VRTEACHER PROJECT: A REVOLUTIONARY APPROACH TO TEACHER EDUCATION USING VIRTUAL REALITY

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Abstract

This paper presents the rationale behind the VRTEACHER project and the integration of Virtual Reality (VR) technology in teacher education. The paper explores how VR and perspective-taking can promote the development of teacher's competences such as empathy. Furthermore, the paper provides an overview of the project's methodology, the VR application developed, and some preliminary results related to the impact of VR-based training, emphasizing the potential benefits in terms of enhancing teaching practices, promoting inclusivity, and fostering a deeper understanding of students' experiences. The paper aims to contribute to the existing body of knowledge on the integration of VR technology in teacher education.

Keywords: Virtual reality, teacher training, empathy, perspective-taking

Introduction

Teachers play a crucial role in driving educational excellence and sustainable development, making them a pivotal force in the realm of education. The "Education and Training 2020" strategy in Europe has underscored the importance of teachers, highlighting the importance of their initial education and continuous professional development (Organisation for Economic Co-operation and Development [OECD], 2020). In today's dynamic educational landscape, teachers face unprecedented challenges as classrooms become more complex, diverse, and digitalized. Moreover, the outbreak of the COVID-19 pandemic has exacerbated the challenges in education, making an imperative need for the implementation of innovative training approaches to equip educators with lifelong skills.

In this context, the VRTEACHER project aimed to empower teachers by introducing a novel Virtual Reality (VR) based approach designed to respond to in-class crisis situations, such as a pandemic. The integration of VR in teacher training holds significant potential as it provides a safe and controlled virtual space for experiential learning and practical training (Stavroulia et al., 2019; Stavroulia and Lanitis, 2023). Through engaging and immersive experiences, VR can replicate real-life situations and challenges, enabling teachers to gain first-hand perspectives and develop key skills such as empathy. The vision of the VRTEACHER project was to foster the personal and professional development of teachers through systematic practical and experiential VR-based training.

Virtual Reality-based Teacher Training

In recent years, education has witnessed a significant shift towards integrating immersive computer-based training tools to boost knowledge and skills acquisition. This trend highlights the growing interest in leveraging VR environments to innovate teaching and learning. VR offers a unique and compelling educational

experience by immersing learners in a simulated environment that replicates real-world scenarios through the use of specialized hardware, such as head-mounted displays. One of the key advantages of VR in education is its ability to provide experiential learning opportunities that go beyond traditional classroom settings. By placing the trainees in virtual environments that mimic real-world contexts, they can actively participate in simulations, experiments, and problem-solving activities. This hands-on and immersive approach allows learners to develop practical skills, critical thinking abilities, and a deeper understanding of complex concepts.

Research on the use of VR in teacher education is still in its early stages, with a limited yet growing body of evidence highlighting its potential. Some attempts have been made to create virtual classrooms for experimentation using large-screen displays instead of VR equipment like head-mounted displays (HMD glasses). Examples of such attempts can be found in studies by Andreasen and Haciomeroglu (2009), Dieker et al. (2007, 2008, 2015), and Ke et al. (2016).

Bailenson et al. (2008) examined how social behaviours and visual cues in a VR teaching scenario affected learning. Their study revealed that participants tended to overlook peripheral virtual students, but implementing a notification system helped distribute their attention more evenly. Similarly, Lugrin et al. (2016) developed an immersive VR system aimed at improving teachers' classroom management skills, particularly in handling disruptive behaviour. While the results indicated the system's effectiveness for teacher training, trainees reported experiencing stress due to the simulated student behaviours.

Manouchou et al. (2016) developed a prototype VR classroom training environment that allowed teachers to experience students' vision disorders, offering them a firsthand perspective of being visually impaired. Stavroulia et al. (2016) focused on training teachers in identifying and distinguishing bullying incidents, utilizing VR to simulate bullying scenarios and teach appropriate responses. These early attempts demonstrate the potential of VR in teacher education; however, further research and advancements are necessary to refine and expand the applications of VR in this domain, addressing challenges such as stress-inducing situations and optimizing user attention and engagement.

VRTEACHER Project: Scope and Aims

The VRTEACHER project (https://www.vrteacher.eu/) was an Erasmus+ KA2 project (2020-1-CY01-KA226-SCH-082707) that took place from June 2021 to May 2023. The project involved six partners: Cyprus University of Technology (Cyprus / Coordinator); University of the Aegean (Greece); Universidad Carlos III de Madrid (Spain); Fundación Siglo22 (Spain); Future In Perspective Limited (Ireland); and Commonwealth Centre for Connected Learning (Malta).

The VRTEACHER project aimed to strengthen teacher education through the integration of VR-based practices. The project was conceived as a response to the COVID-19 pandemic and sought to provide a solution to the crisis by harnessing the power of VR technology. By leveraging VR, the project aimed to support teachers in adapting to the new educational landscape and equip them with the necessary skills to effectively navigate crisis situations, including the challenges posed by the pandemic.

Equally important is that the VRTEACHER project was also developed as a response to the recognized need for practical training and hands-on experiences in teacher education. Traditional teacher training programs often focus on theoretical knowledge and pedagogical strategies, leaving teachers ill-prepared for the practical challenges they encounter in real classrooms. Additionally, the pandemic had a profound impact on the practical training of teachers as it necessitated social distancing measures and the closure of educational institutions resulting in the suspension or limitation of in-person practical training for teachers. Traditional methods of observing and participating in classroom activities, conducting teaching practice, and receiving feedback from experienced educators were disrupted, leading to a significant gap in hands-on training opportunities. The project aimed to bridge this gap by providing teachers with a virtual training tool that offers immersive and real-life classroom scenarios. By using VR technology, teachers can engage in interactive and experiential learning, gaining valuable practical experience in a safe and controlled environment. This hands-on approach allows teachers to develop their skills, build confidence, and refine their teaching techniques. Furthermore, the project recognized the importance of preparing teachers for the unexpected, which is a crucial aspect of their professional development, and VR offers a promising solution in this regard.

VRTEACHER Objectives and Target Audience

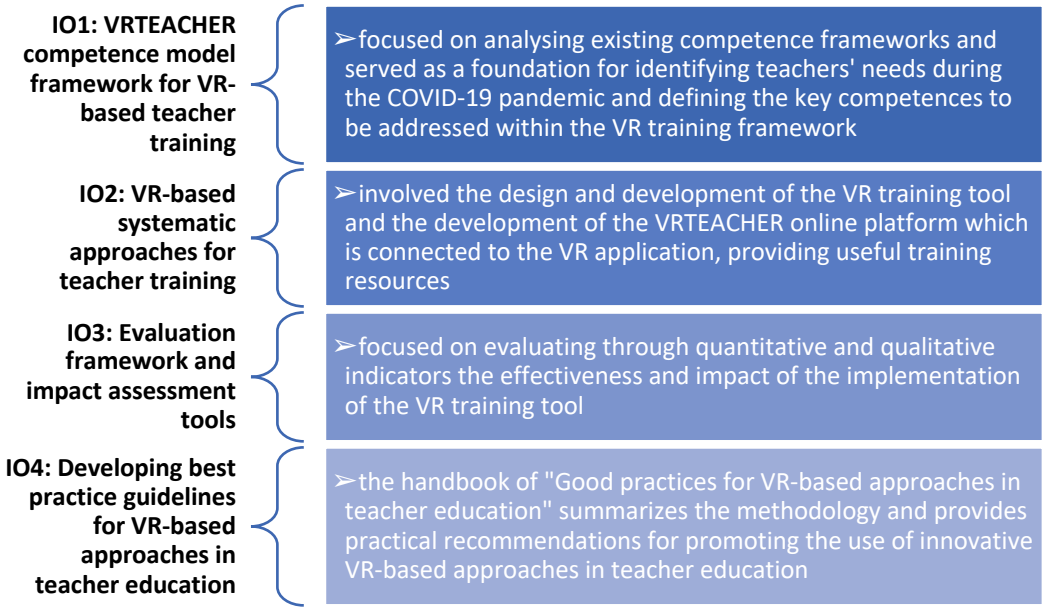
The main objectives of the project were to: i) advance the state of the art in the relatively new area of VR-based teacher training; ii) develop a VR training framework specifically designed for teachers; iii) identify and address the specific needs and challenges faced by teachers during the pandemic; iv) design and develop VR training scenarios that meet the requirements and needs of teachers; v) enhance teachers' practical skills and preparedness for unexpected situations through VR simulations and scenarios; vi) foster empathy and perspective-taking skills among teachers through immersive VR experiences; and vii) support teachers' continuous professional development and lifelong learning.

The primary target groups for the VRTEACHER project were in-service teachers and pre-service higher education students, PhD candidates, etc., who are the next generation of teachers.

The achievement of the aforementioned goals relied on the intellectual outputs (IOs) of the project, which were carefully designed to address specific needs and contribute to the overall goals of the project. The project consisted of four intellectual outputs, which are presented in Figure 1.

Figure 1

VRTEACHER project intellectual outputs



The VRTEACHER Application

The VR application is freely accessible and open to all users without charge through the project's website (https://www.vrteacher.eu/). The application runs on any Android mobile device with Android version 7.0 (API level 24) or newer and requires 604 MB of device storage. The application was developed using UNITY (version 2020.3.22). Apart from UNITY, additional software such as 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. Furthermore, the application requires low-cost VR headsets compatible with Android phones.

When starting the application for the first time, the user is asked to select basic settings such as language, username, and country. In the main menu, the user can navigate through different menus, and select one of the three VR scenarios. When the user launches a VR Scenario, a message appears on the screen indicating that the device must be placed in a VR headset. After a few seconds, the virtual environment appears, and the scenario starts (Figure 2). The user can explore the virtual environment using gaze movements and interact with the 3D user interface using a gaze-controlled cursor (Yu et al., 2021). By incorporating eye gaze as an input modality VRTEACHER application, allowed users to interact with the virtual world more seamlessly and naturally. It eliminated the need for complex controllers or input devices, enabling a more immersive and hands-free experience.

The VRTEACHER application was designed as a multilingual tool to cater to the diverse language needs of teachers. The application is available in English, Greek and Spanish languages to serve the needs of the partner countries.

Figure 2

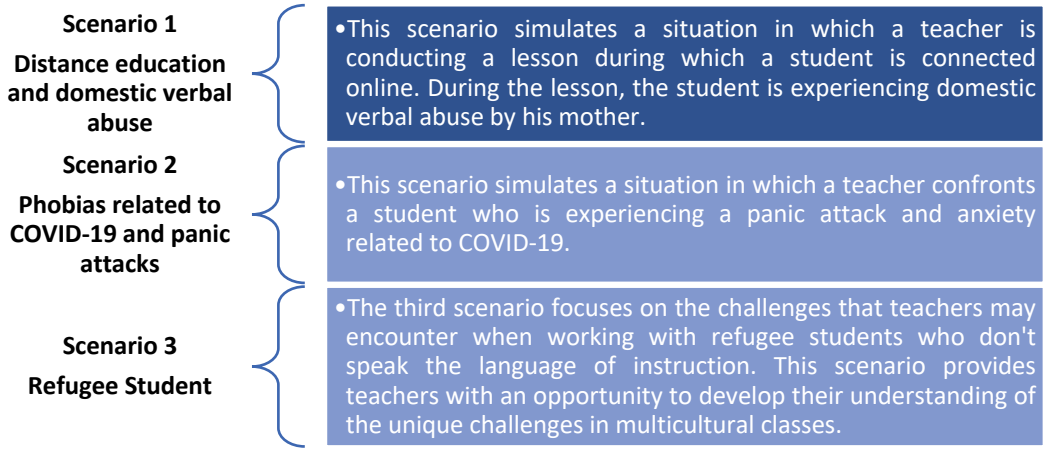
Starting button in the main scene

Training Scenarios

The VRTEACHER application offers three scenarios that simulate real-world classroom scenarios, each with its own set of challenges and learning outcomes. Figure 3 presents the three scenarios and a short description of them.

Figure 3

The three scenarios developed in the VR application



Perspective-taking

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. The main benefit of perspective-taking lies in promoting empathy by allowing users to step into the shoes of their students and experience the world through their eyes. By experiencing different perspectives, users can develop a more empathetic and understanding mindset, fostering tolerance and open-mindedness. Figure 4 below presents the view of the classroom through the eyes of the teacher, and Figure 5 presents the perspective of the student in his bedroom participating in the lesson remotely.

Figure 4

Through the eyes of the teacher

Figure 5

Through the eyes of the student

Implementation and Results

VR-based training and all scenarios had a positive impact on teachers, making them more supportive, empathetic, and better equipped to address the challenges faced by their students. The application received positive feedback from participants related to the realistic and impactful nature of the virtual scenarios, which helped them develop new skills, improve their decision-making abilities, and think

critically about their teaching practices. The VR tool has effectively influenced teachers' perspectives on engaging remote learners and addressing the challenges of bullying and abuse at home (scenario 1). The tool raised awareness of various forms of abuse that students may face at home, making teachers more aware of these realities.

The VR training experience has significantly raised teacher's awareness related to students' psychological distress and phobias arising from events like the COVID-19 pandemic (scenario 2). It has provided teachers with a unique opportunity to experience and comprehend the challenges these students face, which may be dangerous, difficult, or impossible to replicate in real-life situations. Teachers have recognised the importance of developing collaboration and social skills, fostering interpersonal relationships, and creating a safe environment for students.

Equally important is that VR-based training has significantly impacted teachers' perspectives on engaging students from different cultural backgrounds in the classroom (scenario 3). Experiencing students' perspectives allows teachers to better understand challenges related to language barriers and cultural differences. The scenario emphasized the importance of diversity and inclusion, highlighting the need for teachers to be mindful and treat all students equally. The scenario also highlighted the need for additional training to assist teachers in effectively integrating students from different cultural backgrounds.

Another important outcome deals with the long-term impact of the VR-based training, which was assessed four weeks after the end of the trainings. The findings indicate that participants' positive changes in attitudes were sustained and not just temporary. Teachers had the opportunity to further explore and analyse the VR scenarios, encouraging critical thinking and self-reflection concerning their own teaching practices. The introduction of VR likely sparked discussions among teachers, allowing for the exchange of perspectives and experiences related to the encountered scenarios when they returned to their schools. The success of the VR-based training in all partner countries indicates its potential for broader implementation and adaptation in other educational contexts.

Conclusions

The VRTEACHER project has emerged as a ground-breaking initiative that harnesses the power of VR to revolutionize teacher training and respond to the needs highlighted by the COVID-19 pandemic. The project was designed to provide teachers with VR-based immersive learning experiences that enhance their competences, such as empathy, and through virtual scenarios that simulate real-world classroom challenges. By assuming the role of both teacher and student,

participants gained valuable insights into the challenges, emotions, and experiences that students face. This experience fosters empathy and perspective-taking, enabling teachers to better understand their students' needs and tailor their instructional approaches accordingly.

The use of VR in teacher training offers several notable benefits, including practical training and hands-on experiences in a risk-free setting enabling teachers to build their teaching confidence and improve classroom management competences. VR-based training facilitates experiential learning by enabling teachers to step into the shoes of their students. Through immersive simulations, educators can gain first-hand insights into the perspectives and challenges faced by students, fostering empathy and understanding. This experiential approach enhances their ability to address diverse learning needs, adapt teaching strategies, and create inclusive classroom environments. As VR continues to advance, its integration into teacher education holds immense potential for transforming teaching practices and ultimately improving the quality of education.

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