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(Re)Anchored, Video-Centered Engagement: The Transferability of Preservice Training to Practice

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Abstract

This longitudinal study tracks primary participants over 3 years from their last year of university preservice teaching training through their second year of in-service teaching via surveys, interviews, and teaching observations. The study employs a descriptive case study design to examine the transfer of preservice content, pedagogy, and video technology learning into teaching practice. The study places the model case studies within the larger context of analyzed observational and artifact data from 7 years of preservice teachers' learning about (re)anchored, video-centered engagement.

This study examines the implementation of (re)anchored videos, which serve as short video engagements. We use parentheses around the prefix *re* to emphasize the iterative nature of knowledge, signifying how the anchoring of knowledge will occur differently with different students, depending on students' prior learning. Thus, the videos (re)anchor knowledge. Further, the videos are (re)anchored from their preservice creation into the environment of professional practice. The videos in this study are intended to blend with other resources to provide a rich problem-solving environment.

Our study focuses on practicing teachers who graduated from a program where they learned to produce short anchor videos as part of a larger course on project-based instruction. The participants—undergraduate and graduate university students who are now in-service high school science teachers—collaboratively designed an anchor video as one component of a 4-week unit.

This study also attempts to delineate the cycle of teaching, specifically, the transferability of preservice science teacher training to practice. Our research questions include the following:

- How is (re)anchored, video-centered engagement taught in preservice university curriculum courses in ways that in-service high school science teachers will utilize it?
- How do teachers trained in (re)anchored, video-centered engagement successfully use it in practice?
- How does having (re)anchored, video-centered engagement instruction change the role of novice teachers?

Anchored Video Instruction

Bransford, Sherwood, Hasselbring, Kinzer, and Williams (1990) coined the term *anchored instruction* to refer to a problem context that situates students' perceptions and comprehension. The initial goal of anchored instruction was to alleviate the problem of inert knowledge, where students lacked the ability to access knowledge spontaneously during problem solving. According to Bransford et al., video materials served as anchors, or macro contexts, for all subsequent learning and instruction. Bransford, Zech, Schwartz, Barron, Vye, and Cognition and Technology Group at Vanderbilt (2000) identified four principles of anchored instruction as (a) learning and teaching activities centered on *anchors*, which should be a case study or problem situation; (b) curriculum materials allowing exploration by the learners (c) all data needed to solve the problem embedded in the situation alongside irrelevant data; and (d) students working in dialogic small groups to investigate aspects of a situation and gathering relevant information to solve the problem and allowing for revisions as they progressed.

Early research focused on a videodisc-based middle grades mathematics curriculum called The Jasper Series (Cognition and Technology Group at Vanderbilt, 1992). The curriculum included 12 seventeen-minute videos that introduced students to complex scenarios containing embedded clues to the problem solution. The Jasper Series units showed promise in promoting mathematical problem solving, but research showed that students were not able to transfer the knowledge to new situations beyond the scope of the videos (Bransford et al., 2000). The designers of The Jasper Series curriculum identified their own lack of understandings about deep mathematical principles, and the resulting lack of emphasis on those principles in The Jasper Series units as the inherent weakness leading to lack of transfer. Teaming with mathematicians to include deep mathematical principles in the design of subsequent The Jasper Series units resulted in increased transferability of learned skills among the targeted learners (Cognition and Technology Group at Vanderbilt, 1997).

Another popular anchored instructional unit, The Voyage of the Mimi, targeted elementary grades (Cognition and Technology Group at Vanderbilt, 1992). Through 26 fifteen-minute programs, students learned navigation principles, map reading, world cultures, and marine biology while role playing members of the crew on a research voyage.

Using an anchored unit similar to The Jasper Series, Hsin-Yih (2000) found that Taiwanese students' attitudes toward mathematics and their problem solving skills significantly improved. Kurz and Batarelo (2005) utilized the "Rescue at Boone's Meadow" episode from The Jasper Series to evaluate preservice elementary and secondary teachers' abilities to identify constructivist elements and their willingness to use constructivist methods in their teaching. They found that preservice teachers were

able to identify the constructivist features of the unit but had varying degrees of willingness to implement anchored instruction.

More recent research indicates that scaffolding student learning within an anchored environment increases gains. Lamberg and Middleton (2009) found that teacher scaffolding in an anchored mathematics unit helped students progress from naïve to fluent conceptions of fractions. Etheris and Tan (2004) found that students who solved anchored mathematics problems in scaffolded online communication environments performed better than their peers in the nonscaffolded environment. Sanny and Teale (2008) also found that scaffolded anchored instruction enhanced preservice language arts teachers' abilities to teach reading comprehension to young children and generated a more holistic view of the literacy curriculum.

Background

Rationale

The purpose of the university course in this study was to train preservice teachers to design and implement project-based science instruction. During this course, preservice teachers compared traditional curricula with project-based curricula, observed project-based high school classes, taught miniprojects to high school students, and designed 4- to 6-week project-based units. These units were centered on a driving question (defined by Krajcik, Czerniak, & Berger, 2002) that was introduced via (re)anchored video engagement. This study also fills a gap in the research, as it casts the preservice teachers as designers of anchored instruction rather than consumers of anchored instruction designed by others.

The examples referenced in the review of literature modeled the pinnacle of traditional anchored instruction; however, the university instructor in this study realized that course constraints did not allow for development of fully anchored units in her classes. Further, interviews with the university course instructor revealed that as a former high school science teacher she was well aware of the pedagogical implications and the "pragmatic limitations" of the longer, traditional anchor videos. For example, in practice, both The Jasper Series and the Voyage of the Mimi required whole-class instruction around a single videodisc player due to the technological equipment limitations in typical public school settings. These real world constraints limited interactivity in ways the designers had not intended.

The pedagogical implications of positing traditional anchor video units as ideally designed into real public school practice meant this was a shift from theoretical small group, student-centered instruction to real classroom, large group, teacher-directed, and controlled instruction. Even the advent of DVDs required teachers to reserve a computer lab for the duration of the unit—something not possible in most public high schools. In light of these real-world, contextual schooling issues, the university instructor decided to shorten the videos that the preservice teachers created and emphasize high school students' data collection from other media. Hence, the high school students became cocreators in the instructional process of the videos' instructional implementation.

(Re)Anchored, Video-Centered Engagement

Having small groups of preservice teachers develop shorter videos, which we called *(re)anchored, video-centered engagements*, to introduce and connect their students to an instructional unit preserved the best aspects of traditionally anchored video

instruction while increasing flexibility and access. For example, the smaller video files worked with older machines, and they downloaded quickly from the Web, allowing offsite access by an increased number of stakeholders. Although the shortened videos lost a vast amount of data that was found in the traditional anchor videos, this change more closely mirrored the Web-centered practices of real students (Harris, Mishra, & Koehler, 2009).

Herrington, Oliver, and Reeves (2003) contended that students are initially unwilling to immerse themselves in authentic learning experiences and to be fully engaged in a complex problem. Students must first willingly suspend disbelief much like movie viewers do. Like traditional anchor videos, the goal of the (re)anchored, video-centered engagements was to establish a rich, believable problem environment, situate learning within the problem context, and motivate students to work on the problem. However, the (re)anchored videos did not contain all the information necessary to solve the problem and required students to further construct the problem environment using other tools.

The university instructor allowed preservice teachers to decide how much information to include in the videos. Additionally, she advised them to construct videos that would enable their students to think deeply about the instructional units' driving questions or problems as related to the major concepts in the units.

The Process of (Re)Anchoring Video-Centered Instruction

We spent a good deal of time pondering why something as potentially powerful as anchor videos went out of vogue and lost its transferability to professional practice. Cuban, Kirkpatrick, and Peck (2001) found that placing advanced technology in public schools did not necessarily translate into technology use and instruction. In their study, they concluded "that access to equipment and software seldom led to widespread teacher and student use. Most teachers were occasional users or nonusers" (p. 813) of the available school technology. Harris et al. (2009) indicated that teachers were typically taught technological skills separate from their content and pedagogy, causing a disconnect that led to superficial applications of technology.

Beyond the underuse and misuse of available technology, research literature focusing on the success stories of teachers who utilized technology in their instruction was underreported. "Despite the ease of camera use, the array of editing features, and the many video genres, we find it frustrating that the literature provides few resources that can help these students make even more effective use of video for learning" (Schwartz & Hartman, 2007, p. 349). This article presented one way to answer Schwartz and Hartman's call for more literature on this needed topic.

Procedures

Teaching (Re)Anchored, Video-Centered Instruction

The preservice program featured in this study centered on three core curriculum courses specifically focused on mathematics and science teaching. Because no separate technology course existed, the instructor integrated (re)anchored videos into the project-based instruction course, allowing preservice teachers to experience intense and purposeful technology use. Due to this integration, preservice teachers came to recognize technology as an essential component of their content areas and current pedagogy (as suggested by Harris et al., 2009).

The instructor presented a lecture on the theory of (re)anchored instruction, which included sample anchor videos from previous semesters. The lecture incorporated former preservice teachers' created examples of the four main types of (re)anchored videos, including slide shows, skits, teacher-filmed video, and a montage of existing video.

According to Petrosino (2004), a *highly generative video* presents unstructured problems to students that allowed students to generate their own problems within the context of the overarching problem context; whereas in contrast, a *less generative video* prescribes the problems students solve. Our presentation also discouraged narrowly focused videos and encouraged examples that allowed greater student exploration.

The sample (re)anchored videos highlighted editing features of iMovie, such as transitions, video effects, audio effects, and titles, as well as common errors that students make in their (re)anchored videos, including uncited or overused copyrighted sources, imbalanced audio, and too small subtitles or text.

After the lecture, preservice teachers brainstormed ideas and produced one-paragraph descriptions of their intended (re)anchored videos. The descriptions forced consensus within the small groups of preservice teachers, in addition to providing the university instructor with insight about possible student needs in terms of resources and training. The university instructor met with groups to point out relevant iMovie features depending on the type of (re)anchored videos they intended to create.

Small groups that planned and filmed (re)anchored videos containing a preservice-teacher-created skit needed video cameras and instruction on importing video to iMovie. Groups that imported video from the Web typically needed tools to convert the video to a format compatible with iMovie. Alternately, groups that implemented a slide show needed information on timing still images within iMovie and the Ken Burns Effect, an iMovie default setting for still images. The instructor devoted 6 hours of class time to support independent group work on the (re)anchored videos. In addition to the formal class time, the preservice teachers reported a minimum of 16 hours to complete the project, with a mean completion time of 32 hours.

Most preservice teachers had no experience with video editing, so students were encouraged to explore the iMovie tutorial on their own time before meeting with their group to work on the video. Students had 1 month to create their (re)anchored videos. A selection of participants' (re)anchored videos is available in a searchable archive (http://www.edb.utexas.edu/anchorvideo/archive.php). Additionally, the (re)anchored videos may be viewed within the context of the project-based units at (http://www.education.txstate.edu/ci/faculty/dickinson/PBI/).

Tracking Classroom Implementation and Transferability to Practice

We focused on the preservice instructional climate via interviews and observations of the university instructor, in addition to an in-depth study of three of the program's graduates, the primary participants, who were using anchor videos as a regular facet of their current high school science instruction. All three primary participants had completed bachelors degrees in science and were either graduate students in science or postbaccalaureate students seeking teaching certification. Joyce has a Ph.D. in physics and Shelley has an M.S. in biology. Joyce and Shelley completed the undergraduate teaching certification program while working on their graduate degrees. Carol, the third primary participant, has a B.S. in environmental science and completed the undergraduate certification program as a non-degree-seeking postbaccalaureate student. Each primary participant

begins her third year of public school teaching in fall of 2010. All three primary participants teach at a project-based magnet high school.

Method

This longitudinal study spanned 3 years, tracking the primary participants from their last year of preservice teacher training through their second year of in-service teaching. The study employed a descriptive case study design, describing the transfer of preservice learning into practice as related to (re)anchored video engagement. Additionally, the study analyzed observational and artifact data from 7 years of preservice teachers (n = 459).

The study utilized an etic (first author) and emic (second author) historical viewpoint to understand what components of the preservice instruction fortified the flexible transfer of pedagogy, content knowledge, and technology skills into public school teaching practices. This portion of the study relied upon artifacts including students' reflective assignments and video products (n = 459). It also utilized interview and autoethnographic explorations of instructional techniques and videotaped classes from over 7 years of higher education instruction. The second part of the study was grounded in surveys (n = 59), on-campus observations of teachers (n = 4), and interviews (n = 5), about their present-day practice as it related to their preservice instruction on creating (re)anchored videos.

Results

Benefits

Increasing approachability via shortened length and focus. We hypothesized that shortening the video length of the (re)anchored products would increase teachers' use of the technology skills and associated products beyond their preservice teaching course. Unlike the transferability gaps of The Jasper Series, the preservice teacher participants in this study easily related to the short (re)anchored videos ranging in length from 3 to 5 minutes. Further, the participants reported that the specified (re)anchored videos' purpose—engaging secondary students in complex problem solving—transferred to their in-service teaching practice.

We entered the primary participants' classrooms to triangulate their words with their practice and to find if our hypothesis held true. Researcher observations confirmed that their teaching utilizing (re)anchored videos was consistent with the ways the in-service teachers reported using the videos in interviews and surveys. Shortening the video length and narrowing its focus served several pedagogical purposes. First, in theory, it gave preservice teachers an approachable introduction to creating videos to anchor their instruction. In practice, it also gave them skills and ideas that could realistically be used in their high school courses.

Immediate authenticity. We hypothesized that producing a highly relevant instructional video product would build preservice teachers' agency in relation to using video technology in a teaching domain. Kearney and Schuck (2006) noted that student-generated videos were highly motivational among the high school students they studied. We hoped that, like these high school students, preservice teachers would find creating videos for use in their future classrooms an empowering experience.

Although preservice teachers typically reported that they resented "the stress of completing the anchor video," they were generally quite proud of their work, and nearly all preservice teachers chose to show their anchor videos during their final university class presentations. In the 7 years and 459 preservice teachers taught by the university instructor, only nine preservice teachers chose not to show their anchor videos during their final presentations. Many preservice teachers in the university course commented that they wanted their own awards ceremony.

In addition to providing a context for secondary student learning, the videos were included in a website, thus server space and download times were also prime considerations. Every preservice teacher in the university project-based course had access to units and anchor videos created by fellow preservice teachers, so that they could access and utilize the other preservice teachers' materials. Some preservice teachers reported and were observed using units created by others during their apprentice teaching. They indicated that they chose the units based on required curriculum and a timeline that fit within their schedules and student interest.

We would expect that the teachers would apply the (re)anchored video skills to creating new products aligned to current in-service instruction. Only three of the 59 teachers surveyed, however, reported using the videos they produced as preservice teachers in their in-service teaching. One of the surveyed in-service teachers stated,

> I was originally planning to teach high school biology, but was transferred (within contract) to middle school, so the same subject area [in the unit I developed] is only briefly touched upon. However, I adapted part of the unit and used my anchor video (iMovie) that I created for the project based instruction project in my current teaching.

Another in-service teacher stated that, even though the 4- to 6-week project was too cumbersome to use in her class, she still uses the anchor video.

Increased continuity between preservice instruction and professional practice. Our hypothesis that learning to create (re)anchored videos in preservice teaching courses increases the likelihood that their learning would transfer to their in-service teaching practice held true in the longitudinal study of teachers embedded in project-based instruction or technology magnet high schools. Specifically, the selected in-service participants reported using and were observed using (re)anchored, video-centered engagement during random classroom observations. The opportunity to create a (re)anchored video without overwhelming the preservice teachers increased positive feelings toward the project and their success.

In a training program for a profession like teaching, learning tasks need to consider transferability to practice. Teaching knowledge is not abstract, learning for the sake of knowing. This study found that the teacher training prepared people to enter professional practice while demonstrating the needed and learned skills. We need to do additional comparative research case studies for in-service teachers in environments where project-based instruction is not actively supported. We know that the (re)anchored videos transferred from preservice learning to in-service practice in project-based-instruction-rich teaching environments. Further research must examine if the transferability of (re)anchored videos will work in high schools where project-based instruction is sparse.

A Longitudinal Sample of Success

Seventy-three percent of the surveyed teachers indicated they were using project-based instruction to some degree in their teaching and, although the survey did not specifically ask about (re)anchored video use, seven spontaneously offered that they had either used the (re)anchored videos they developed as preservice teachers or developed new (re)anchored videos for use in their classes.

We tracked the long-term success of 59 teachers via survey and follow-up emailed questions then chose a purposeful sample of six teachers to interview and observe based on the transferability of in-service learning into professional practice. From this purposive sample, we chose three teachers who exemplified the ways that teachers transferred preservice (re)anchored, video-centered instruction to illustrate the continuity from training to professional practice. Although we highlighted these three teachers as the model of each common, observed in-service teaching outcome, we drew from a larger sample of longitudinal data to present each model as a composite of teachers trained in (re)anchored, video-centered instruction.

Shelley: The Professional Educator as a Leader/Trainer

Shelley initially found that the "idea of an anchor video was something that was really interesting." She found the use of the (re) anchored videos to be unique, saying, "Our school is the only one in the consortium that does the videos and the kind of creative entry stuff. A lot of them just use Word documents and stuff." The magnet consortium uses the term *entry doc* or *entry documents* to describe the problem statement for project-based units.

Prior to these teachers' participation in the training program featured in this study, all entry documents were MS Word documents, not videos. Shelley did not expect that as a second-year teacher she would be training other, often more experienced, teachers: "I'm actually presenting at the our annual consortium conference on doing entry documents that are not Word documents. I've never done one that's a Word document. It has never even dawned on me." Moreover, although Shelley had no experience with video editing prior to the course, creating a (re)anchored video as a preservice teacher conditioned her to think of (re)anchored videos as integral to content instruction:

> I think that the idea of an anchor video is something that's really, really super engaging. I think that was really cool because those were a pain. Oh my God, they were a pain! And they take so much effort but I think that having that in my head as a thing that's a part of a really successful project and doing it before I came here because I was like all right. I've done iMovie and Lord knows I didn't know how to use it when I did that. So having that experience. Having done it was a valuable experience because it made me think, "Yeah, I can do this."

Even though Shelley found the process cumbersome at first, she now values (re)anchored video as an integral part of her practice.

Joyce: The Novice Educator as Expert

Joyce was also a second year teacher. Although many aspects of teaching, such as classroom management and communicating with parents and local communities, were new to her, she came in as an expert on using video-centered instruction for engaging

students in problem-based instruction. When talking about her technology magnet campus she said,

> The other consortium members were really impressed by the core of teachers [from our teacher preparation program] even though we didn't have as much problem-based instruction (PBI) background as everyone else. And things that we had that I didn't see in other teachers in the trainings cause we go through this training where we do a project together is being willing to collaborate.

Joyce believed that one of the biggest advantages was "being comfortable with technology. The fact that we know the word *Office Suite* and can make a movie in iMovie is huge."

Joyce was a good preservice teaching student and learned what she was supposed to learn alongside all of the other students engaged in creating video-centered instruction in preservice teacher training. Because all the students learned these skills to a level of proficiency, she never saw her skill-level as being an expert—she *was* a novice teacher. Still, she spoke at length about the reaction of other teachers to her skills, saying things like,

> "Oh my God, you can make entry videos. You're so special." I'm like, "OK, whatever." And that's our big thing now. I'm like, "Whatever, a two-minute video?" It's fine. It's definitely a hook and engagement is huge, but it's funny that they'll make that such a big deal even, 'cause it's not so hard.

Joyce also commented that her experiences as a student had been largely traditional in nature and that the experience of trying something new profoundly changed her way of pedagogical thinking. She stated, "I mean it, [learning to create the shortened (re)anchored videos] changed my mindset, which was huge. It gave me the confidence to try things 'cause we were always trying things, which was huge."

She viewed herself as changed and successful because of the transformation that took place in her preservice teacher training. She said, "We're always creating our own stuff. And I never developed the mindset that I'll produce it all myself cause we never did. And if those things hadn't happened, I probably wouldn't be here and I probably would've quit."

Carol: The Pleased and Proficient New Professional Educator

Carol stated,

> Our professor had us all do Entry Doc videos. Where I work now, most every teacher now does Entry Doc videos and in the consortium of schools, our school leads the way in Entry Doc videos!! Thanks professor! Entry Doc videos are way more cool to the students than an Entry Doc "letter" or some other written "document." The [preservice program] teachers at our school were lucky because we just assumed that Entry Docs were supposed to be videos!

What was hard work and expected as an average part of preservice instruction gave Carol the agency in in-service practice to enact effective teaching and the self-efficacy to feel competent and happy with her professional work.

Our longitudinal approach adds two new findings to the academic literature. First, our study documents preservice teachers as successful creators of anchor videos. This finding stands in contrast to the majority of academic literature that frames preservice teachers as consumers of anchor videos. Second, the in-service case studies affirmed the functionality of (re)anchored videos in everyday science classrooms.

This small case study, purposefully selected from the larger preservice population, speaks to the lack of longitudinal studies affirming transferability of anchored videos from preservice training to in-service practice. (Re)anchoring these engagement videos within professional teaching practice brings the success of preservice anchor videos with teachers as the learners into current classroom practice with the teachers as experts. The in-service teacher case studies reveal that the (re)anchored videos mirror academic gains of preservice teachers in K-12 students, thus making a future, larger longitudinal sample feasible.

Implications and Conclusions

This study offers an example of a transferable model for preservice training that extended into practice. However, more study is needed. Unanswered questions remain, such as, how does the profession recoup teachers who did not learn video-centered instruction skills in preservice teaching yet are expected to use them, like the teachers in the technology magnet high school in this study? Researchers must not limit their investigative scope to models of success, as we need to know what is not working and where and why it is not working.

Future studies need to examine cases where preservice technology instruction fails to take hold in practice and determine how such failures relate to low student performance and teacher attrition. Although a benefit of using technology as engagement for secondary students is its dynamic nature, this could also present a problem for maintaining teacher expertise. As technology develops, even effectively trained teachers need to keep their proficiencies current or risk becoming irrelevant with outdated skills.

The instructional benefits of using teacher-created (re)anchored videos in secondary classrooms are numerous, yet there are also ethical considerations. On one hand, (re)anchored videos increase students' learning and access. Students who need or want reinforced learning can view the exact instruction input multiple times and can pause the video to ask questions or take notes. Videos also provide a link to students who experience high absenteeism due to economic, family, or medical constraints on school attendance. On the other hand, unless videos are captioned or interpreted, students with hearing limitations may receive less-than-effective instruction.

Additionally, centered visual learning can fail to translate material meant to draw students together and deeper into learning, and instead serve to separate and marginalize students with visual limitations. Luckily, the overall increase in video inputs in our modern society means that assistive technologies for students with disabilities are also increasing. Unfortunately, captioning or integrated visual enhancers such a Jaws, which offer screen reading alongside outputs to refreshable Braille displays, often require individualized viewing, separating students from a cooperative community of learners (see the training module for the Assistive Technology Division of the Mississippi Department of Rehabilitation Services for various program options to assist students with low vision or blindness).

Premade videos (re)anchoring instruction and increasing engagement can also be purposely designed to reaffirm and highlight diversity. These videos can serve the dual purpose of increasing cultural inputs in primarily homogenous classrooms or in marginalized communities they can increase exposure to students' viewing a diversity of people as scientists and professionals. The level of ethical commitment to quality and best practices relies upon the professional teachers who produce the videos. Therefore, every opportunity in (re)anchored videos to engage best practices and multicultural affirmations can also be a chance of reinforcing negatives. This is why (re)anchored videos needed to be taught by professionals who teach pedagogy alongside content and technology.

In the end, the positive aspects of (re)anchored, video-centered engagement outweigh the drawbacks and possible limitations. The in-service participants had sustained achievement and positivity toward their preservice instructional learning goals. This study provides one preservice model that demonstrated longitudinal transferability to in-service practice. The longitudinal study will continue to provide more results and to answer more questions over time about the sustained influence of preservice video instruction alongside continued advancements in technology.

Preservice programs should include opportunities for participants to generate (re)anchored videos in the context of unit development, and those units should be tied to state standards. Utilizing user-friendly software and tailoring video editing training to the needs of small groups reduces the emphasis on technology skills, allowing greater focus on design and curricular objectives. Successful preservice (re)anchored video development fosters in-service adaptation, but teacher predisposition and school culture play a significant role in transfer to in-service practice.

The teachers in this study actively sought a project-based environment because they were convinced that traditional modes of instruction are less effective than project-based instruction. Teachers at the study site were expected to engage students in complex problems. Study participants intuitively applied (re)anchored video engagements to address school expectations for situated learning because they were familiar and fun. Moreover, familiarity with video editing eliminated fears about the technology. Although some participants at traditional high schools indicated interest in using (re)anchored video engagements, few actually did.

Didactic methods of instruction do not require situated learning contexts and, therefore, the effort to develop (re)anchored video engagements would be counterproductive. Teachers in didactic school cultures may benefit from additional professional development and mentoring. Toolin (2004) found that that first year teachers with support structures such as team teaching, one-on-one professional development, and professional development workshops became capable of implementing successful project-based instruction units. Our findings indicate that increased implementation of constructivist pedagogies such as project-based instruction generates the need for engagements that immerse students in complex problems and, therefore, contributes to transfer of preservice skills to professional in-service practice.

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