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► **To cite this version:**

Lionel Roche, Ian Cunningham, Cathy Rolland. Enriching internship with 360° video. Journal of Technology and Teacher Education, 2021. hal-03417479

HAL Id: hal-03417479

<https://uca.hal.science/hal-03417479>

Submitted on 17 Dec 2021

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Enriching internship with 360° video

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Abstract

360° video offers a valuable tool for bridging coursework and fieldwork during pre-service teacher internships. The purpose of this study was to explore the usefulness of 360° video integration into the scaffolding of pre-service teacher education. Quantitative feedback from 82 student teachers during a teacher education course showed a general preference for 360° video based on improving an increased noticing of teaching and students' classroom activity. A qualitative analysis of one teachers' learning experiences using 360° video (based on reflections gathered from a self-confrontation interview) showed an increased perceptual immersion, enhanced attentional capacity, and teaching situation discovery (i.e., better classroom observing). Based on the results, we find 360° video has stronger immersive qualities compared to 2D video and augmented experience, providing a different way to learn teaching skills through reflection on one's own or another's teaching practice. Due to its affordability and usability, 360° video can be seen to enrich internships and allow for "virtual internship" experiences to prepare for real classroom situations.

Introduction

The global pandemic and lockdown periods have impacted different countries around the world leading to the rapid consideration of new modalities to scaffold teacher education (TE) (Flores & Swennen, 2020). In addition, during the lockdown periods, it became difficult

to carry out internships in schools and therefore necessary to consider new ways of training teachers, however also to compensate for the absence of internships. Internships are important foundational experiences in TE while the articulation of coursework and fieldwork remains challenging (Korthagen, 2001). Peltier et al. (2021) showed that teacher educators seek to create learning experiences that connect coursework and fieldwork, and we argue the 360° video should be a powerful tool to effectively bring these two aspects together in initial TE. Particularly, 360° video possess a strong immersive quality in the viewed situations (e.g., Theelen et al., 2019 ; Kosko et al., 2021).

The purpose of our study is to report on the interest of using 360° video to scaffold initial fieldwork experiences in TE. The use of video in TE is not new since the first experiments in micro-teaching at Stanford University (Allen & Eve, 1968) and not a real innovation in TE, more generally. However, all the literature reviews on the use of video in initial and in-service TE (Gaudin & Chaliès, 2015; Christ, Arya & Chiu, 2017; Major & Watson, 2018; Cattaneo et al., 2019; Hamel & Viau-Guay, 2019) have shown an increased and consistent use of video. We can identify different ways of using video in teacher training: a) with small or large group, b) viewing modalities (i.e., allo-confrontation¹ or self viewing situation), and c) the use of various video formats (e.g., wide angle, point of view video, etc). Furthermore the use of video in TE has two main objectives: a) to develop pre-service teacher's professional vision (e.g., Seidel & Stürmer, 2014). Professional vision is based on two essential elements (Seidel & Sturmer, 2014): the ability to identify certain elements in a teaching/learning situation ('noticing') and the ability to reflect on and analyse previously identified aspects of a situation ('reasoning'). Given the situated and contextualised nature of the teacher's knowledge, the use of authentic video sequences of classroom situations can

¹ Mollo and Falzon (2004) defined allo-confrontation like a method in which participants are confronting with an activity they practice but which is performed by someone else, without the latter being present

provide a means of accessing the teacher's professional gestures and knowledge *in situ*; and b) the ability to carry out a reflective activity on a teaching activity viewed.

Video-based teacher education programs can be based on videos of one's own teaching or someone else (allo-confrontation with peers or an unknown teacher) but less rarely are both used together (Zhang et al., 2011). Watching videos of oneself thus acts as a mirror of one's own teaching (Zhang et al., 2011) and allows reflections on one's own classroom practice to emerge. It allows teachers to know and recognise themselves in order to identify aspects of their professional practice that need to be improved, but also to develop the ability to observe classroom situations (e.g., Sherin & van Es, 2009; Star & Strickland, 2008). According to some authors, this type of video about others would allow for easier engagement in shared reflection within a training collective than if it were a video of only the self (Mitchell, Marsh, Hobson & Sornsen, 2008). Furthermore, Kleinknecht and Schneider (2013) also show that emotional and motivational engagement is higher when the teachers viewed unknown teachers. Also, in order to use 360° videos, it's necessary to choose to use videos of students themselves or videos of other teachers.

Finally, when video use in TE is discussed, most studies identify mainly 2D video (Gaudin & Chaliès, 2015). However, the use of other video formats exists (Roche & Gal-Petitfaux, 2015) but is still relatively undeveloped. For example, the use of point-of-view (POV) video has emerged due to increased availability to GoPro-type cameras or miniaturised goggle cameras (Sherin, Russ, Sherin & Colestock, 2008; Luna & Sherin, 2017). The work using this type of camera in TE has shown that the use of this type of video allows for better reporting of teacher-student interactions (Luna & Sherin, 2017). In the context of physical education teacher training, Baghurst (2016) showed the interest of using POV videos in order to evaluate teachers actions during internship. 360° videos has recently developed in the field

of education but is not yet a truly mature field (Reyna, 2018), but its use does have many interests and applications (Kosko et al., 2021).

Increasing use of 360° video in TE

Literature reviews in the field of video-training in initial and in-service teacher education (i.e., Gaudin & Chaliès, 2015; Christ, Arya & Chiu, 2017; Major & Watson, 2018; Cattaneo et al., 2019; Hamel & Viau-Guay, 2019) fail to indicate any use of 360° video. Although the first studies on the use of panoramic videos date back to the 1990s (e.g., Peri & Nayar, 1997), while the first study on the use of 360° video with teachers is related to the DIVER (Digital Interactive Video Exploration and Reflection, 2004) project. This project led by Roy Pea at Stanford University is an interactive video exploration and reflection system. It allows for the exploration of a classroom situation from a single video capture made with a 360° video camera.

This new type of video has developed considerably in the last ten years for two reasons. First, while Calandra and Rich (2014) indicated that video technology continues to grow in affordability and usability, their work does not take into account 360° video in which the same observation can be made for this technology. Second, some studies have been able to report that 2D video has the potential to support teacher learning by capturing the richness and complexity of classroom practice (Borko, Whitcomb, & Liston, 2009) but also provides better access to classroom events than traditional observation (Ball & Cohen, 1999) without compromising authenticity (Sherin, 2004). 360° video enriches the authenticity of the situations viewed thanks in particular to viewing with a headset (Theelen, van den Beemt & den Brok, 2019), or the use of ambisonic sounds coupled with 360° video (Ferdig, Kosko & Gandolfi, 2020). 360° video offers an immersive power (Roche & Rolland, 2020) that remains to be exploited in the context of internship support. Zolfaghari et al. (2020)

underlined 360° video as a useful supplement when face-to-face experiences aren't available representing a viable alternative when real-world interactions are not accessible. For example, Theelen, van den Beemt & den Brok (2019, 2020) have shown the interest of using 360° video to develop interpersonal skills (such as identifying and interpreting events in the classroom related to teacher/student relationships). Furthermore, Walshe and Driver (2019) have shown that the use of 360° video can help develop a more nuanced understanding of teaching practices but also offer pre-service teachers the opportunity to "relive" the situation as if they were back in the classroom. The teacher is no longer placed in a situation of 'passive' spectator viewing a video framed by the person filming and are more actively engaged in the 360° video where they can explore deeper video details.

Pre-service teachers have the possibility of orienting themselves in the space of the viewed class situation, perceiving some angles of view and observe only particular groups or the whole classroom situation. 360° video are particularly helpful to access the whole complexity of classroom situations (e.g., Roche & Gal-Petitfaux, 2017; Theelen et al., 2019). Due to its realness and groundedness in real classroom practices, 360° video can enable more effective learning among pre-service teachers than other training resources. Furthermore, Ibrahim-Didi (2015) showed that 360° video uses lead pre-service teachers to feel physically present in the classroom situation being viewed. Based on the perspective of embodied cognition (Shapiro & Stolz, 2019; Varela, Thompson & Rosch, 1991), we can consider that possibilities offered by 360° video (to view and interact with the video) in the development of teaching skills and abilities for teaching. In the embodied cognition perspective, all knowledge is based on corporeal dimensions and for Maturana and Varela (1998) they suggest, " All doing is knowing, and all knowing is doing" (p. 26). Finally, Kosko et al. (2021) posited "there are clear implications for an increased and more prevalent use of 360

media in teaching and teacher education" (p. 249). We align with this suggestion and believe that 360° video needs to be more widely integrated into teacher education.

Internship in teacher education: a bridge between theory and practice

Tardif (2015, p. 227) points out that, at the international level, all countries are faced with the same three major challenges in their desire to reform and improve TE: a) to rely on a knowledge base derived from research; b) to establish a lasting and fruitful relationship between training institutions and schools (i.e., between field instructors and university instructors); and c) to put in place training mechanisms likely to contribute, for future or new teachers, to understand and master the situations and activities that characterise real work in the classroom. The place of access to the field and to classrooms during internship situations is therefore a real added value and a crucial moment in teacher training (Kosnik & Beck, 2003; Helgevold, Næsheim-Bjørkvik, & Østrem, 2015). Tardif and Borges (2009) identify five main domains of knowledge that constitute teacher education arrangements internationally: (a) the domain of reference disciplines, which refers to teaching subjects and disciplinary contents; (b) the domain of didactics which brings together disciplines and methods to ensure the transposition of teaching subjects to teaching/learning situations; (c) the domain of educational sciences (i.e., disciplines whose object of study is the educational reality such as philosophy or sociology of education; d) the field of psycho-pedagogical training, which refers to the knowledge, formative approaches and activities put in place to develop professional skills at the basis of teaching, such as classroom management; and e) the field of practical training and internships allowing a transfer to other concrete teaching situations.

Reflective practice is a means of exploiting the practicum by developing various modes of reflection to bring about professional development however also to consider new

teaching practices in the classroom (Ottesen, 2007). Video is a tool to enable the reflective activity of pre-service teachers (Hamel & Viau-Guay, 2019), however to date very few studies have looked at the use of 360° video to facilitate reflective practice during internships.

A pilot professional learning course at university

The study was conducted with a cohort of 82 student teachers as part of a course designed to develop reflexivity on teaching situations (e.g., verbal instruction given by the teacher, teacher scaffold students learning process; assessment of students learning) experienced or observed during the internship, or from the viewing of videos of oneself, one's peers or an unknown teacher as part of a multimodal approach based on various video formats (Roche & Gal-Petitfaux, 2015). The main goal of the course is to prepare pre-service teachers for teaching PE and develop their ability to analyze, recognize and identify a wide range of teaching skills during a PE lesson. During the course, pre-service teachers engage in different learning tasks: plan a lesson, analyze some specific moments of a PE lesson (e.g., beginning of the lesson, verbal instruction) based on video extract (self video during internship or other teacher video). Between January and May, students were on internship one day a week and the course took place every week. Before internship (in January), a questionnaire was sent to the students to collect their observations and what they identified in a 360° video of an unknown teacher. After the course, an interview was arranged with the student volunteers in order to be able to report on the evolution of their analyses and the contribution of the 360° videos to their training.

Theoretical framework

The study is positioned in the theoretical framework of the Course of Action research programme (Theureau, 2010) in cognitive anthropology and is part of the enaction paradigm

and embodied cognition perspective. The aim is to consider human activity according to a double logic of, activity is enaction and experience. According to the hypothesis of enaction, activity is the result of an asymmetrical actor-environment coupling, "cognition is not the representation of a pregiven world by a pregiven mind but is rather the enactment of a world and a mind on the basis of a history of the variety of actions that a being in the world performs" (Varela et al., 1991, p. 9). Activity is dynamically situated in a spatial, temporal, material, cultural and social environment. Activity is an ongoing process of creating and attributing meaning in relation to the affordances offered by the environment. Activity is an embodied and incorporated totality.

Second, activity is experience in the sense that it is lived, it goes hand in hand with a particular modality of consciousness, consubstantial with the flows of activity and at the origin of a first-person point-of-view, and source of an experience of oneself in the process of acting. This is what Poizat, Durand and Theureau (2016) call prereflexive consciousness. For these authors, 'experience is not conceptualised as a process or the product of an active introspection or exploration of one's own subjectivity or interiority, but as a natural concomitant of an actor's vital engagement in the world. It is therefore not turned towards the subject and his or her interiority, but is the permanent expression of an 'overflow into the world' (p. 237).

Research questions

RQ 1: Does the use of 360° video in initial teacher training contribute to the development of teachers' professional experience and their ability to perceive, analyse and understand teaching situations ?

RQ 2: What activity do students engage in when watching a 2D video and a 360° video?

RQ 3: What is the lived experience when watching a 360° video (i.e., emotion, perceptions, concerns and knowledges used) ?

Study design

The study is based on a mixed-method sequential design (Tashakkori & Newman, 2010) using quantitative data collected online through a questionnaire and qualitative data from an interview designed to capture the lived experience of a student (Dieumegard et al., 2019; Poizat, Durand & Theureau, 2016). The aim of this type of approach is to consider a more qualitative collection from the first quantitative collections and to obtain greater finesse in the results, however also to reveal certain atypical results.

The study was conducted in two stages. In the first stage, an online questionnaire was sent to all students before their internship. In this questionnaire, they were asked to view the same classroom situation however through two videos of equal length (6 min, 24 sec), one in 2D (with a fixed ratio) and the other in 360° (Figure 1). The online questionnaire was anonymous, but the last question offered the possibility to indicate one's e-mail address in order to participate in an interview to further explore the answers given.



Figure 1: Videos included in the online survey

During the second stage, which took place after the course, an interview was conducted in two stages: 1) an online interview (with one pre-service teacher named Zoe) using video-

conferencing software according to a think-aloud protocol during which the student was asked to comment on what she observed in the video and 2) a questioning phase on the answers she had given before the course and for which her point of view may have changed after the course. The answers to the questionnaire were used as a basis for the interview. The purpose of the interview was to report on her experience of using 360° video to prepare for the course.

Data analysis

We used a mixed method approach (Creswell & Plano Clark, 2011) within a sequential mixed design in which "the purpose, questions, sample, data, or other components of the second strand are rooted in the results of the first strand" (Tashakkori & Newman, 2010, p. 516). Using the questionnaire, we obtained results of pre-service teachers global activity during viewing video (explanatory step) and by using self-confrontation interview (and results from open response questions) we can explore more in depth certain trends in the quantitative data, individual activity and lived experience during viewing situation. Also, the self confrontation interview give the opportunity to document individual's cognitive activity during the viewing situation, that is not possible only with questionnaire.

The data from the questionnaires were statistically processed for the closed questions and a content analysis was carried out for the open questions in order to report on trends in what the students observe however also what they discover and learn when watching the videos included in the questionnaire. As Stecher and Borko (2002) suggest, "we use the surveys to 'portray the landscape' and the case studies to 'illuminate key locations" (p. 567). The quantitative data from the questionnaire is complemented by "qualitative" material which provides information on individual "cases" relating to the students' experience.

The data from the interview was processed in order to give an account of the student's experience of the course she attended. The self-confrontation interview aims at developing

'the experience or pre-reflexive conscience or immediate comprehension of the actor upon each moment of his/her activity' (Theureau, 2002). It enables the actor to provide elements which are essential to the comprehension of the activity as well as the reality of its practices. Self-confrontation interview is a method of documenting an individual's cognitive activity through the researcher's questions. For realizing this kind of interview, the actor is confronted with records related to his activity and invited to detail, demonstrate and comment on the most significant points of this activity, in the presence of another person (researcher). During the self-confrontation interview, actors were asked by the researcher to describe their concerns ("What are you trying to do at that moment?"), perceptions ("What do you pay attention to? What do you notice?"), emotions ("What do you feel?") and knowledges used ("What are you thinking about at that moment, what do you tell yourself?").

For data analysis, a three-part table was constructed in order to match: 1) the student's activity during the video conference interview (e.g., freeze frame in the video, change of orientation in the video, zoom in the video), 2) verbalisations from the self-confrontation interview and 3) the units of meaning granted by the student and identified by the researcher during the interview. These successive units (fluctuating during the interview) represent what the individual experienced as her own activity. From these units, it remains possible to identify the mobilised and constructed by the student during her viewing activity.

Results

A more expanded perception of classroom events

During the viewing situation before internship, 63.4% of students watched the 360° video multiple times and 62.2% of students watched the 2D video multiple times (see Figure 2). These percentages remain almost equal which indicates that 2D video does not seem to provide all the information related to the classroom situation and that the use of 360° video is

complementary to that of 2D video and allow PSTs to perceive new information and discover new aspects of the viewed classroom situation. In addition, an interactive video where PSTs can explore the classroom situation might lead one to believe that they will view 360° videos more frequently due to the opportunity for different viewing angles.

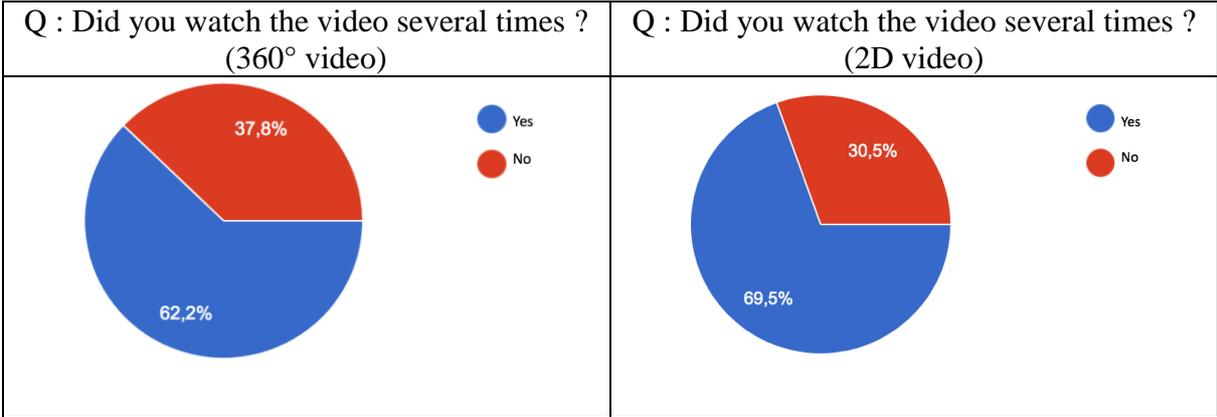


Figure 2 : Multiple viewing amount

Indeed, 69.5% of the students declared that they were able to observe new elements on the teacher's activity and 68.3% on the students' activity due to the viewing of the 360° video compared to the viewing of the 2D video (Figure 3).

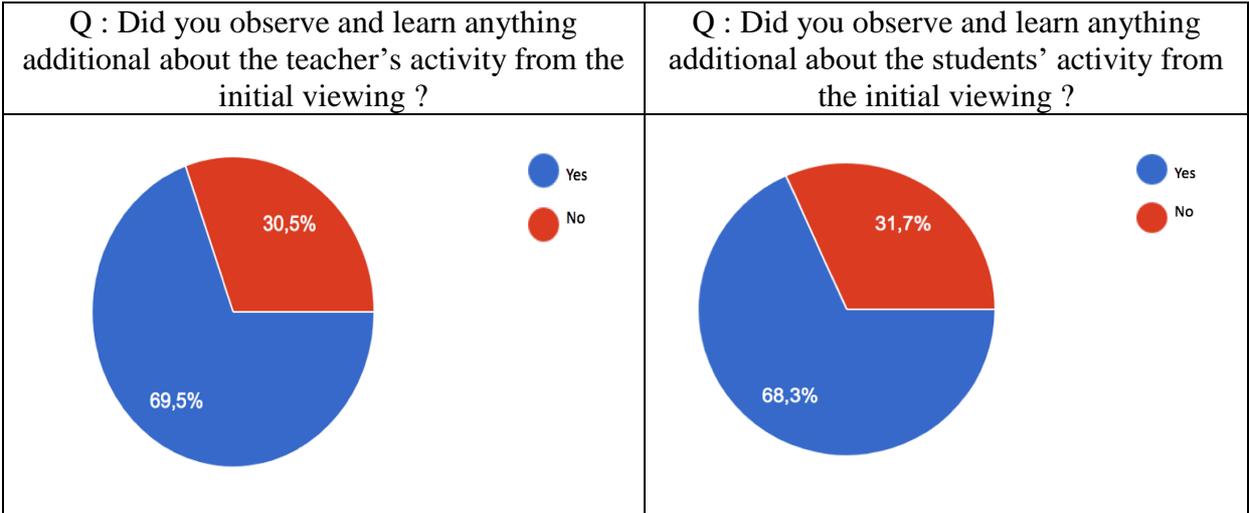


Figure 3 : Observation results during 360° video viewing

This result clearly shows the interest of using 360° video as a complement to 2D video. These two kinds of video, used simultaneously offer PSTs a complete perception of the classroom situation and teacher and student’s activity during learning task.

An affordable and suitable training tool for PST

360° video were used for the first time in a course with the study’s participating PSTs. A tutorial had been sent prior to the questionnaire to allow them to discover how to use this new tool. Following the questionnaire, 67.1% of the pre-service teachers said they preferred to use of 360° video compared to the 2D video. Moreover, 93.9% of the pre-service teachers declared that it is interesting to have both types of video to observe and analyze a classroom situation. Indeed, these two types of videos constitute a global view for the pre-service teachers of the classroom situation and also an "inside" view to be immersed in the heart of the classroom situation. Finally, 95.1% of the pre-service teachers stated that in their training to prepare for the internships that the 360° video use is highly interesting (see Figure 4).

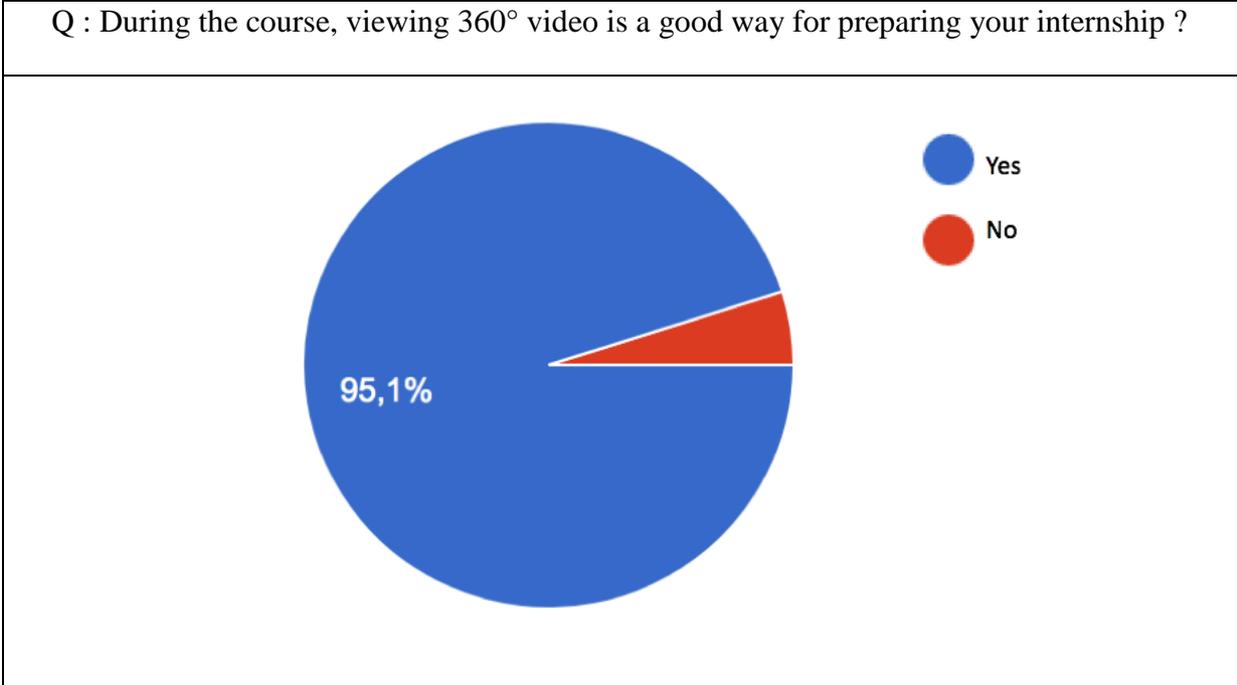


Figure 4 : PST’s interest in using 360° video to prepare for internships

These results from the quantitative analysis show 360° video is defined by three dimensions : utility, usability and acceptability (Nielsen, 1994). Utility because 360° video is perceived by PSTs like a exciting tool for training, usability because PSTs don't had any difficulties to use 360° video and want to use these in the future and acceptability because it address the learners' desire, motivation and pleasure to use 360° video. Acceptability had two main dimensions (Nielsen, 1994) : practical and social. By using 360° video PSTs don't have any difficulties and they subscribe to the social dimension of this tool by expressing their interest for using 360° video in order to prepare their internship and learning to teach PE.

A more accurate perception of student's and teacher activity during the learning task

If results from quantitative data show that PST develop a more expanded perception of classroom events, the use of self-confrontation interview give us more details of the nature of this expanded perception and also about the usability of video viewed by PSTs.

In terms of usability, in a first step (after internship), Zoe tried to observe all the groups in the 2D video. She focused on the global activity of the class of each group, whereas during the viewing before the training course her observation had focused on the class atmosphere and the work climate (without trying to observe in details the activity of each group and each student). However, she could not see all the groups and tried to explore the video as if she were watching a 360° video. She forgot that she was watching a 2D video and is frustrated that she cannot explore the video as a 360° video. By using 360° video before the internship, she rather integrated this specific feature of the 360° video, and this case example demonstrates the usability and acceptability of this new tool.

Quite quickly, in a second step, she tried to observe precisely how the students carried out the learning task requested by the teacher. These concerns during the viewing led Zoe to view the video several times whereas before the course she had indicated that she had only viewed the 2D video once. Thus, her way of observing student activity from the 2D video had

evolved from simply trying to perceive the classroom climate to trying to observe motor skills learning. The experience she had in the internship led her to reflect and try to identify motor skill learning difficulties of the students during learning task execution. However, the 2D video does not allow her to explore the classroom situation: *"I no longer focus on the same things. In an internship you can't see everything, but video can offer a different perspective. After the course, I know a little more about what to look for when doing the exercises"* (Self-confrontation excerpt). For Zoe, the 2D video allows her to *"perceive the classroom atmosphere and the students' work, but it is difficult to see all the groups"* (Self-confrontation excerpt).

When watching the 360° video, Zoe also tries to observe all the groups and specifically focused her attention on motor skills realizations. However, 360° video offers her the opportunity to observe more precisely, and with accuracy, all the groups and also to observe some groups that could not be seen in the 2D video: *"That I could not see with the 2D video, I could not see that this group does not work"* (Self-confrontation excerpt). With the 360° video, she can see and explore everything and also see the learning task several times by changing the viewing angle. For Zoe, 360° video allows her to observe precisely certain aspects that she was only able to discover during her internship and she can't observe in a 2D video: *"I now know a little more where to look during a learning task. Thanks to the course and internship, I can observe specific aspects of a learning task that I can only see and discover in the 360° video"* (Self-confrontation excerpt). The use of 360° video allows Zoe to amplify the experience she had during the internship ; now she knows which aspects of a learning task to observe and dimensions of teaching activity (e.g., body position, demonstrations, instructions) and students' activity (e.g., body position, correct realization of the task). While watching the 360° video, she discovers that the way the teacher moves in the gym is not random; he intends to manage classroom climate however also supervise each

student individually. She perceived that when the teacher is physically close to a student, he becomes more attentive, vigilant and executes the learning task much more seriously. Thus, Zoe discovered the crucial importance of proxemic aspects in teaching

The post-internship viewing is an 'extension' of the internship experience she lived and completes it by offering Zoe viewing of an activity that echoes her own practice during the internship. During the post-internship viewing, she makes more specific observations, focusing on the students' difficulties during the exercises. She feels more deeply involved in the situation. This engagement in the 360° video viewing situation is also facilitated by the technological opportunities offered by 360° video. Indeed, Zoe used the zoom function to observe with accuracy some students however also without zooming in order to capture the globality of the classroom situation without being constrained by the framing of a 2D video. By using these functions offered by 360° video, Zoe shows the usability and acceptability of 360° video and all the opportunities offered than 2D video.

A strong perceptual immersion in the classroom

Before internship, Zoe had expressed a preference for viewing video of classroom situation in 2D. This preference had changed and she began to prefer to watch the 360° video because it allowed her to observe the students in details however also perceive the sound of the gymnasium. She feels perceptually immersed in the situation, from a visual and auditory standpoint: *"Watching a 360° video is like being in a training course, you are in the center of the teaching situation, you can turn around, look around, listen to what is being said in the different groups...as if I were in the classroom"* (Self-confrontation excerpt). For Zoe, watching a 360° video helps her to prepare for the teaching by experiencing the ambient noise of a classroom: *"It's noisy and it allows you to see that noise is part of the students' activity. It's a part of the activity of a classroom"*. She viewed the video like she is in the classroom,

engaged in the feeling of the gymnasium and not considered she is actually watching a video. In addition, for Zoe, 360° video allows for a better grasp of the organization of a classroom, the spaces, and the depth and size of the spaces. The aspect is more concrete for Zoe after her internship because she had experienced teaching situations in practice. Being able to view the same 360° video before and after internship led to a shift in Zoe's attentional focus. She shifted from observing teacher's activity and classroom atmosphere from a global point of view to an increased observation of teacher and students' activity in realizing learning tasks requested by the teacher. She acknowledges feeling totally immersed in the classroom and due to this feeling she preferred viewing 360° video. Before the internship, this was not the case and she had preferred viewing 2D video. This shift in her preference is a consequence of the highly immersive power of 360° video.

Discussion

Previous studies have shown that 360° video can be used to prepare internships (Sato & Kageto, 2020), create virtual internships (Zolfaghari et al., 2020), or accompany internships (authors, 2020) while limiting anxiety prior to the first classroom experiences (Theelen et al., 2020). Based on our results, we can consider 360° video as a tool that can enrich internship experience and allow pre-service teachers to re-envision and re-interpret classroom situations already viewed. They can discover, in-depth, classroom situations and perceive teacher and student's activity with more accuracy. This new tool in teacher education can also help PST to develop embodied cognition as considered by Ibrahim-Didi (2015). Indeed, 360° video seems to be able to help pre-service teachers to live an 'augmented experience' compared to the experience they had really live during internship. Furthermore, Peltier et al (2021) showed that teacher educators seek to create learning experiences that connect coursework and fieldwork. Based on our results, 360° videos seem to be an appropriate tool for teacher

educators in order to reduce this gap in teacher education. We have also showed with our qualitative and quantitative results an important acceptability of 360° video use. However, this result can be nuanced based on two aspects. First, the order of presentation of the videos in the questionnaire, but also the students' enthusiasm for viewing 360° videos; which can be explained by the novelty of this medium introduced in training.

Our results show that the use of 360° video viewing in allo-confrontation (Mollo & Falzon, 2004) allows for an evolution in the quality of reflexive analyses of the viewed teaching and therefore aligns with the work of Walshe and Driver (2019) who reached the same result, however rather during a self-confrontation situation. If 2D video allows trainees to feel sensorially immersed in a classroom situation (e.g., Goeze et al., 2014), 360° video offers both visual and auditive immersion allowing the overall sound ambience of a lesson to be perceived. The pre-service teachers experienced a kind of enhanced sensory immersion compared to a video associated with a microphone recording exclusively focused on certain protagonists. The importance of the sound dimensions of the video has been underlined by Ferdig, Kosko and Gandolfi (2020) who have shown that the use of ambisonic sound, coupled with 360° video, increased the perception of presence in the viewed situation. This aspect seems important to us in order to discover the sound atmosphere of a classroom before interships.

Finally, our study goes beyond the idea that video is a relevant tool for proposing "virtual internships" (Theelen et al., 2020), but rather supporting pre-service teachers' reflective activity on observed professional gestures and also student's activity engaged in a learning task. If the course designed by Theelen et al. (2020) for realizing virtual internships was based on 2D videos, 360° video seems to be an avenue to be explored to improve the authenticity of situations addressed during these "virtual internships". Together, 360° video

can be seen to enrich internships and allow for "augmented" experiences in preparation for real classroom situations.

Conclusion

At the end of this study, we recommend there is great merit in the use 360° video before the first real teaching experiences in order to prepare future teachers for real classroom experiences. However, the integration of 360° video in teacher training seems to us to be interesting to consider along a continuum. If it offers to be a resource of choice for preparing, accompanying and enriching pre-service training, 360° video also seems to be highly interesting for re-formulating the in-service training of teachers and offering them the possibility of considering their teaching from a new angle. We believe that this training continuum can only be envisaged on the condition that reflection and research on the integration of 360° videos (of oneself or of another teacher) are carried out in order to identify the effects on pre-service and in-service training. Indeed, Hamel and Viau-Guay (2019) have pointed out that studies on the use of video in teacher training should focus on pre-service training in relation to theoretical courses and that it is possible to identify a consensus regarding the benefit of using video to develop reflexivity. It seems important to us, therefore, to consider the integration of 360° video throughout teacher training in order to foster the development of lifelong teaching skills and professional vision. However, 360° video does not currently offer opportunities to interact with the environment being viewed. Torres et al. (2020) suggest that 360° video offers highly realistic contents but lacks interactivity. In line with their work, one perspective is to develop 360° video with interactive contents (e.g., quizzes, images, texts) in order to increase the feeling of immersion and get PSTs more active during viewing situations of 360° videos.

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