Jl. of Technology and Teacher Education (2020) **28**(2), 315-320

Creating Asynchronous Virtual Field Experiences with 360 Video

MARYAM ZOLFAGHARI, CHRISTINE K. AUSTIN, KARL W. KOSKO, AND RICHARD E. FERDIG
Kent State University, USA
mzolfagh@kent.edu
causti17@kent.edu
kkosko1@kent.edu
rferdig@gmail.com

The global COVID-19 pandemic has disrupted normal face-to-face classes across institutions. This has significantly impacted methods courses where preservice teachers (PSTs) practice pedagogy in the field (e.g., in the PreK-12 classroom). In this paper, we describe efforts to adapt an assignment originally situated in a face-to-face school placement into a virtual version. By utilizing multi-perspective 360 video, preliminary results suggest virtual field experiences can provide PSTs with similar experiences for observation-based assignments. Acknowledging that immersive virtual experiences are not a complete replacement for face-to-face field-based experiences, we suggest virtual field assignments can be a useful supplement or a viable alternative during a time of the pandemic.

Keywords: Teacher education; Virtual-based assignments; 360 video; extended reality.

Face-to-face K-12 field experiences are an essential component of teacher licensure programs. They are often used in methods courses as a space for preservice teachers (PSTs) to provide content-specific tasks and analyze students' thinking. Yet, the sudden cessation of face-to-face education in K-12 and higher education has disrupted this practice. One alternative to face-to-face observations of students' reasoning is the incorporation of video-based assignments. However, traditional video limits what a PST may see by pre-selecting what is in the video frame at any given time. By contrast, 360 video records in a spherical direction allowing the viewer, not a videographer, to select what is perceivable from the physical position of the camera (see Figure 1).

Figure 1. What is available to view in a standard video (left) versus what is viewable in a 360 video (right). The right-hand image is a stretched image of a 360 video scene. The yellow rectangle conveys the area of the scene that is perceivable from a standard video with the same camera position. Readers who are interested to watch this and similar videos may visit the website https://xr.kent.edu/

Use of 360 video has been found to be effective in facilitating professional knowledge (Theelan, van den Beemt, & den Brok, 2019; Walshe & Driver, 2019), and early research suggests it may be more effective than other mediums (Kosko et al., in review; Walshe & Driver, 2019). Specifically, PSTs consider 360 video to be highly immersive representations of practice (Ferdig & Kosko, in review; Roche & Gal-Peitfaux, 2017). Given these advantages of 360 video, and the needed alternative to face-to-face observations, this paper reports on the adaptation of field-based assignments in a mathematics methods course through application of 360 videos to facilitate asynchronous virtual field experiences. The paper also includes implications for those interested in the creation or integration of 360 videos in licensure programs.

Overview of Intervention

Teaching methods courses often involve content-specific assignments in which PSTs visit a K-12 classroom and engage with students face-to-face.

In one such course taught by the first author, a field-based assignment involved PSTs engaging elementary students with a mathematical task and assessing children's reasoning. Attempting to approximate this experience, we designed a virtual field experience using multi-perspective 360 video. Whereas typical *360 videos* record in a spherical direction from a single camera, *multi-perspective 360* allows viewers to watch different perspectives (cameras) of a scenario while switching their viewpoints. PSTs were able to use the multi-perspective 360 video to virtually move around a class, from one group to another one, and look in any direction at each group to observe different students from each camera position. In the video, recorded by the third author, 20 second-grade students sat at four different tables and worked on an elapsed time lesson (see Figure 2). To begin the virtual based assignment, we asked 34 PSTs to watch the entire eight-minute video and then select one student to focus observing. PSTs were then instructed to: 1) explain why they chose their focus student; 2) describe their assessment of the child's mathematical thinking; and, 3) reflect on their experience with the virtual field assignment.

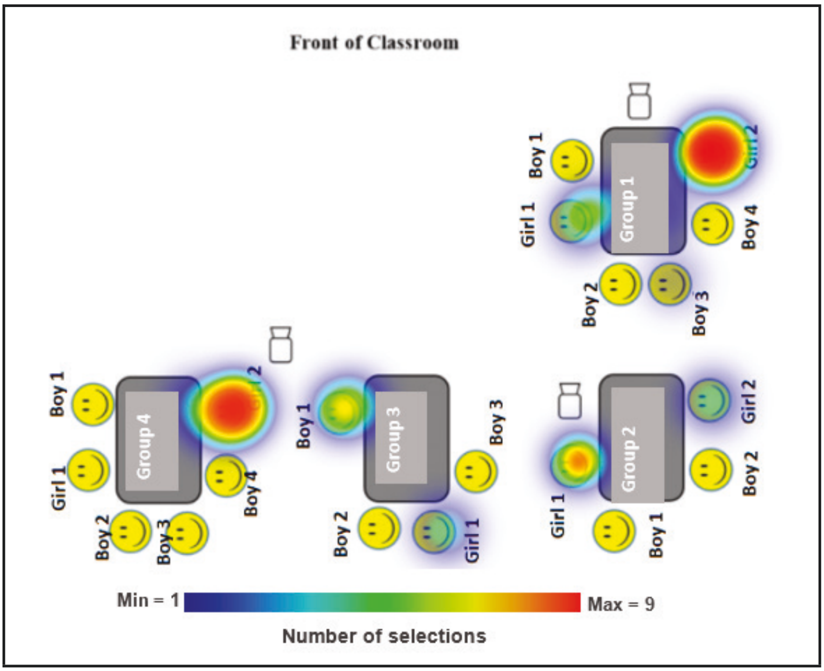

Figure 2. The layout of the classroom showing the position of the students and cameras. The color map represents the number of PSTs that selected the focus student.

Preliminary Results

Two early findings show the potential value in using 360 video for field experiences during COVID-19. First, PSTs attention was widespread across the classroom. The heatmap in Figure 2 illustrates how PSTs selected different groups across the class where they observed students. The results from a chi-squared test suggest that PSTs place more focus on certain groups rather than paying equal attention across the classroom, indicating that the distribution of PSTs' group selection (see Table 1) was statistically significant ($^2(df=3)=9.76$, $p=0.021$). Groups were chosen as the unit of analysis, rather than students, to prevent violating the expected count assumptions for chi-square (≥5 counts per cell expected by chance). This finding also offers evidence that utilizing 360 videos gave PSTs the autonomy of moving around each group and attending to moments of interest. Given the importance of capturing PSTs' attention, we also examined student engagement at each group. Students at Groups 1, 3, and 4 were heavily engaged in discussion, whereas students at Group 2 were focused but worked silently for much of the time. However, Group 1 interactions conveyed many pedagogically interesting exchanges. For example, Girl 2 realized she erred and asked her peers to explain their reasoning, observed their strategies, and experimented with her own. This and other events at Group 1 provided PSTs numerous opportunities to assess students' reasoning, suggesting a reason for this higher percentage (47.1%).

Table 1
PSTs' Distribution of Selecting Groups

	Group 1	Group 2	Group 3*	Group 4*	Total
PST Group Selection	47.1% $n = 16$	11.8% $n = 4$	17.6% $n = 6$	23.5% $n = 8$	100% $N = 34$

*Denotes groups next to the camera where PSTs entered the virtual field experience
n= number of PSTs observing each group.
Note: The expected count for each cell was assumed to be evenly distributed (8.5) for estimation of the chi-square statistic.

A second key finding is 61.7% of participants made statements reflecting positively on the assignment. The remaining PSTs (38.2%) were less positive with many explicitly stating they missed their face-to-face field experiences. his sentiment is understandable. since these 360 videos were created to supplement, not replace, face-to-face field experiences. Despite not fully replacing face-to-face field experiences, we found PSTs engaged in authentic observation when assessing students in the virtual experience. These findings lend support for incorporating virtual field experiences with 360 video, particularly when face-to-face alternatives are not available.

Implications

Early results from this study suggest that 360 video can successfully fill part of the gap created by losing face-to-face field experiences. There are several direct implications for preservice and in-service teacher professional development.

1. COVID-19 stay-at-home orders make a collection of new classroom video in 360 or traditional formats nearly impossible. However, teacher educators and inservice teachers should consider using this time to familiarize themselves with the inexpensive technology (consumer-level 360 cameras range from $200-400) to record future video. This could prove useful as the world prepares for future pandemics or lockdowns.
2. Others interested in using 360 video for field experiences or supplemental classroom material right now can capitalize on an NSF-funded project called the Extended Reality Initiative (https://xr.kent.edu). The site contains tutorials for creating and using 360 video, free access to single and multi-perspective 360 videos, and links to recommended equipment.
3. The video used in this study, and this research project, was focused on elementary mathematics instruction. Teacher educators should consider 360 video for other content areas, age bands, and career fields (e.g., education, aviation, medicine). For example, science PSTs could use 360 video to evaluate effective practice at different stations in chemistry labs. Physical education PSTs could immerse themselves in an activity to observe student engagement and movement (Roche & Gal-Peitfaux, 2017). Collegiate or graduate teaching assistants (TA) could observe a lecture to further explore how students engage in the material.

Future Research

This study provided early evidence that 360 video can give PSTs opportunities to observe and assess students from varying perspectives. This would be a respectable supplement for teacher education field experiences when normal K-12 instruction resumes. However, in contexts where face-to-face field experiences are improbable (e.g., COVID-19), we believe virtual experiences such as those described here can provide a useful alternative. Additional research is needed to further assess the effects on PST education across varying domains.

Acknowledgments

Research reported here received support from the National Science Foundation through DRK-12 Grant #1908159. Any opinions, findings, and conclusions or recommendations expressed in this paper are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

References

Ferdig, R. E., & Kosko, K. W. (in review). Implementing 360 video to increase immersion, perceptual capacity, and noticing. *TechTrends*.

Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson, P. (2009). Teaching practice: A cross-professional perspective. *Teachers College Record, 111*(9), 2055-2100.

Kosko, K. W., Ferdig, R. E., & Zolfaghari, M. (in review). Preservice teachers' professional noticing when viewing standard and 360 video. *Journal of Teacher Education*.

Roche, L., & Gal-Petitfaux, N. (2017, March). Using 360 video in physical education teacher education. In *Society for Information Technology & Teacher Education International Conference* (pp. 3420-3425). Association for the Advancement of Computing in Education (AACE).

Theelen, H., van den Beemt, A., & den Brok, P. (2019). Using 360 degree videos in teacher education to improve preservice teachers' professional interpersonal vision. *Journal of Computer Assisted Learning*, *35*(5), 582-594.

Walshe, N., & Driver, P. (2019). Developing reflective trainee teacher practice with 360-degree video. *Teaching and Teacher Education*, *78*, 97-105.