VR-Assisted vs Video-Assisted Teacher Training

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Abstract

This paper compares teacher training in Virtual Reality (VR) to traditional approaches based on videos analysis and reflections. Our VR-assisted teacher training targets classroom management (CM) skills, using a low cost collaborative immersive VR platform. First results reveal a significant improvement using the VR approach.

Index Terms: Human-centered computing—Human computer interaction (HCI)—Interaction paradigms—Virtual reality

1 Introduction

The benefits of virtual environment training for teacher education using semi-immersive VR systems have been demonstrated [1,4,6], notably with a system such as the TLE TeachLivE^{TM} Lab [4]. This system was adopted by fifty-five universities and was used with over 12000 teacher candidates during the 2014/15 academic year [2]. Its ability to help teacher education has been demonstrated by many case studies [4,6]. With this system, in-service and pre-service teachers can train various situations coming up in school. A classroom with five virtual students is displayed on a large screen. These are in fact avatars embodied by actors. Consequently, they behave and respond very realistically, replicating the actor's voices and movement. But they require trained actors as well as a special infrastructure (motion capture room, equipment, and technical support). A five-student classroom is also significantly less than the average in most schools.

In contrast, "Breaking Bad Behaviours" [5] is a fully immersive VR system proposed recently for easy and everyday usage in normal seminar rooms. It is based on collaborative and immersive VR training approach using low-cost portable hardware and software. It is capable of simulating a large number of virtual students–over twenty-five–and does not request special actors to embody them. They are semi-autonomous agents which can be controlled at any time by a CM *instructor* via a simple desktop Graphical User Interface (GUI) Fig. 1. The *trainee* is immersed within the virtual classroom using a VR headset and 3D controllers. The *instructors* are expert in CM, and evaluate the teacher's reactions to the bad or good behaviors of students. This system was designed to be integrated into a CM seminar for educating teachers for primary and secondary schools. The main aim was to improve the interconnection between theory and praxis. Previous short-term user studies demonstrated its usability, believability, safety, and comfort as well as its acceptance and interest from both the students and pedagogic team [5]. However, the actual efficiency and effectiveness of such a system regarding learning outcomes have never been demonstrated. In this paper, we present the first results of a long-term study comparing this VR system to the classic video-assisted method.

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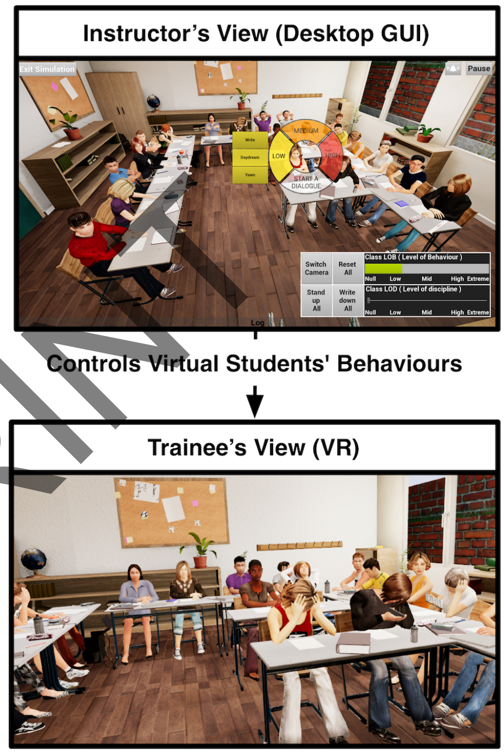

Figure 1: VR Teaching Training System Overview (Here an instructor triggering a *bad* behavior: a student sleeping in front of the teacher)

2 Experiment

We adopted a pretest-posttest experimental design where the between-subjects factor is the type of medium used: VR or Videos. The seminar was then divided into two groups: *Group 1: VR-Assisted*, and *Group 2: Video-Assisted*. Each group passed the same test before and after the seminar to measure their progress between the start and end of the semester. The seminar groups thematized the same contents in the same order and intensity. The only difference was that one of the seminars used video reflections instead of the virtual classroom to illustrate the theoretically acquired contents. In each of the VR practical sessions, there was a short theoretical recall, followed by one type of bad behavior situation to prepare for 10-15 minutes. Afterwards, three to five students were randomly selected and asked to perform their coping strategies in VR. The rest of the seminar participants were able to observe their performances as well as their points of view in VR and instructor's one using two large screens. They then received feedback from the lecturers and other students after their performance in VR and the coping strategies they adopted against bad classroom behaviors.

Figure 2: Experiment Overview: Pedagogic experts evaluating a student's performance immersed in VR simulation (in the background)

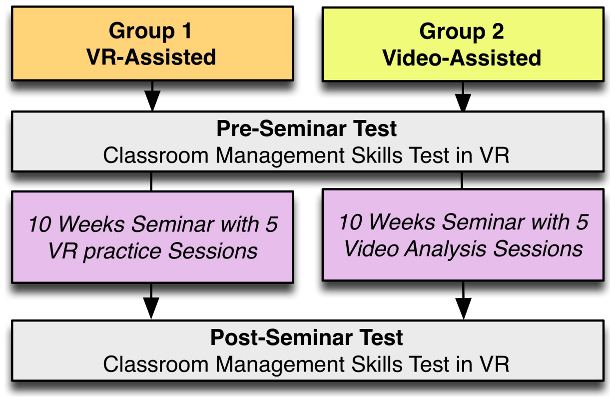

Figure 3: Experiment Design Overview

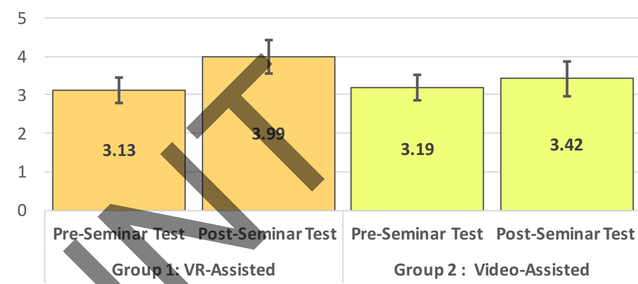

Figure 4: Overall Instructors' Rating Results (with standard deviation error bars, where five was the highest mark achievable for the seminar)

During the pre- and the post-seminar test, every participant passed a 7-minutes test scenario in VR. They had to inform the class about an upcoming class trip to London (pre-seminar test) or Berlin (post-seminar test). The two seminar instructors evaluated the participant's reactions and coping strategies against bad behaviors they generated (Fig. 2). Their ratings were based on three sub-scales *Classroom Management/discipline*, *External Influences* and *Personal Teaching Efficacy* as proposed by Emmer and Hickman [3]. Each participant received an overall score rating their CM competences, in particular, their ability to managing bad behaviors without affecting their teaching. The participants were also filmed for further analysis of the body language, signs of nervousness, gap fillers in speech and so on. Additional questionnaires regarding usability, user experience, cybersickness, presence, tasks load and specific open questions were also given. However, this paper is just focusing on the CM competences results. The experiment design is summarized in Fig. 3.

3 Results and Discussions

The participants of the study were pre-service teachers for primary as well as for secondary school. They were all taking part in the CM seminar at the University of Würzburg during one semester in 2017 (N=54, 36 worked with VR - Group 1, 18 with videos - Group 2). The range of the student's age was between 19 and 30 years (M=21.57, SD=2.24). There were 41 female and 15 male participants who were in the 2nd to the 8th semester of their studies (M=4.52, SD=1.13). The Fig. 4 is summarizing the overall instructors' ratings by cumulating and averaging their sub-scale scores. It is a value from zero to five (highest score) reflecting their CM competences. An unpaired t-test showed no significant difference in the instructor rating score between the groups for the pre-seminar test ($t(52) = .279$, $p = .781$), whereas the VR- and Video-assisted groups presented a significant difference in the post-seminar test. ($t(52) = 2.26$, $p = 0.03$, d=.653). A paired-samples t-test revealed a significant improvement of the CM competences between the pre and post-seminar test with the VR-assisted condition ($t(35) = 5.18$, $p < .001$, $d = .864$). On the other hand, the Video-assisted condition did not raise any significant improvement ($t(17) = 1.01$, $p = .323$). Consequently, it appears that the VR sessions were beneficial for the students, with significantly higher scores inside the VR group between their pre-seminar test and post-seminar test within the VR group as well as better results in VR group post-seminar. The fact that student performance was lower in the video-assisted group could be due to a certain lack of habit or difficult to interact in VR. Nevertheless, the observed improvement is already a convincing and encouraging result for the future of such VR education platform. We expect the further analysis of our quantitate and qualitative results to provide us with additional information, as well as interesting insights on the integration of VR practice in a university curriculum.

4 Conclusion

This paper described the successful integration of a low-cost collaborative immersive VR training system into an existing university curriculum for teacher education. We reported its positive effect on learning outcomes. Our research contributes to empirical evidence of VR training benefits for teacher education and presents a valid alternative to video-assisted methods. Our first results are encouraging, and their further analysis should lead to more insightful observations and guidelines for the community.

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