

PEDAGOGY

Using Digital Video Analysis to Develop Elementary Education Majors’ Noticing Skills in Elementary Physical Education

David C. Barney, Keven A. Prusak, Zack Beddoes

Abstract

Preparing future teachers is a complex endeavor, yet there are tools that help prepare preservice teachers (PST). One tool is digital video (DV). DV provides opportunities for PST to see and hear themselves teach and make the needed corrections in their lessons and activities. This study examined the accounts of elementary education majors’ experiences with DV self-analysis and how these related to noticing skills in their teaching elementary physical education lessons. The PST benefited from noticing themselves teach and that DV is an appropriate tool in the preparation of PST.

The preparation of new physical education teachers is a complex endeavor that encompasses many and varied pedagogical elements often organized into three broad categories: instruction, management, and discipline. In turn, each of these comprise more explicit pedagogies such as giving specific or general feedback, skill modeling, skill cuing, classroom management routines, moving equipment, grouping students, and dealing with noncompliance

David C. Barney, Department of Teacher Education, Brigham Young University. Keven A. Prusak, Department of Teacher Education, Brigham Young University. Zack Beddoes, Department of Teacher Education, Brigham Young University. Please send author correspondence to David_Barney@byu.edu

(Pangrazi & Beighle, 2013). Often, these pedagogical elements are modeled and then practiced in peer-teaching experiences. Ideally, preservice teachers (PST) will also engage in early and frequent field-based experiences or an extended practicum in the gymnasium or on the playground.

In some states where physical education specialists are not required, elementary classroom teachers must also be prepared to plan and deliver quality elementary physical education (EPE) lessons to their elementary classes. To make the most of the limited amount of coursework dedicated to EPE preparation, we turned to digital video (DV) technologies to maximize the internalization of the list of complex teaching behaviors.

For example, EPE majors prepare for and deliver a weekly 30-min physical education lessons over 5 weeks. Each of these lessons is video/audio recorded and uploaded to a DV analysis platform. We began with a stand-alone program (StudioCode, now defunct) and now use GoReact (an online program and platform; <https://get.goreact.com/>).

The use of video recordings of teaching instances is not necessarily new, but the advancement of DV technologies, cloud storage, instant video manipulation, and a host of program features and functionalities provides game-changing improvements in quality, immediacy, and depth of analysis. Traditional feedback sources such as systematic observation and reflection are greatly enhanced when paired with actual objective video evidence (Prusak et al., 2010). Further, video-recorded episodes guard against memory decay and misperceptions for student and observer (Prusak et al., 2010). Last, DV recordings offer a third source of feedback, performance analysis (Prusak et al., 2010).

Performance analysis, however, requires a clearly articulated set of descriptors of desired behaviors or competencies that act as a scaffolding and serve to guide student attention to a finite set of salient details that occur in a complex lesson. The utility of such scaffolding was recognized after researchers (Brophy, 2004; Brawdy & Byra, 1994) showed a lesson to a group of PST who were later unable to speak directly to the specifics of key lesson components and ideas. They simply did not know of what they should take note or, in other words, *notice*. As a result, the video content simply washed over

them without taking hold. Researchers realized that unless there was specific prompting or attentional cuing, PST did not *notice* what the instructor hoped for (Bransford et al., 2006; Sherin & van Es, 2005).

Video can help pre-service PST (Kang & van Es, 2019). First, it lets the teacher educator slow down, rewind, or zoom in on specific teaching moments. As a result, PST see and learn from highly accurate examples from their or others' teaching. Next, PST can share their teaching with others for feedback or for evaluative purposes. Last, DV analysis gives the PST the opportunity to identify discreet instructional, management, and discipline episodes as they unfold during the entirety of the lesson. In other words, they gain the skill of noticing.

Noticing comprises three key aspects:

(a) identifying what is important or noteworthy about a classroom situation, (b) making connections between the specifics of classroom interactions and the broader principles of teaching and learning they represent, and (c) using what one knows about the context to reason about classroom interactions. (van Es & Sherin, 2002, p. 573)

To ensure appropriate *noticing*, we sought to develop a list of desired competencies (instruction, management, and discipline) and their respective critical elements (what the teacher should look like, sound like, or do, etc.) to act as scaffolding to guide and delimit their noticing. Further, we created student and instructor rubrics for systematic observation, reflection, and performance analysis to serve as rich sources of timely and accurate feedback specific to the desired competencies-based scaffolding. Student self-analysis greatly multiplied the amount and timeliness of meaningful feedback. Thus, during these practicum experiences, DV recordings became a source of high-fidelity feedback to students and instructors. As students watched, reflected on, and analyzed their own teaching, guided by the set of specific desired competencies, they noticed strengths and deficiencies and then made adjustments for subsequent teaching experiences (Prusak et al., 2010).

Prusak et al. (2010) proposed that by using DV self-analysis tools, PST can become their own powerful source of accurate feedback, by “essentially, [learning] a new skill set, necessary for accurate

‘noticing’” (p. 137). Prusak et al. examined student accuracy and reliability when students attempted to conduct DV self-analysis. Within three attempts, PST matched expert coders 75% of the time and with an additional fourth attempt, 83%. Further, of the 300 coded instances, coding accuracy was 91%. Prusak et al. concluded that within a reasonably short time and when provided with a clear set of coding criteria, PST learned to become more than adequately proficient at DV self-analysis.

The conceptual basis for noticing proposes that developing systematic ways of learning entails learning to identify, evaluate, and make connections of classroom interactions guided by a clearly defined and articulated set of pedagogical practices and routines (van Es et al., 2017). Estapa et al. (2018) observed that learning from prerecorded classroom episodes fell into two categories: (a) watching others, especially master teachers, who serve as virtual models of best practices while concurrently recording thoughts about what they noticed or later as they reflected and (b) watching and recording thoughts about their own performance (i.e., engaging in DV-based self-assessment). In both instances, noticing skills improved greatly when students engaged in written reflections.

Expanding on early work focused primarily on PST behaviors, others (van Es & Sherin, 2002) used DV review to identify (notice) and unpack the complexities of instructional chains that linked teacher behaviors to student reactions (Lee, 2020) and success rates of student cognitions, work product, or achievement learning outcomes. In Lee (2020), noticing and understanding each link in an instructional chain provided a powerful means for PST to make informed and targeted interventions to increase student learning. Lee used DV analysis to detect students’ reasoning and errors in their written and verbal problem-solving efforts in a math class. A majority of the PST that observed individual students working on math problems did not successfully identify students’ difficulties as they attempted to solve the math problems. Thus, the PST needed to have many opportunities observing students and other teachers to improve their noticing skills (Lee, 2020).

The aforementioned studies present a collective conclusion: DV analysis guided by clearly articulated prompts provides access to accurate and rich feedback on not only teacher and student behaviors

but also the complex instructional chains and iterations that make up the teaching and learning equation. Further, DV analysis can be applied equally well across all subject areas if PST are provided the scaffolding unique to each setting. If PST are taught to notice pertinent aspects of teaching episodes selectively, perhaps it will help them improve personal practices more quickly. It appears that PST experience with DV analysis is an effective means of noticing across all subject areas in this examination, with most of the work having been done in math and geography and less in EPE. It remains unclear in EPE whether DV analysis experiences are received positively or negatively.

Therefore, this study examined the accounts of elementary education majors' experiences with DV self-analysis and how these related to noticing in their teaching EPE lessons.

Method

Participants and Setting

Participants for this study were 251 elementary education majors (12 males, 239 females) from approximately 20 sections of an EPE methods class at a private university in the western United States. Participants were in the first year of their elementary education coursework. Participants signed a letter of informed consent to participate in this study. Each participant was enrolled in an elementary physical education methods class specifically for elementary education majors. The class met twice weekly for 2 hr over an 8-week term. During the final five weeks, participants planned and delivered a 30-min physical education lesson to an assigned K–6 class in one of several local schools. Depending on availability of public-school classes, some students taught in pairs and others taught alone.

All PST were instructed on how to set up the camera and remote microphone and record each of four or five lessons taught. Upon returning to the university, participants uploaded their lessons to the DV analysis platform and then performed their analysis before the next class when a group debriefing was held. Participants were free to share their experiences or to ask questions of the instructor or classmates.

Digital Video Analysis Platforms

Both StudioCode and GoReact video analysis software platforms allow instructors to create a set of predefined codes specific to desired learner outcomes (referred to as *desired competencies* for teaching episodes). Captured video is presented in a viewing window complete with the typical stop/start, advance/rewind buttons, as well as a scrubber tool that can be dragged to any point in the video timeline. There is a coding window with buttons for each of the coded competencies. There is a timeline window that spans the entire length of the video and is automatically populated with time-referenced, coded instances. Finally, there is a text window that allows for student comments that are also time-referenced. Users can move instantly to and view any point in the lesson that is coded or for which they have made a comment.

Coded behaviors for this class included five general behaviors: (a) stopping/starting a class, (b) transitions involving equipment, (c) transitions for moving/grouping students, (d) instructional episodes and techniques, and (e) the discipline plan. Nuanced behaviors within these five main categories also have assigned code buttons. For example, instructional episodes might consist of short or long instructions or modeling group activities. Another example, the discipline plan, has code buttons for each of six steps in the discipline plan. The advantage of user-defined coding functionality is that any instructor can create scaffolding to guide student noticing toward those things deemed central to the experience and its desired outcomes. The present example is simply the one used in this course and this attendant examination.

Students in this EPE methods class first practice coding a previously recorded lesson taught by a master teacher. In this manner, they become familiar with the DV analysis tool while learning to identify the specific teacher behaviors in a real-time lesson. They are instructed to code all instances that occur, whether or not they are effective. If a code is missed or miscoded, they simply move back in time and correct their mistake. Coding *every* instance strengthens their noticing abilities and initiates their quality-of-performance analysis, which occurs later in the process. Once a lesson is fully coded, students can then click on any of the populated codes and instantly review the episode and assess its quality and look for

strengths or weaknesses. At this point, the student begins to make plans for improvement. One advantage of self-analysis lies in its privacy. Mistakes can be reviewed and a plan for improvement can be devised privately.

Data Collection and Analysis

Students in 20 sections of the EPE methods class, all of which used DV self-analysis, were asked to complete five open-response questions. The first four questions asked participants to provide their perceptions of the course as a whole. For example, they were asked what they liked least or most about the course, the teacher, and what suggestions they might have to improve the course. The final question asked, “Did you find it helpful to analyze your teaching using [the coding software]? Please explain why or why not.” Responses from the open-ended questions were transcribed and content analyzed by one of the present researchers in search of common themes (O’Sullivan & Tsangaridou, 1992; Mueller & Skamp, 2003). Sarvela and McDermott (1993) have defined qualitative thematic content analysis as a technique for making objective and systematic inferences and identifying certain characteristics of messages.

Once the initial content analysis was completed and themes were identified, the results were presented to the other members of the research team who sought to confirm or deny the findings of the initial analysis. Research team members met to discuss and refine the analysis in preparation for its reporting in this paper.

Results and Discussion

This study examined the personal accounts of elementary education majors’ experiences from the use of DV self-analysis. Of particular interest was how the course and DV self-analysis may have influenced their noticing ability in their own teaching episodes. We present the results and discussion together to provide greater continuity for the reader.

Content analysis of the transcribed responses yielded three themes: (a) DV self-analysis allowed students to notice teaching behaviors specific to this EPE class that they had forgotten or were not aware of in the moment, (b) watching oneself teach could be uncomfortable, and (c) watching their teaching was helpful.

Theme 1: I Forgot or Was Unaware of What Had Happened

Prusak et al. (2010) described several shortcomings of traditional assessment and feedback practices (i.e., reflection and systematic observation) including memory decay, unawareness while teaching, and communication breakdowns. They argued that DV analysis provided a high-fidelity representation of one's performance that helped to mitigate these deficiencies.

Thus, the first theme was that DV analysis helped students who often forgot some of the many details about the lesson. For example, Sharon (all names are pseudonyms) stated, "You notice a lot more when you go back and watch a video than you would ever take away from just the teaching experience itself." Joan said, "I love watching videos because it helped me to notice things that I didn't see while I was teaching." Ashley said, "It was weird [watching myself teach], but it's nice to go back and see what actually happened and look for things I forgot." Beth stated, "When you are nervous [while teaching], it's hard to know how it went and when you go back to code, you see what you did and didn't do and what to practice. It really helped me." Sally stated, "When I went back and watched myself teach, I caught a lot of things that I didn't notice in the moment I was teaching." Barbara said, "You notice a lot more when you go back and watch the video than you would ever take away from just the teaching experience."

Understandably, students were so involved in their lessons they did not notice certain aspects of their teaching. Without the aid of DV evidence, much valuable information would have been lost due to memory decay or unawareness of areas needing to be remediated. Prusak et al. (2010) also reported that noticing accuracy increased when there were explicit prompts and attentional cueing, thereby increasing the amount and accuracy of what Sharpe (1997) referred to as self-feedback.

Theme 2: Watching Oneself Teach Could Be Uncomfortable

Some students felt uncomfortable or self-conscious about watching themselves teach (often because they dreaded seeing themselves make mistakes). Thus, the second theme was that DV self-analysis

provided students with a reality check (not always a pleasant one) that was, nevertheless, very helpful. Robert and Karen both said, “As much as I hated doing [DV self-analysis], it was really helpful to make sure I got all the desired competencies [teaching requirements] completed.” Mary explained, “It’s helpful to go back and watch yourself and say, ‘oh that was great or wow that probably wasn’t the best thing to do.’ This way we learn from ... our experiences and watching ourselves.” Sally stated, “I could see exactly what my strengths and weaknesses were and what desired competencies I was missing in my lessons.” John said, “I didn’t always love watching myself, but it was good to see how the students see me and have specific things to look for in my teaching.” Beth stated, “Sometimes it was painful to watch, but it really made me aware and helped motivate me to work harder each day.”

Theme 3: Digital Video Self-Analysis Strengthened Noticing Skills, Which, in Turn, Helped Their Teaching

Students also found that DV self-analysis was helpful to their teaching. Sun and van Es (2015) argued that the video technology helped PST view themselves as they achieved specific expectations, goals, or milestones. Van Es and Sherin (2002) reported that the more that alternative certifications students in math and science used DV self-analysis, the more depth and nuance their noticing skills had. Early self-analysis attempts were often shallow, but, with practice, led to more salient pedagogical examinations and decisions, which they attributed to DV self-analysis. In other words, the ability to accurately notice the quality of instructional episodes aided PST to strengthen their teaching behaviors.

Carol stated, “While using [DV analysis tools], I was able to analyze and see both the things I did well and what I could improve on as a teacher. It was a great form of self-evaluation.” Joan said, “I found it very helpful to *re-watch* [emphasis added] myself teaching because I could see what I was doing right and what I could improve on.” Maggie said, “I enjoyed seeing where I needed to improve in my teaching. I didn’t realize [there were] so many things I could change.” Becky stated, “There were so many things you don’t realize until you play it back. Sometimes I feel like I did a horrible job, but when I watch it I see that it wasn’t as horrible as I thought. It helped in my planning for my next lesson.”

Implications for Physical Education Teacher Education

These results suggest that the use of DV self-analysis can strengthen the skill of noticing or focusing on what is of central importance, whether the performance is good or the performance is in need of remediation. DV self-analysis improves their pedagogy in physical education. By creating a clearly articulated set of criteria for a set of desired competencies, PST can reliably develop their noticing skills in as few as three or four attempts (Prusak et al., 2010). The student comments in this study support the notion that repeated attempts yield increasingly accurate and meaningful feedback (Estapa et al., 2018; van Es and Sherin, 2002) that enhances their pedagogy.

Another implication to this study is that noticing forces PST to reflect on their teaching and strategize their teaching for their next lesson. On the basis of this study, after PST observe their their teaching, they notice certain pedagogical aspects of their lesson that they are not particularly pleased with, but they have the desire to improve for their next lesson. For example, reflecting on what she had noticed and thinking of ways to improve for the next lesson, Susan stated, “I felt like it was helpful because it forced me to go back and actually figure out how I teach and where I needed to improve.” Thus, by reflecting on what they noticed in their teaching PST figure out how to improve their teaching. Reflection is a long-used and powerful means of personal feedback. DV-aided reflection, with accurate noticing, is even more beneficial. Feedback is only as good as it is accurate and timely.

PETE faculty often have had a background in coaching sports and likely have reviewed game film because of its impartial effectiveness of noticing strengths and weaknesses. It seems a prudent practice to make use of the same practice in the training of new physical educators. DV self-analysis trains new teachers to become their own source of analysis and feedback as they strive to become better teachers.

Limitations

There are two limitations for this study. First, the participants came from a single, private university and therefore may not be a representative sample of participants from other colleges or universities, public and private, or of geographic regions, which may

limit the generalizability of the findings. Second, the conclusions and implications are limited and perhaps mostly applicable to those participants' demographics. Thus, further research with a broader demographic would give a richer data set to ascertain the generalizability of the conclusions and implications of the study.

References

- Bransford, J. D., Barron, B., Pea, R. D., Meltzoff, A., Kuhl, P., Bell, P., Stevens, R., Schwartz, D. L., Vye, N., Reeves, B., Roschelle, J., & Sabelli, N. H. (2006). Foundations and opportunities for an interdisciplinary science of learning. In K. R. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 19–34). Cambridge University Press.
- Brawdy, P., & Byra, M. (1994, April). *A comparison of two supervisory models in a pre-service teaching practicum* [Paper presentation]. Annual Meeting of the American Educational Research Association, New Orleans, LA, United States.
- Brophy, J. (2004). Introduction. In J. Brophy (Ed.), *Advances in research on teaching: Vol. 10. Using video in teacher education* (pp. ix–xxiv). Emerald Group Publishing.
- Estapa, A. T., Amador, J., Kosko, K. W., Weston, T., de Araujo, Z., & Aming-Attai, R. (2018). Preservice teachers' articulated noticing through pedagogies of practice. *Journal of Mathematics Teacher Education, 21*, 387–415. <https://doi.org/10.1007/s10857-017-9367-1>
- GoReact. (2021, November 7). *GoReact* [Software]. <https://get.goreact.com>
- Kang, H., & van Es, E. A. (2019). Articulating design principles for productive use of video in preservice education. *Journal of Teacher Education, 70*(3), 237–250. <https://doi.org/10.1177/0022487118778549>
- Lee, M. Y. (2020). Using a technology tool to help pre-service teachers notice students' reasoning and errors on a mathematics problem. *ZDM – Mathematics Education, 53*, 135–150. <https://doi.org/10.1007/s11858-020-01189-z>
- Mueller, A., & Skamp, K. (2003). Teacher candidates talk: Listen to the unsteady beat of learning to teach. *Journal of Teacher Education, 54*(5), 428–440. <https://doi.org/10.1177/0022487103256902>

- O'Sullivan, M., & Tsangaridou, N. (1992). What undergraduate physical education majors learn during a field experience. *Research Quarterly for Exercise and Sport*, 63(4), 381–392. <https://doi.org/10.1080/02701367.1992.10608760>
- Pangrazi, R. P., & Beighle, A. (2013). *Dynamic physical education for elementary school children*. Benjamin Cummings.
- Prusak, K. A., Dye, B., Graham, C., & Graser, S. (2010). Reliability and pre-service physical education teachers' coding of teaching videos using Studiocode® analysis software. *Journal of Technology and Teacher Education*, 18(1), 131–159.
- Sarvela, P. D., & McDermott, R. J. (1993). *Health education evaluation and measurement: A practitioner's perspective*. WCB Brown & Benchmark.
- Sharpe, T. (1997). Using technology in preservice teacher supervision. *The Physical Educator*, 54(1), 11–19.
- Sherin, M. G., & van Es, E. A. (2005). Using video to support teachers' ability to notice classroom interactions. *Journal of Technology and Teacher Education*, 13(3), 475–479.
- Sun, J., & van Es, E. A. (2015). An exploratory study of the influence that analyzing teaching has on preservice teachers' classroom practice. *Journal of Teacher Education*, 66(3), 201–214. <https://doi.org/10.1177/002248115574103>
- Studiocode. (2021, October 2). *Studiocode* [Software]. <https://www.studio-codegroup.com/>
- van Es, E. A., Cashen, M., Barnhart, T., & Auger, A. (2017). Learning to notice mathematics instruction: Using video to develop preservice teachers' vision of ambitious pedagogy. *Cognition and Instruction*, 35(3), 165–187. <https://doi.org/10.1080/07370008.2017.1317125>
- van Es, E. A., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, 10(4), 571–596.