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Exploring the Use of 360-degree Video for Teacher-Training Reflection in Higher Education

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Exploring the Use of 360-degree Video for Teacher-Training Reflection in Higher Education

A Case Study

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Abstract: 360-degree videos offer new features to extend video-based learning scenarios. In combination with virtual reality (VR) displays such as full-feature or cardboard displays the use of 360-degree video can further support the feeling of immersion and provide more degrees of freedom to look around. This paper presents preliminary results from an interpretive case study (n=16) evaluating the use of 360-degree videos for video reflection of teacher training sessions in a business education context. In two courses students were offered to record their teaching sessions with a 360-degree video camera in order to reflect on their teaching performance. The process of video reflection consisted of watching the video multiple times and answering specific questions on didactics, content and performance. For this case study participants could explore three viewing experiences, a head-mounted display, a cardboard viewer and a web-based player. Based on their experiences made, they were interviewed focusing on the usefulness for video-based self-reflection. Preliminary results show that 360-degree videos are embraced positively and perceived more useful than regular video for reflection. However, challenges were identified for the scalability and usability of 360-degree video content.

Keywords: 360-degree Video, Virtual Reality, Teacher Training, Video Reflection Case Study, Higher Education.

1 Introduction

Video-based learning (VBL) is used in higher education for scenarios ranging from lecture recordings to interactive video quizzes to flipped classroom concepts [Lo13]. With new developments in the area of video technology such as 360-degree videos [Ib15] and virtual reality (VR) [He17], the central question arises if and how such technologies can be used in a meaningful way for technology enhanced learning (TEL).

360-degree videos enable capturing the complete surrounding of a video scene, enabling the viewer degrees of freedom to look around. Additionally, 360-degree videos can be seen as an entry-level product to explore VR applications by watching videos either via a head-mounted display (HMD), a cardboard viewer or a web-based video player. Based on

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the chosen display format an immersive or non-immersive viewing experience can be supported, which may be beneficial for video-based learning.

Current adoptions of 360-degree videos focus on activity-based and immersive learning scenarios, such as sports education or remote exploration of locations. This paper aims at contributing to the identification and evaluation of VBL scenarios in the domain of a business and economics oriented university. Currently three classes of scenarios were identified: (1) video reflection, (2) group work and (3) video orientation [Fe18].

This paper presents preliminary results of a case study evaluating the use of 360-degree videos for individual self-reflection of teacher training sessions in business education. The following research question is addressed: *How can 360-degree videos support video reflection in higher education?*

2 Related Work

The task of using video for reflection is not novel. In the context of teacher education it has been shown to be beneficial for the reflection process, enabling the viewer to see their practice and subsequently analyze it [TR12]. There are different categories of video reflection. Tripp and Rich [TR12] analyzed 63 studies on video reflection of teachers identifying six key dimensions along which video reflection can be categorized: type of reflection tasks, guiding reflection, individual or collaborative reflection, video length, number of reflections and measurement of reflection. A key finding in their work is that viewers prefer to choose their own focus during video reflection.

Christ et al. [Ch17] identified four different video methods for use in teacher education: video embedded in multimedia, video case studies, video self-reflection and video reflections with peers. The latter three all focus on reflection. If used in combination (e.g. video case study and video self-reflection) these methods may enable high learning benefits for the teacher.

Ibrahim-Didi [Ib15] identifies the potential of 360-degree videos for teacher education, as the feature of immersion can prepare students for real classroom settings. Research on the use and potential of 360-degree video for VBL scenarios ranges from sports to medical education, where 360-degree videos are already being used successfully [He17]. The use of 360-degree video for video reflection is slowly getting attention in research. Windscheid and Will [WW18] have developed an environment integrating 360-degree video which enables video reflection where the teacher *"becomes part of the situation"*. Walshe and Driver [WD19] have evaluated the use of 360-degree videos for teacher education and found that it supports students' reflection and enables a better understanding of their teaching activities in combination with a positive experience of immersive reflections. The study provides a starting point; it is however limited, due to its sample size and unaddressed challenges such as positioning, handling and integration.

3 Research Design

3.1 Methodology

This project builds on an interpretive case study approach, based on Walsham [Wa95]. In its context generalizations can be made from case studies in the form of specific implications for particular domains of action [Wa95]. The main source of evidence is based on interviews with additional sources such as note taking, direct observations and participant observation. The following case study contributes to general recommendations of how to use and integrate 360-degree video in VBL scenarios for video-based self-reflection. Its focus lies on the technical feasibility and meaningfulness rather than the didactical and field-specific questions.

3.2 Context

The study program for business education foresees the practical training of prospective teachers and trainers. At certain stages in the program this includes teaching in front of real classes in a real environment such as a business school. These environments can be challenging for new teachers with possibly no experience in teaching. Hence teacher-training sessions with video self-reflection are an obligatory part of the study program to prepare teachers and trainers for real world environments.

In this context the term student refers to two different groups: (1) the actual student standing in front of their class and holding a teacher-training session – this person can be defined as a teacher trainee; (2) the students sitting in class listening to the teacher trainee currently performing a teacher-training session – these persons can be defined as students. The course itself is held by a lecturer and supported by an assistant.

A teacher-training session is planned for 20 minutes each. The following class setup is given: each student prepares a 20-minute class unit as an exercise in written form. This document is handed in beforehand so that the lecturer and assistant can use this as guidance during the teacher-training session. The actual teacher-training session happens in a classroom setup with all students present. Each teacher trainee then simulates a 20-minute teaching unit based on the written class concept. This training session is recorded on video. The lecturer and assistant are observing the simulated class and using the class concept as a reference to give feedback. After finishing each training session, feedback is given immediately by students and lecturers. Afterwards the video is sent out to the corresponding teacher trainees to reflect on their teaching session. This is where currently regular video is used and 360-degree videos could prove useful to offer a better perspective on the actual teaching session.

The video self-reflection task is handled via the e-learning platform Learn@WU [Al03]. First, the video is made available only to the teacher trainee and the lecturer. Second, an assignment is provided with scaffolding questions focusing on three perspectives: (1)

Reflection of the overall teaching performance, what worked out and what went wrong; (2) Reflection of a specific phase during the teaching session; (3) Reflection of posture, gesture, facial expressions, eye contact and language. With these perspectives in mind, the teacher trainee can review his video as often as he wants to and needs to write up his reflective thoughts in order to be assessed. Based on Christ et al.'s [Ch17] overview of video methods for reflection, the video method used for reflection is video self-reflection. Taking into account Tripp and Rich's [TR] key dimensions to categorize video reflection, in this case it is guided by scaffolding questions on an individual basis; the video length is around 20 minutes and students need to reflect on three different perspectives.

3.3 Case Study

For this case study two courses were chosen with a pool of 39 students and four lecturers. 17 students were part of the master program and 22 students were part of the bachelor program in business education. Students were asked to participate on a voluntary basis, leading to a final group of 13 students willing to record their sessions with a 360-degree video camera. The courses were taught by the same lecturer and assistant, which added to a total of 16 participants for the study (n=16). The case study was divided into three main steps:

Step 1 Camera Placement: An optimal position for the camera had to be evaluated for the classroom setup. Tables were aligned resembling a U-shape. As we could not clearly define a good position we chose to rotate around 5 different options available, depicted in Fig. 1. The camera was placed on a chair with a tripod resulting in a lens height at around the same level of a person's eye height sitting at this position. Fig. 2 shows the resulting perspective for position P2 *"front left"*.

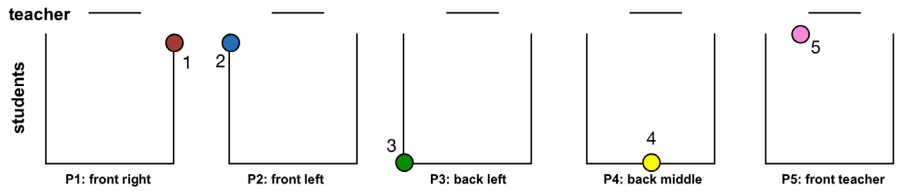

Fig. 1 Camera positions in classroom with tables aligned in U-shape.

Step 2 Recording of Teaching Sessions: A consumer-level 360-degree camera[2] was used. Regular camcorder recordings were still made for all students. The author himself handled the recordings for the 360-degree format in order to eliminate user errors. The camera was controlled manually and via a remote control application on a mobile device.

[2] Ricoh Theta V: https://theta360.com/. Last access: May 2019

Fig. 2 Sample perspective from position P2 in 360-degree video (anonymized)

Step 3 Reflection & Interviews: The recorded material was provided to the selected teacher trainees as additional material for their self-reflection. This group of teacher trainees therefore had access to both the 2D video and the 360-degree video of their teaching performance. Each teacher trainee was then invited to explore the 360-degree videos through three different types of display formats in the following order: an HMD, a cardboard viewer and a web-based video player. They were instructed to get acquainted with all three formats and assess their usefulness for a video self-reflection. After leaving enough time for exploration the participants were interviewed in a semi-structured form including room for discussion on their experiences made. The same procedure was conducted for the involved lecturers, additionally focusing on their view as instructional designers. The interviews were recorded and transcribed and will be analyzed using a thematic analysis.

4 Preliminary Results

Ten teaching sessions were recorded with two 360-degree video cameras, 4 hours and 22 minutes of video material were produced and 12 students and 4 business education lecturers (n=16) were interviewed and experienced all three display forms. Based on the available pool of 43 possible participants this results in a participation level of 37%. Three main preliminary findings can already be communicated based on the experience made during this case study: (1) The camera position is perceived differently between lecturer and teacher trainee, (2) scalability in terms of usability of the camera and integration for large-scale systems is not yet given and (3) using an HMD for video self-reflection may hinder users to effectively take notes.

All participants stated that the camera position and installation was unobtrusive and had no influence on their active teaching performance. Teacher trainees noted that camera position P2 (see Fig. 1 and Fig. 2) provided the best immersive viewing experience. Course lecturers however stated that position P4 better suited their needs as it provided them with a complete overview of the class. This may suggest different needs for the two groups of users. The trainee who performed the teaching session could be more interested in how the teaching performance actually felt in class, hence the need for more immersion. The lecturer himself may be more interested in an overview of the class in order to see all reactions, possibly leading to a need for less immersion.

Scalability in this case study can be characterized by two questions. (1) Ease of use: can 360-degree cameras replace a standard video camera and be handled easily? (2) Large-Scale Systems: can 360-degree videos be integrated into large-scale learning systems such as Learn@WU?

Taking these perspectives into account the following experiences have been made. From a technical point of view the camera only allowed to record videos for 25 minutes, which led to data loss in between recordings. Even though each session was planned for 20 minutes, overtime was standard. In order to deliver the video for reflection a stitching process needed to be taken into consideration, which took more than 2 hours for all videos. This is why the production phase can be seen as limited in usability and scalability, which may be challenging for lecturers managing all recordings and orchestrating the class at the same time.

Compared to regular video the 360-degree format was perceived as more useful and activating due to its immersive feature. Participants communicated differences in the perception of image quality. Most videos with a resolution of 1920x960 (Full HD) were perceived as too blurry and thus not usable for identifying facial expressions far away. Recordings with a resolution of 3840x1920 (4K) resulted in better image quality, however video files were 3.16 times bigger (24 minutes = 10.98 GB). This again can be seen as a challenge for scalability if 360-degree videos may be integrated in an automated video-based learning system.

All participants perceived the HMD and web player as useful for video reflection. The cardboard viewer was perceived as not usable, distracting more than adding value. Two out of 16 users noted that the HMD complicated the process of taking notes, due to being fully immersed. It could be that the immersive effect of the HMD and the overwhelming first impression of the 360-degree video led to a certain positive bias towards the HMD. This needs to be taken into account for future interviews. Even though only two participants highlighted this challenge it is still relevant and highlights a challenge in terms of usability.

5 Conclusion and Future Steps

This paper presented a case study on the use of 360-degree video for teacher training self-reflection in business education and communicated preliminary results. These results are based on the presented case study and will be further analyzed in a thematic analysis. Two university level teacher-training courses were involved, over 4 hours of material recorded and 16 participants interviewed.

The experiences made during this study show that 360-degree video is perceived as more useful than regular video for reflection. The positioning of the camera is perceived differently depending on the role of the viewer. The teacher trainee, reflecting on himself, seems to aim for more immersion in order to relive his or her own teaching performance. The lecturer assessing the performance seems to be interested in a less immersive setup in order to have an overview. This is a finding, which needs to be further iterated in future studies and interviews in order to optimize possible camera positions for 360-degree applications.

Challenges were also identified in terms of scalability during production and delivery. Time limits for recording 360-degree video (25 minutes) can be constraining for different use cases. Only higher resolution 360-degree videos (4K) were usable in terms of resolution to identify facial expressions and gesture details. This however leads to 3.16 times bigger data files than regular recordings. The excessive file size creates bottlenecks in terms of data capacity and requires longer transfer rates and even longer stitching times. Such factors may discourage lecturers to try and adopt new technology such as 360-degree videos.

Future steps involve a thematic analysis of the collected data and further exploration of use cases applying 360-degree videos for negotiation and orientation.

Bibliography

[Al03] Alberer, G., Alberer, P., Enzi, T., Ernst, G., Mayrhofer, K., Neumann, G., Rieder, R., & Simon, B.: The Learn@WU Learning Environment. Wirtschaftsinformatik 2003/Band 1, Dresden: Physica-Verlag, 593 – 612, (2003)

[Ch17] Christ, T., Arya, P., Chiu, M.M.: Video use in teacher education: An international survey of practices. Teaching and Teacher Education 63, 22 – 35. (2017)

[Fe18] Feurstein, M. S.: Towards an Integration of 360-degree Video in Higher Education. In: Daniel Schiffner (eds.) Proceedings of DeLFI Workshops 2018, 16th e-Learning Conference of the German Computer Society (DeLFI 2018). Frankfurt, Germany (2018)

[He17] Hebbel-Seeger, A.: 360 Degrees Video and VR for Training and Marketing within Sports. Athens Journal of Sports (2017)

[Ib15] Ibrahim-Didi, K.: Immersion within 360 video settings: Capitalising on embodied perspectives to develop reflection-in-action within pre-service teacher education. In: Thomas, T., Levin, E., Dawson, P., Fraser, K., Hadgraft, R. (eds.) Research and Develoment in Higher Education: Learning for Life and Work in a Complex World. vol. 38, 235 – 245. Melbourne, Australia (2015)

[Lo13] Loviscach, J.: The Inverted Classroom: Where to Go from Here. In (Handke, J.; Kiesler, N.; Wiemeyer, L. ed.): Proceedings of the 2nd German ICM Conference, Munich, De Gruyter, 3 – 14, (2013)

[TR12] Tripp, T., Rich, P.: Using video to analyze one's own teaching. British Journal of Educational Technology 43(4), 678 – 704 (2012)

[Wa95] Walsham, G.: Interpretive case studies in IS research: nature and method. European Journal of Information Systems p. 8 (1995)

[WD19] Walshe, N., Driver, P.: Developing reflective trainee teacher practice with 360-degree video. Teaching and Teacher Education 78, 97 – 105 (2019)

[WW18] Windscheid, J., Will, A.: A Web-Based Multi-Screen 360-Degree Video Player For Pre-Service Teacher Training. In: Adjunct Proc. of the Intl. Conference on Interactive Experiences for TV and Online Video (TVX2018). ACM, Seoul (2018)