360°-VIDEO REFLECTION IN TEACHER EDUCATION: A CASE STUDY

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ABSTRACT

360°(degree-)-videos inherit interesting potentials for teaching competence development. Reflecting on personal teaching performance from multiple perspectives potentially increases the depth in situated reflection and provides new learning insights for pre-service teachers. In this light, this paper describes a case study conducted at the University of St.Gallen where 360°-videos were used for reflection on personal performance of pre-service teachers in order to clarify, whether they add value to reflective observations compared to classical video recordings. Key findings are that (I): 360°-videos can add value to reflection processes in teacher education when combined with feedback and situated learning processes in a learning design and (II): 360°-videos offer advantages to follow teacher-student-interactions and to reflect upon personal teaching performance from multiple perspectives.

KEYWORDS

360°-video, Immersion, Social Video Learning, Teacher Education, Situated Learning, Experiential Learning

1. INTRODUCTION

The use of 360°-videos in education is still in its infancy. Nevertheless, the technology is enjoying steadily growing interest and relevance (Yildirim et al., 2020, p. 241; Schmoelz, 2018; Parker et al., 2016; Radianti et al., 2020, p. 26). Prior research shows, that participants pointed out elevated levels of interest, engagement and enjoyment when experiencing learning with 360°-videos (Snelson & Hsu, 2020). Sato and Kageto (2018, p. 267) affirm that 360°-videos watched with HMDs (Head Mounted Displays) support learners to remember how they felt when they were engaged in an activity. Future research efforts should therefore aim to deepen understanding of how and under what conditions 360°-videos effectively support learning (Snelson & Hsu, 2020, p. 411; Nissim & Weissblueth, 2017, p. 52; Kalliopi-Evangelia, 2020, p. 31). In addition, Wohlgenannt et al. (2019, p. 4) and Radianti et al. (2020, p. 26) affirm that researchers should aim to identify adequate learning theories to ground didactic designs using 360°-videos.

To contribute to the closure of this knowledge gap, the purpose of this research is to describe a case study conducted in the teacher education programme at the University of St.Gallen. The programme is designed for students who aim to be educated as teachers in the subjects of business, law and economics for high school and vocational education. The purpose of this study was to test, wheter reflection processes with self-recorded 360°-videos of teaching performances could add value to the learning process of pre-service teachers. Accordingly, the following research question has been defined:

RQ. Can 360°-videos of personal teaching performance watched with an HMD effectively extend learning and reflection processes of pre-service teachers?

To answer this question, we worked with a small group of pre-service teachers and recorded their microteachings (teaching units in front of a simulated class) with a 360°-video camera. Additionally, we used live-video annotation (Social Video Learning (SVL)) to visually explicate important teaching situations by using a smartphone-based SVL-application. This procedure should assure a goal-oriented reflection using the 360°-video technology. Therefore, the paper is structured in four parts: the first chapter focuses on the rationale of the research project. In the second chapter, the study design and the methodology are described. In the third chapter, the case study, the corresponding learning design as well as the data analysis and collection process are themathized. Finally, the fourth chapter concludes and discusses the key findings of this research.

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2. RATIONALE OF THE RESEARCH PROJECT

What distinguishes 360°-videos from VR (Virtual Reality)? First of all, it is essential to bring the heterogeneous definition landscape around the terms 360°-videos and VR to a common denominator that makes sense for the context. According to Feurstein (2018, p. 3), VR can be defined as an "environment in which the participant is fully immersed into a computer simulated reality or a stereoscopic perspective". Schmoelz (2018, p. 8) developed a classification of immersive density showing, how different forms of engagement in an immersive environment can be classified:

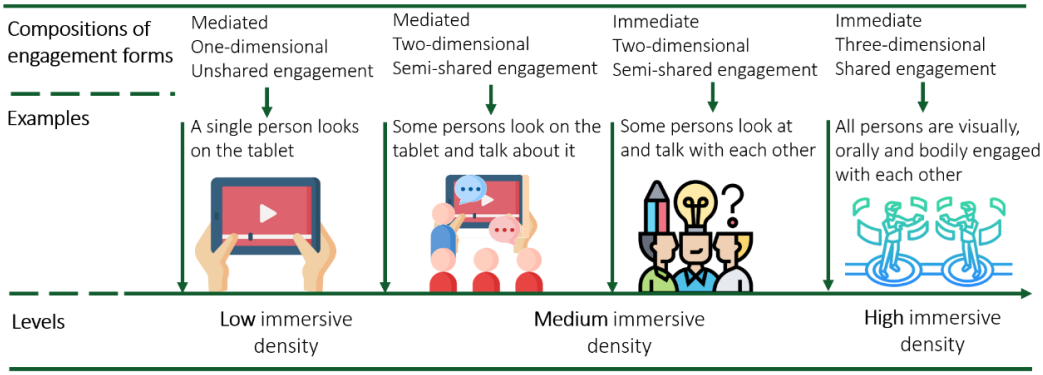

Figure 1. Immersive density
Own illustration based on Schmoelz (2018)

Nevertheless, 360°-videos make use of vital elements that characterize VR. From a personal perspective, they can be classified as medium/high immersive according to Schmoelz (2018), as they allow immersive experiences but without a motion free, virtual and shared engagement (see Figure 1). Although they are generated with real-world footage and not by using computer software, 360°-videos are characterized by self-directed control and multi-perspectivity. In consequence a sense of immersion is generated and results in an enhanced feeling of presence within the specific environment (Snelson & Hsu, 2020, p. 1; Feurstein, 2018, p. 2). It is important to underline that 360°-videos are immersive experiences which are limited to the viewer looking around statically in a 360°-space. In case of usage with a projection device (e.g. HMD), they can be classified as a VR application due to the generated perception of being virtually present in a specific environment, according to Milgram et al. (1994) and Zobel et al. (2018). 360°-videos can also be used browser-based supported by video-platforms like YouTube VR, which is interesting from a cost-saving perspective as HMDs are not necessairily needed to watch them. The present research limits its experimental efforts to self-recorded 360°-videos used with an *OculusGo* HMD for reflection processes.

Why do we think that 360°-videos can represent an added value for teacher education? The immersive experience provided by 360°-videos watched on an HMD allows pre-service teachers to re-experience their teaching performance from different angles (also depending on where the camera is positioned in the room). According to recent studies, the 360°-view allows the *analysis of behavior and reactions* in the complete classroom-surrounding resulting in an improved understanding regarding the conduction of constructive and fruitful teacher-student interactions (Luo et al., 2020, p. 11; Stavroulia & Lanitis, 2017; Feurstein, 2018, p. 5). As a consequence of previous research efforts, we assumed that the immersive experience of teaching performances by watching 360°-videos with an HMD could positively affect the subsequent reflective activity as it disconnects the user from distracting factors of the "real world" (Theelen et al., 2019, p. 584; Zobel et al., 2018). Teachers can take on the students' position and emphasize with their problems. Furthermore, it is assumed that 360°-videos can facilitate *situated learning*, i.e. social collaborative knowledge construction (Gaudin & Chaliès, 2015, p. 58; Greeno, Collins & Resnick, 1996, p. 40). Key components of situated learning are storytelling, reflection (video-based and peer-based reflections about one's own and others' practices), collaboration, coaching and real-life experience. Immersive technological support (e.g. 360°-videos) can expand the intensity and flexibility regarding key components of situated learning and promote the development of reflective practice (McLellan, 1996, p. 48; Gaudin & Chaliès, 2015, p. 58). Focusing on the field of teacher education, 360°-videos can be used to experience classroom situations up close with HMDs.

3. STUDY DESIGN AND METHODOLOGY

The participants were pre-service teachers at Bachelors` level from the University of St.Gallen. 60% of the participating students were female, aged 21-30 with a mean age of 21.9. The students could participate in the study on a voluntary basis given that it was not a mandatory element to successfully complete the course. The study was conducted within an obligatory course in teacher education called *Didactic Transfer*. The course runs during a whole semester. Students teach their fellow colleagues (simulated class) to gain their very first teaching experiences in a protected setting. They plan their microteachings of 45 minutes in tandems and are simultaneously coached by a lecturer. The course is split up in two rounds of microteachings, i.e. every student tandem teaches twice during the semester. The microteachings of the first round are purely for practice, whereas those of the second round are graded by the lecturer (see Figure 2):

Figure 2. Semester structure
Own illustration

The small size of the group resulted in practical advantages. The course was attended by 40 students split up in grous of 10. From a lecturer`s point of view this was highly beneficial to create a positive and trustful group culture resulting in critical, honest and constructive feedback processes. Especially since reflecting on one's individual teaching practice can be shameful and therefore challenging for some students, we have experienced many times that a positive group culture is essential for learning success. Practically speaking, we have tried to estaböish this culture by using elements like a kick-off meet-and-greet or joint coffee breaks.

4. RESULTS

4.1 Development and Implementation of the Learning Design

The creation of a meaningful learning design integrating the 360°-video reflection represented a particular challenge. We already worked with Social Video Learning (SVL) in our course (Tarantini, 2020). SVL means an interactive annotation of videos (Vohle & Reinmann, 2012, p. 416; Meixner, Siegel, Hölbling, Kosch & Lehner, 2009; Krüger et al., 2012, p. 200). The learner visually specifies the reference point for his or her interpretation of a specific teaching situation (annotation) (Tarantini, 2020; Chatti et al., 2016). Explaining personal observations, insights or critical remarks within this learning process represents an effective way to develop a precise and constructive feedback competence (Vohle & Reinmann, 2012, p. 416). The idea is, that the students representing the simulated class explicate their observations after a microteaching on a SVL-platform for a very specific situation (video annotation). To sum up, SVL represents a form of situated learning.

The video annotation process is split up in two steps: Firstly, students (simulated class) can annotate a live- video by using the *edubreak App* (visual tags) while the lecturer records the microteaching via smartphone (see Figure 3). They can add time stamps accurate to the second (so-called “visual tags”) and immediately "save" observed critical or positive teaching situations. Secondly, after recording the video, it is uploaded to the SVL-platform (edubreak CAMPUS, edubreak.de) including all annotations made during the microteaching. Participants can now explicate their annotations with specific text-based comments on their computer (see Figure 3).

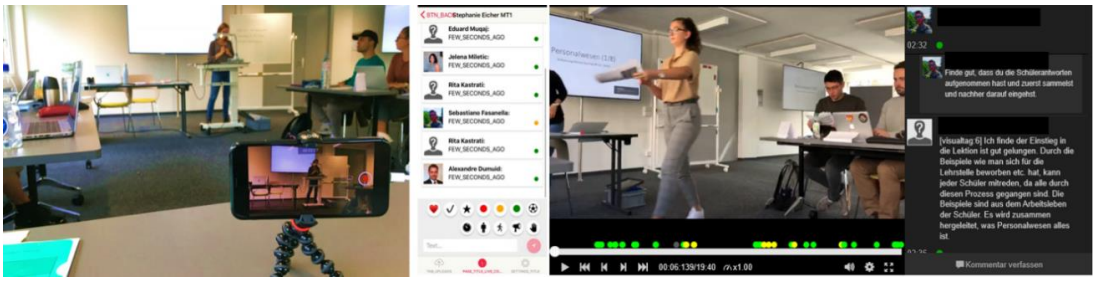

Figure 3. Live-video in the microteaching (left), user interface on the edubreak App (centre) and SVL-platform (right)
Own illustration

The importance of this well-established design element for the current research lies in the thought, that the concrete explication of observations sensibilizes the simulated class and the teaching students for important situations during a microteaching. In consequence, this situated learning approach could lead to a deeper learning and reflection process (Tarantini, 2020). With these annotated situations from the single-perspective video in mind, the complementary 360°-video of the microteachings could potentially support the teaching students in exploring these "critical situations" form different perspectives in a more immersive environment. One could justifiably claim that it doesn`t make sense to record two videos in order to reflect on one microteaching but 1) unfortunately the SVL-platform does not yet support the annotation of 360°-videos and 2) the live-annotation process requires a live-recording via the smartphone-based *edubreak App*, which in consequence represents a classical video. To sensefully combine the explained elements, we followed the logic of an **experiential learning process** to create an adequate learning design which fitted very well with the course structure:

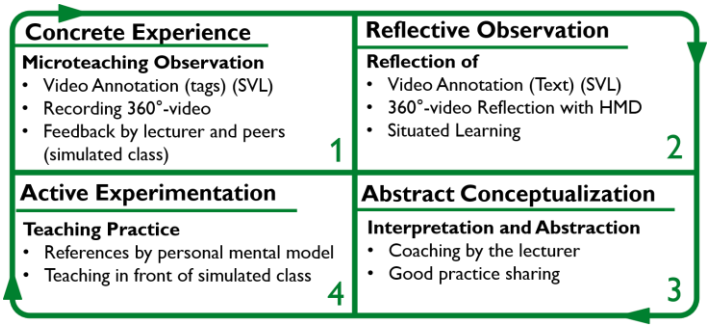

Figure 4. Learning Design
Own illustration adapted from Kolb (1984)

The micorteaching was conducted by the student tandem in front of the simulated class (*concrete experience*) (1). Meanwhile, the 360°-video is recorded by using a laptop, a 360°-camera (in our case a RICOH THETA Z model) and a tripod. We opted for this type of camera as it was quite lean and easy to use. The camera was set up in the middle of the room, in order to provide the teaching students the "class perspective", when watching the video with the HMD:

Figure 5. 360°-video recording (left) and 360°-video in YouTube VR (right)
Own illustration

Furthermore, the simulated class annotated live-situations with the *edubreak app* (see Figure 3). The SVL was followed up by an oral peer feedback to identify and discuss the crucial situations highlighted in this process (Kleinknecht & Gröschner, 2016, p. 47; Prilop et al., 2020). The lecturer moderated the feedback session. Subsequently, the 360°-video was uploaded to YouTube VR for the *reflective observation* of the students with an *OculusGo* model (HMD) (2). We decided to use YouTube VR, because 1) the platform was supported by the *OculusGo* and 2) it is very easy and intuitive in use. The reflection process supported by the 360°-video took place at another day and was combined with a coaching session (3). This decision had practical reasons, as uploading the videos to YouTube VR took several hours due to the huge data size of the 360°-video files in 4K-quality. Lower video quality (1080p) resulted in enormous blurriness due to the scaling of the viewing field in the YouTube VR environment. The supervising lecturer provided feedback regarding ciritical situations to sensibilize the students by showing them selected 360°-video sequences. Again, the selection process of those situations was facilitated by the preceding SVL process. Furthermore, theoretical implications of good teaching practice could be *abstracted from the concrete teaching situation*, resulting in a learning process in the sense of situated and experiential learning. In conclusion, it seems that the students have effectively developed their mental teaching models in order to provide them concrete references during their future teaching practices as a consequence of the combined, situated SVL and 360°-video-reflection approach (*active experimentation*) (4).

4.2 Data Collection and Analysis

During the course we recorded five 360°-microteaching-videos, i.e. one per tandem. Due to the COVID-19 pandemic it was not possible to record more videos for the second half of the semester in fall 2020 because the University of St.Gallen completely shifted to online lecturing via ZOOM (see comparison in chapter 5). Data was collected by 1) personally interviewing the participants after the coaching sessions and, 2) with an online-questionnaire (via surveymonkey.com) to be filled out right after the reflection on personal teaching performance with the HMD-based 360°-video. Excel was used to analyze the collected data. The students evaluated the 360°-video environment as experienced in YouTube VR based on seven items: 1) *Intention to use*, 2) *Attitude*, 3) *Awareness*, 4) *Presence*, 5) *Ease of use*, 6) *Playfulness* and 7) *Usefulness*. The items were defined by considering findings from Fang et al. (2014), Tcha-Tokey et al. (2014) as well as Venkatesh et al. (2003) and operationalized with specific questions. Figure 5 shows an overview of the average values of the student responses to the questions regarding an item. A 5-point likert scale was used to classify the questions within the survey (1 = Not at all true; 5 = Strongly agree).

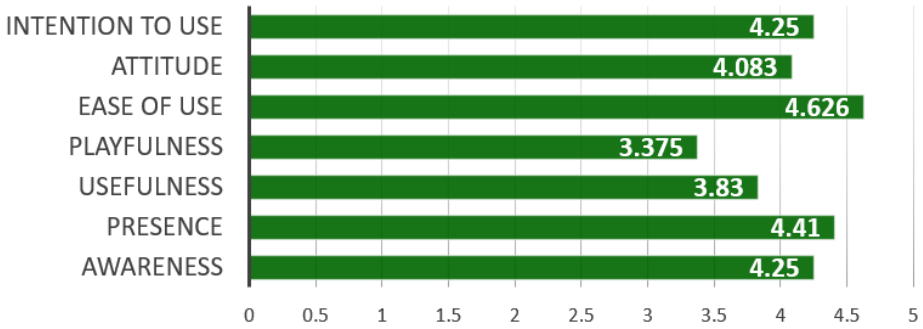

Figure 6. Means questionnaire 360°-video reflection (n = 10)
Own illustration

The results showed that the 360°-environment in YouTube VR was perceived as highly user-friendly and intuitive (*ease of use*). Furthermore, it was emphasized in the evaluation as well as in the interviews that interactions between teacher and students can be better followed and perceived (*presence and awareness*). The participants positively assessed the *usefulness* of 360°-videos for reflection processes in teacher education (3.83), especially due to multi-perceptivity and the sensibilization for ciritcal teaching situations via SVL. In the interview, a participant mentioned that he was able to notice details in the classroom (student`s attitude), which were not visible to the viewers eyes when watching the classical video on the SVL-platform. Two items that can be considered as interdependent are *intention to use* and *attitude*. The positive attitude of the

participants towards new technologies, which is probably due to the young average age of the participants (around 21.9 years), could be an indicator for the high intention of further wanting to use of 360°-videos for reflection processes. Finally, it is noted that the item *playfulness* scored somewhat lower in the evaluation. On the one hand, this could be due to the fact that the immersion through the HMD takes some familiarization time and can lead to visual and physical discomfort. However, this has not been the case for our students as they stated in the interview. On the other hand, it is an experience that does not allow any playful actions compared to a virtual simulation, but focuses on observation by rotating statically around one's own body axis.

5. CONCLUSION AND DISCUSSION

This paper sheds light on the valuable use of 360°-videos for reflection processes in teacher education. Referring to the research question, results of this research imply that 360°-videos are promising and fruitful for the reflection on teaching performance when 1) embedded in a learning design which provides feedback from peers or/and experts and 2) combined with a situated learning method (e.g. SVL) to sensibilize for critical situations in order to enable a goal-oriented watching of the 360°-video in YouTube VR.

From a practical point of view, we experienced 360°-videos as a very interesting technology for education. They are easy to produce, cameras are affordable and the upload to and use via YouTube VR is relatively easy.

From a theoretical standpoint it shall be highlighted that situated learning can be embedded in or combined with an experiential learning procedure. In our case, it was important to abstract concrete situations in order to discuss about concepts and methods of effective and good teaching, such as asking the right questions at the right time or how to provide constructive feedback to the learners.

From a methodological point of view the personal interviews with the pre-service teachers in the study revealed interesting findings, such as the possibility to perceive environmental factors of the classroom by using the 360°-video reflection. Furthermore, this method helped to establish a trustworthy and deeper dialogue with the participants, which also became noticeable during the semester in a positive working and discussion culture in the group but also with the lecturer.

As mentioned in chapter 4.2, we had to switch to ZOOM teaching for the second half of the semester. However, since there was no longer any face-to-face teaching, it must be said that it is difficult to compare the two scenarios because too many variables were changed by the ZOOM teaching compared to the face-to-face teaching. It was no longer possible to record microteachings camera-based (neither classic nor 360°-videos) and as a consequence only the ZOOM recordings were used as reflection tools. In addition, SVL by practicing live-annotation was not possible anymore. Nevertheless, at the end of the semester the participants mentioned that the pandemic-related changed circumstances in the second half of the semester had positive side effects. It made them even more aware of how valuable the work with SVL in combination with the 360°-video environment was in terms of concrete reflection on teaching situations. Especially the observation with multiple perspectives helped them to gain new insights regarding their own teaching style.

However, there are other limitations to this research. The learning design could only be tested with a small sample of students characterized by a relatively young average age. Despite the positive reactions, the pedagogically valuable use of 360°-videos in teacher education requires further validation due to this circumstance. From the author's point of view, this factor had an impact on the results with regard to the attitude towards technology but also the handling of the video platforms (SVL and YouTube VR). Secondly, there is the restriction to framework conditions of our context at the University of St.Gallen and our teacher education programme in business and law. It would be insightful to test the technology in other contexts as well.

Regarding future work, it would be interesting to further investigate the enrichment of 360°-teaching performance videos with hotspots (interactive elements within the video) or follow-up activities. This would allow to virtually take action in the video, which influence the further course of the scene. Thus, an effective learning medium for teacher training could be created. Secondly, experimenting with different 360°-camera positions and perspectives in the classroom would provide exciting insights. For example, the static camera position could be replaced by an action camera carried by the teacher in order to be able to follow the action situation closely in the video. Furthermore, several 360°-cameras could be used to capture new perspectives. In our case, we decided to position the camera in the middle of the classroom to provide the viewer with a complete view of the classroom from the student's perspective.

To sum up briefly, the case study at hand aims to motivate for follow-up experiments with 360°-videos in the context of teacher education. The results and the reactions of the participants are encouraging. In particular, the use of new perspective observation possibilities in a spatial 360°-setting allows to further enrich the development process of teaching competencies.

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