

## Changing from blended learning to fully online learning: Does the change influence the learners' experiences and perception of a 360 lecture?

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**Abstract:** This paper evaluates whether a change of teaching method influences students' experiences, perception and usage of 360-degree videos within an e-tutoring training. Due to the Corona pandemic, a long-ongoing training had to be changed from a blended learning teaching approach to a fully online teaching format. Both approaches covered a "360 lecture" with almost identical learning content, methodologies and structures, enabling a direct comparison of effects when switching the teaching method. The evaluation considered both a quantitative analysis (evaluation of questionnaires data) as well as qualitative feedback of the students (discussions, word cloud comparison) that was collected identically for 5 years. Results show that since the Corona pandemic learners have higher awareness on their technical infrastructure (and its limitations) and therefore chose their playback options for "360 lectures" accordingly and were consequently more satisfied with it. Quantitative data backs these outcomes as showing no significant differences.

### Introduction

In contrast to traditional videos, with 360-degree videos learners get a view in spherical format providing an omnidirectional representation of the video content. This is achieved mostly by stitching views of multiple cameras (e.g. camera rigs, two fisheye-lenses) together. By head movements or other inputs (such as mouse drags or fingertips), learners can decide and actively choose the direction of their attention when watching these videos. Therefore, 360-degree videos are highly engaging and provide holistic and realistic experiences when viewing recorded learning content. Subsequently 360-degree video technology is immersive and interactive by nature providing various interesting application possibilities in different fields as described in (Lampropoulos et al. 2021). A broad overview of applications in education is given by (Shadiev et al. 2021) investigating 52 research papers between 2017 and 2020. This paper backs the advantages of 360-degree videos on learning such as increased degree of presence, better understanding of content, increased learning satisfaction, or higher motivation in learning. (Shadiev et al. 2021) also provides a holistic view on the disadvantages of 360-degree video technology, such as physical discomfort (e.g. headache, dizziness, nausea), technical issues such as navigation issues within the 360-degree canvas, playback problems that can be traced back to video, audio and network quality issues, or increased cognitive load of students.

360-degree video technology itself has massively improved in the last decade. 360-degree cameras for recording become more affordable, playback options (such as mobile devices) getting powerful enough to view 360-degree videos (see Theelen et al. 2019). Various creation techniques exist, one explained in depth can be found in (Kavanagh et al. 2016). The increase of development is described precisely in (Lampropoulos et al. 2021) showing an increased usage since 2016 by evaluation social media data analysis.

There is an increasing number of papers describing the use of 360-degree video technology in teaching, such as (Fung et al. 2021). For example (Theelen et al. 2019) and (Kosko et al. 2022) were using 360-degree videos similarly for teacher training to improve preservice teachers' abilities at creating positive teacher-student relationships. Here videos were used to simulate scenarios where teachers' skills on noticing were about to improve. Another example in teacher training is the application of 360-degree videos as a video self-reflection tool. (Walshe et al. 2019) applied this technology as a reflective training in microteaching to overcome the limited views provided by traditional videos.

Due to the Corona pandemic many education institutions had to switch their teaching method from presence or blended teaching to a fully-online format. This paper tries to address the question first whether this switch of the teaching method influences the learners' experiences, perception and usage of 360-degree videos in the context of e-tutoring training. So far, hardly any research has focused on this aspect. Similar to this paper's approach (Ricke 2021) also investigated the effects of the Corona pandemic and its shift to online learning in the context of 360-degree technology, however focusing more on the translation of the learning content into "360 lectures" and supporting student engagement.

## **Description of the Case Study**

### **Introduction**

As part of an e-tutoring training with the goal of training future e-tutors for a university, a "360 Lecture" has been held for 5 years. This so-called "360 Lecture" is a learning unit within the training, which was delivered as 360-degree videos. The learning content of the 360-degree videos has been identical for 5 years and focused on the same topic. The videos have been shot and created by the teachers and convey the possibilities and limitations of this technology. Furthermore, the videos also cover didactic application scenarios and recommendations for the use in different teaching contexts. Due to the Corona pandemic, teachers were forced to switch from the blended learning scenario, where content was partially taught in physical teaching units and accompanied by online content - such as the 360-degree videos - to a fully online format.

### **Focus of the case study**

Focus of the case study: The question now is whether learners' perceptions, opinions, thoughts and activities in this "360 Lecture" have changed due to the switch in teaching method. The switch may have caused changes because now physical interactions with teachers and other fellow students were completely absent in fully online teaching format. Another possible impact would be that now students were forced to participate merely remotely (e.g., only from home). In this case, teachers almost cannot control increased distractions, infrastructure deficiencies (such as network, availability of technical devices, spatial conditions, etc.) and other aspects of the "360 Lecture".

### **Design and evaluation**

Design and evaluation: The central elements of the "360 Lecture" learning unit were the 360-degree videos (see an exemplary image in Fig. 1a). The videos were made available via Youtube video platform for a limited time. The videos had to be viewed on the participants' own devices. The teachers presented different playback types in advance, recommendations were made and instructions were provided. There were 4 playback types classified with different navigation types for the 360-degree videos (see also in Fig. 1b):

1. desktop playback with a web browser on a laptop or notebook (navigation via mouse)
2. mobile playback (navigation with finger tips)
3. playback by cardboard with inserted smartphone (navigation with head movements)
4. playback with virtual reality headset (navigation with head movements and hand controllers)

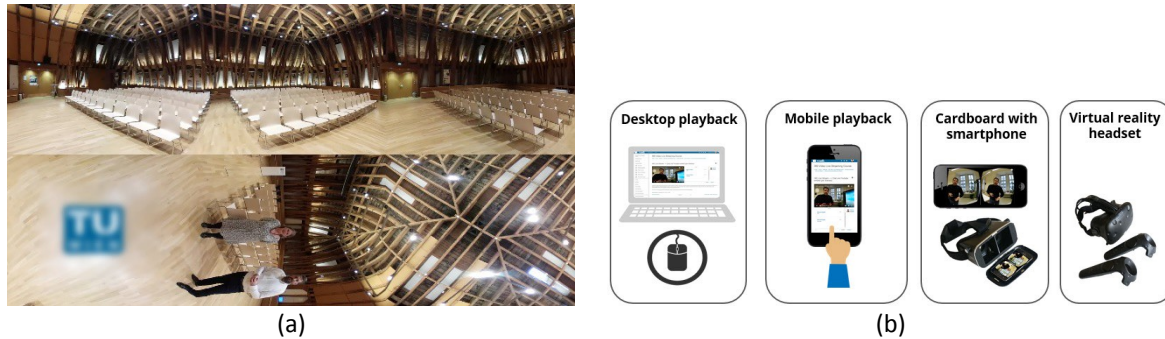
For the analysis of this case study, quantitative and qualitative evaluations were used. The quantitative analysis is based on the data from a questionnaire that was given to the learners at the end of each "360 Lecture" identically for all 5 years. Statistical analysis of these data was performed using T-tests for independent samples. The aspects were queried with the following 3 to 5-point Likert scales:

- *rating of immersion* (3-point Likert scale, from high (1) to no immersion (3))
- *lost of orientation* (3-point Likert scale, from often (1) to no loss of orientation (3))
- *rating on easiness of navigation* (5-point Likert scale, from very easy (1) to very difficult (5))
- *quality of video* (5-point Likert scale, from very good (1) to very bad (5))

- *quality of audio* (5-point Likert scale, from very good (1) to very bad (5))
- *quality of network connection* (5-point Likert scale, from very good (1) to very bad (5))
- *favor of technology* (how much students would use the 360 video technology if they would become e-tutors themselves, 4-point Likert scale, from very likely (1) to no usage at all (4))

The learners' decision for the playback type was queried with a single choice question:

- *used playback type* (single choice, types are desktop playback, mobile playback, playback by cardboard with inserted smartphone and playback with virtual reality headset)



**Figure 1:** Exemplary screenshot in spherical presentation of a 360-degree video of the „360 Lecture“ (a). Graphical overview of the four different playback types (b).

For analyzing the learner's activities and perception, also qualitative feedback was used. Here two types of qualitative feedback was collected. First, students' experiences were discussed jointly with the lecturers immediately after the "360 Lecture". Discussions focused on immediate reflections, thoughts, experiences of learners and were captured via open questions in both teaching methods via web conferencing sessions. Secondly, students were also asked to submit most suitable terms describing their experiences, which were subsumed to word cloud images. A subset of pre-selected terms were provided, such as the terms "boring", "captivating", "fascinating", "vivid", "only gimmick", "enhances my understanding" and "does not enhance my understanding". The submitted terms than were used to generate a word cloud image for both – the blended learning scenario and the fully online learning scenario.

## Design and evaluation

In total, 84 students participated in the course over the 5 years. The number of students in the blended learning teaching method was 58 (in the first three years, 2017 to 2019), while this was 26 in the fully online teaching method (in the last two years of the Corona pandemic, 2020 and 2021). The gender distribution is uneven, with 24 female and 60 male learners participating. However, the distribution in each teaching year was very similar. The participants were regularly enrolled students between the ages of 20 and 40.

## Main Research Questions

The central research questions of this case study are:

- Did the change in teaching method change the learners' perception of the 360-degree videos? Specifically, was their immersion, navigation, sense in terms of loss of orientation affected?
- Due to the fully online-learning constraint, was there any perceived issues for playback in terms of video, audio, or network quality?
- Were learners' opinions and thoughts about the "360 Lecture" itself - specifically, the 360-degree video technology, affected? It is of special interest, would these future e-tutors use this tool based on their experiences with the "360 Lecture"?

## Findings

The results for the quantitative analysis of the questionnaires are summarized in Table 1. The evaluation has pointed out that no significant differences occur when learners rate their immersion, lost of orientation or easiness of navigation within 360-degree videos for the different teaching methods. In addition, their rating how much they would use the 360-degree video technology - if they would become e-tutors – does not differ in blended or fully online learning methods. Marginally significant changes could be observed for the learners’ ratings of video, audio and network qualities. For all three aspects learners of the fully online learning approach rated better experiences. This effect could also be detected in the discussions after the “360 Lecture” (qualitative evaluation). Students have reported that due to the Corona pandemic, they were more aware of their network infrastructures and its limitations hence have chosen those playback types that were more suitable for their current situations.

Questionnaire aspect	Results of T-tests for independent samples			
	Blended learning	Fully online-learning	conditions	significance
<i>rating of immersion</i>	M=1.90, SD=0.67	M=2.00, SD=0.69	t(82)=-0.65	p=.52, n.s.
<i>lost of orientation</i>	M=2.66, SD=0.59	M=2.46, SD=0.64	t(82)=1.36	p=.17, n.s.
<i>rating on easiness of navigation</i>	M=1.62, SD=0.79	M=1.42, SD=0.64	t(82)=1.11	p=.27, n.s.
<i>quality of video</i>	M=2.40, SD=0.79	M=1.96, SD=0.96	t(82)=2.18	p<0.05
<i>quality of audio</i>	M=2.78, SD=1.53	M=1.85, SD=0.73	t(82)=2.94	p<0.05
<i>quality of network connection</i>	M=1.91, SD=1.20	M=1.31, SD=0.47	t(82)=2.48	p<0.05
<i>favor of technology</i>	M=2.62, SD=0.93	M=2.31, SD=0.88	t(82)=1.44	p=.15, n.s.

**Table 1:** Overview of the quantitative results based on the questionnaire’s aspects.

The distribution of the playback options used by learners are similar for both teaching methods, yet somewhat different for specific playback types. The playback option most often used is *desktop playback*, followed by *mobile playback*. Virtual reality headsets were not used at all in the fully online teaching method. Table 2 shows the distribution of the playback types used for to the different teaching methods.

Playback types		Teaching method		Total
		Blended Learning	Fully online-learning	
	desktop playback	33	17	50
	mobile playback	15	6	21
	card board with smartboard	4	3	7
	virtual reality headset	6	0	6
	<i>Total</i>	58	26	84

**Table 2:** Distribution of the playback types for the different teaching methods.

Submitted terms describing the experiences of learners during the “360 Lecture” were subsumed to word cloud images shown in Figure 2. The generated images showing overall cumulated responses of the learners are for both – the blended learning method and the fully online approach – very similar. For both methods, learners describe “360 Lectures” as fascinating and vivid tool that enhances their understanding of the learning content. Smaller amount of students rate “360 lectures” as a gimmick tool. Overall, no change of learners’ perceptions can be identified using this analysis. This result also backs outcomes of the qualitative discussions held immediately after the “360 Lecture”.



**Figure 2:** Students' cumulated responses concerning their experiences during the "360 Lecture" are very similar for both teaching methods.

## Conclusions

The teaching methods of this case study do not influence students' perception of the "360 Lectures" per se. Rather, the playback type was the most influencing factor. This will be taken up and investigated in depth in another paper or study. Visiting the physical space of the seminar room, which was to some extent related to the teaching content, did not cause a change in the use and perception of the "360 Lecture". Statistical analysis based on questionnaires showed no significant differences for immersion, navigation and the evaluation of losing of orientation. Significant differences could only be found in the evaluation of video, audio and network quality. Learners are more aware of their technical infrastructure (and its limitations) since the Corona pandemic. Learners therefore chose their playback option accordingly and were consequently more satisfied with it. This in turn was reflected in better ratings throughout the quantitative as well as qualitative analysis. The evaluation also showed that students chose similar but still those playback options that required less network resources. One reason for these decisions could also depend on the fact that other devices for playback in the sense of borrowing them from colleagues or purchasing, exchanging etc. were limited or not possible in the Corona pandemic.

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