NOTICING MATHEMATICS FROM MULTIPLE PERSPECTIVES

Karl W. Kosko
Kent State University
kkosko1@kent.edu

Richard E. Ferdig
Kent State University
rferdig@gmail.com

Enrico Gandolfi
Kent State University
egandol1@kent.edu

Keywords: Technology; Preservice Teacher Education; Teacher Noticing; 360 Video

A key aspect of professional noticing includes attending to students' mathematics (Jacobs et al., 2010). Initially, preservice teachers (PSTs) may attend to non-mathematics specific aspects of a classroom before attending to children's procedures and then, eventually their conceptual reasoning (Barnhart & van Es, 2015). Use of 360 videos has been observed to increase the likelihood that PSTs will attend to more mathematics-specific student actions. This is due to an increased perceptual capacity, or the capacity of a representation to convey what is perceivable in a scenario (Kosko et al., in press). A 360 camera records a classroom omnidirectionally, allowing PSTs viewing the video to look in any direction. Moreover, several 360 cameras can be used in a single room to allow the viewer to move from one point in the recorded classroom to another; defined by Zolfaghari et al., 2020 as *multi-perspective 360 video*. Although multi-perspective 360 has tremendous potential for immersion and presence (Gandolfi et al., 2021), we have not located empirical research clarifying whether or how this may affect PSTs' professional noticing. Rather, most published research focuses on the use of a single camera. Given the dearth of research, we explored PSTs' viewing of and teacher noticing related to a six-camera multi-perspective 360 video. We examined 22 early childhood PSTs' viewing of a 4th grade class using pattern blocks to find an equivalent fraction to 3/4. Towards the end of the video, one student suggested 8/12 as an equivalent fraction, but a peer claimed it was 9/12. The teacher prompts the peer to "prove it" and a brief discussion ensues before the video ends. After viewing the video, PSTs' written noticings were solicited and coded. In our initial analysis, we examined whether PSTs attended to students' fraction reasoning. Although many PSTs attended to whether 8/12 or 9/12 was the correct answer, only 7 of 22 attended to students' part-whole reasoning of the fractions. Next, we examined the variance in how frequently PSTs switched their camera perspective using the unalikeability statistic. Unalikeability (U_2) is a nonparametric measure of variance, ranging from 0 to 1, for nominal variables (Kader & Perry, 2007). Participants scores ranged from 0 to 0.80 (Median=0.47). We then compared participants' U_2 statistics for whether they attended (or not) to students mathematical reasoning in their written noticing. Findings revealed no statistically significant difference (U=38.5, p=0.316). On average, PSTs used 2-3 camera perspectives, and there was no observable benefit to using a higher number of cameras. These findings suggest that multiple perspectives may be useful for some, but not all PSTs'.

Acknowledgments

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

References

Barnhart, T., & van Es, E. (2015). Studying teacher noticing: Examining the relationship among pre-service science teachers' ability to attend, analyze and respond to student thinking. *Teaching and Teacher Education, 45*, 83-93. https://doi.org/10.1016/j.tate.2014.09.005

Gandolfi, E., Kosko, K. W., & Ferdig, R. E. (2021). Situating presence within extended reality for teacher training: Validation of the eXtended Reality Presence Scale (XRPS) in preservice teacher use of immersive 360 video. British Journal of Educational Technoology, 32(2), 824-841.

Kosko, K. W., Ferdig, R. E., & Zolfaghari, M. (2021). Preservice teachers' professional noticing when viewing standard and 360 video. *Journal of Teacher Education, 72*(3), 284-297. https://doi.org/10.1177/0022487120939544

Jacobs, V. R., Lamb, L. L. C., & Philipp, R. A. (2010). Professional Noticing of Children's Mathematical Thinking, *Journal for Research in Mathematics Education*, 41 (2), 169-202. https://doi.org/10.1111/bjet.13058 https://doi.org/10.5951/jresematheduc.41.2.0169

Zolfaghari, M., Austin, C. K., Kosko, K., & Ferdig, R. E. (2020). Creating asynchronous virtual field experiences with 360 video. *Journal of Technology and Teacher Education, 28*(2), 315-320. https://www.learntechlib.org/p/216115/