact of their teaching methods from the perspective of the virtual student. This enables teachers to develop an empathetic and student-centered approach to teaching, which can lead to better engagement and learning outcomes for students.

The results of the evaluation revealed that for all three scenarios, including distance education and domestic verbal abuse, phobias related to COVID and panic attacks, and students who are refugees, the VR application offered a highly realistic experience. Furthermore, the impact of perspective change that allowed the users to experience the crisis situations both from the eyes of teachers and students, proved to be a highly promising approach for VR-based teacher training.

In the future, we plan to present more comprehensive results that will also consider the responses from the offline pre- and post-questionnaires. Furthermore, we plan, in cooperation with active teachers, to include new scenarios in the application, provide versions for more languages, and evaluate the application in additional countries.

References

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