Ellis, J., McFadden, J., Anwar, T., & Roehrig, G. (2015). Investigating the social interactions of beginning teachers using a video annotation tool. *Contemporary Issues in Technology and Teacher Education*, *15*(3), 404-421.

Investigating the Social Interactions of Beginning Teachers Using a Video Annotation Tool

Joshua Ellis
Michigan Technological University

Justin McFadden
University of Louisville

Tasneem Anwar and Gillian Roehrig
University of Minnesota

Abstract

This study examines the use of a digital video annotation tool used by beginning in-service secondary science and mathematics teachers in the Teacher Induction Network (TIN). TIN is an online induction program in its ninth year of existence and has served over 180 teachers. The need to provide spaces for beginning teachers to reflect on their practice and seek support of their colleagues is critical to their professional growth. The current study specifically examines the social interactions and potential supports of a video annotation tool (VideoANT) to promote collaborative interactions toward the development of reflective practices. Results suggest that in the absence of additional scaffolding, teachers overwhelmingly used VideoANT to respond to their peers' teaching practices with praise and agreement. Given the aims and objectives of the induction course, this finding indicates the need to give beginning teachers specific supports and scaffolds to further their development as reflective practitioners. This study adds to the literature on online video clubs for teacher education and identifies changes intended to improve the current design of the video activity in TIN.

For decades, there has been a nationwide demand to increase the number of science and mathematics teachers in K-12 education (National Research Council [NRC], 2007). Recently, teacher preparation programs have been successful in graduating enough teacher candidates to keep pace with the increased demand for secondary science and mathematics teachers (Ingersoll & Merrill, 2011); however, up to 50% of these new teachers leave the profession within their first 5 years of teaching (Smith & Ingersoll, 2004).

This poor retention of beginning teachers creates continued teacher shortages and a revolving-door phenomenon, as districts scramble to address this early attrition with the hiring of more beginning teachers. The education community must address what Ingersoll (2012) described as the "greening" of the teaching force: the fact that an increasingly large segment of the teaching force is comprised of beginning teachers who are at a high risk of leaving the profession.

An accepted approach to ameliorating this problem is the implementation of induction programs, which serve to support beginning teachers over time through professional development, mentoring, and collaboration (Smith & Ingersoll, 2004). Induction programs have been promoted as a means to reduce teacher attrition, and research shows that high quality induction programs (i.e., those that go beyond the simple provision of a mentor) improve teacher retention (Ingersoll, 2012; Smith & Ingersoll, 2004). This singular focus on the impact of induction programs on teacher retention has limited exploration of the potential of teacher induction programs to improve beginning teachers' instructional practices and student learning (Feiman-Nemser & Parker, 1990).

Science teacher induction programs can develop beginning teachers' capacity for inquiry-based and student-centered teaching strategies (Luft, Roehrig, & Patterson, 2003), but little research has investigated these particular benefits. While teacher retention is critical, looking more deeply into the effect of teacher induction programs on promoting reform-based teaching practices for new teacher participants is important at this time.

This study investigates the Teacher Induction Network, an online induction program for beginning secondary science and mathematics teachers. TIN is structured to help beginning teachers not only survive their first 2 years in the classroom but also advance their professional growth toward implementing the reform-based science and mathematics classroom practices advocated for in the *Framework for K-12 Science Education* (NRC, 2012) and *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000), respectively.

In particular, TIN was designed to provide support for teachers who have completed a high-quality teacher preparation program, serving as a bridge to professional practice and building upon knowledge and practices from their preservice program. This design extends reflection on reform-based practices into teachers' first school placements, as science teachers tend to revert back to traditional practices as they experience the reality of the classroom (Simmons et al., 1999).

Reflective practice is well established as central to the teaching and learning process of student teachers (Harford & MacRuairc, 2008; Zeichner & Liston, 1987), acting as a bridge between theory and practice through the integration of experience and reflection. Roehrig, Donna, Hoelscher, and Billington (in press)

identified video annotation as a tool to promote beginning teachers' reflective practices. Our previous research (McFadden, Ellis, Anwar, & Roehrig, 2014) revealed that, with proper scaffolding and support from the instructor, video annotation provides beginning science teachers the opportunity to think critically on their own teaching practice.

The current study extends our analysis of the use of video annotations by examining the technological and social affordances (Kirschner, Strijbos, Kreijns, & Beers, 2004) of the online video annotation tool through consideration of peer response annotations. The following research question guided this study: How do beginning teachers respond to a peer's initial annotations on his or her own teaching using a video annotation tool?

Supporting Literature

Within the classroom environment, teachers engage in a variety of tasks, from maintaining student engagement and sustaining lesson momentum to facilitating student learning. These actions create a continual array of dilemmas and choices with competing alternatives that require attention (Lampert, 2003). When considering the practice of teachers within the classroom, the use of video presents opportunities for promoting reflective practices not afforded prior to its inception and use in teacher education. The advantage of capturing video is simple: while teaching, teachers cannot stop to reflect on their practice, but video enables them to remove themselves from the demands of the classroom and to step back and examine classroom events (van Es & Sherin, 2008).

Given that teachers' knowledge is practical, personal, (Clandinin & Connelly, 1987), and contextualized (Brown, Collins, & Duguid, 1989), the opportunity to view oneself teaching has the potential to enable powerful reflection. Video, then, becomes a valuable means of supporting learning for teachers, as it facilitates the development of reflective practices, the examination of teaching from different perspectives, and the discussion of critical incidents and dilemmas (Le Fevre, 2004).

Teacher educators have used several video-based methods to promote teacher development. Two extensive reviews of the use of video in teacher education (Brophy, 2003; Wang & Hartley, 2003) revealed the predominance of video cases, both as a practice and research focus in teacher education. In a review of the literature related to the use of video in teacher education, Sherin (2003) concluded that two affordances emerge when using video: (a) video allows for a permanent record of classroom occurrences that can be viewed repeatedly to ensure capture of classroom complexity and student-teacher interactions, and (b) video provides the opportunity for teachers to develop an "analytic mind set" (p. 13).

In a follow-up study, Sherin and van Es (2009) identified three primary research agendas for the use of video in supporting teacher learning: increasing pedagogical repertoire, developing content knowledge for teaching, and "learning to notice" important features of classroom interactions. Van Es and Sherin (2002) stated that the development of reflective skills based on learning to notice important classroom events requires teachers to analyze video of their own teaching within a familiar context.

Existing research has focused on video reflection and teacher change through self-analysis (Brophy, 2003; Rich & Hannafin, 2009; van den Berg, 2001). Each of these studies maintained a focus on teacher self-analysis and did not consider the impact of peer feedback on video of teaching practice. While self-analysis is valuable for the beginning teacher, the knowledge that is built with a teacher's peers is deemed most useful (Staver, 1998), and an understanding of how beginning teachers support one another through video reflection is equally necessary. However, research investigating the use of video in teacher education with groups of teachers interacting in communities of practice is scarce.

Sherin and van Es (2005, 2009) identified video clubs as examples of groups of teachers that view and reflect on video of themselves teaching. Harford, MacRuairc, and McCartan (2010) examined a similar video club model with 20 preservice science teachers, wherein the participants viewed and discussed a wider selection of teaching episodes selected by their peers. These video clubs met in person in a preservice or professional development context in order to extend teachers' thinking about their own practice.

Knowledge about online video reflection in community is even scarcer. Rich and Hannafin (2009) described the variety of online video annotation tools available, and Rich and Tripp (2011) also set up guidelines as to how video annotation should be used. McFadden et al. (2014) explored beginning teachers' use of an online video annotation tool; however, they focused on the annotations made by the teacher in the video without regard to the peer interactions.

This research trajectory mirrors the trajectory of research on in-person video clubs, which first explored teacher self-reflection before considering the role of peer feedback in a community environment. Therefore, the next step in exploring online video reflection is to analyze the ways in which teachers support their peers through the use of online video reflection tools. Such work has the potential to support teacher educators in developing beginning teachers' reflective and reform-based teaching practices.

Theoretical Framework

National guidelines for teacher preparation and induction advocate the development of teachers as reflective practitioners (Council for the Accreditation of Educator Preparation, 2013). As we consider how participants in TIN reflected on their teaching practice, we must frame the work as researchers, instructors, and designers of this online environment (McKenney & Reeves, 2013) in the context of reflective practice.

Dewey (1933) and Rodgers (2002) stated that the primary objective of reflection *on* action is to promote the more difficult reflection *in* action. Reflection in action refers to the instantaneous response or action given in a situation as it unfolds in real time (Schön, 1984). Reflection on action occurs after an event via a conscious and disciplined process, ending with analysis of the experience and experimentation with possible methods of action (Rodgers, 2002; Zeichner & Liston, 1996). Video can aid in this process of reflection on action and allow the viewer to activate previously constructed knowledge (Eilam & Poyas, 2009).

The act of teachers viewing a video of themselves teaching provokes memory of a previous experience and provides opportunities for analysis and deliberation of possible future actions. Video annotation also challenges beginning teachers to move beyond a literal description of teaching events and think about why an event occurred. Van Es & Sherin (2002) referred to this phase as developing an argument and noted the importance of providing evidence to support claims about the effectiveness of an event. Online video annotation in an induction program can provide beginning teachers the scaffolds they need to push them beyond describing what happened toward improving what will happen.

Methodology

The Teacher Induction Network

The Teacher Induction Network (TIN) is an online induction program for beginning secondary science and mathematics teachers. TIN is part of the postbaccalaureate teacher preparation program at a large Midwestern US university. The teacher preparation program includes two components: initial licensure and completion of the M.Ed. degree. Preservice teachers enter the 15-month initial licensure program as a cohort, completing coursework including a three-course, subject-specific methods sequence with extensive supervised practicum and student teaching experiences in both middle and high school settings. An additional 12-credits are required postlicensure to complete the M.Ed. degree. TIN is offered as a three-credit online course that fulfills part of this 12-credit requirement.

The four primary course assignments within TIN are reflective journals, topical response forums, venture/vexation discussions, and professional development inquiries. These four assignment categories are described in detail in Roehrig et al. (in press). The context for the use of video annotation and the data for this study are the professional development inquiries (PDIs) that are detailed in this section, followed by a description of the video annotation tool.

The PDIs provided beginning teachers with an opportunity to investigate an area of concern or an area of their teaching that they wanted to improve. Prior to starting each PDI, teachers completed a self-assessment using Danielson's (2007) Framework for Teaching. Specifically, teachers were asked to evaluate themselves and identify areas for growth related to the five components of the instructional domain: communicating clearly and accurately, using questioning and discussion techniques, engaging students in learning, providing feedback to students, and demonstrating flexibility and responsiveness.

In each PDI, teachers critically examined their own science teaching in relation to their beliefs and commitments and developed the skills of data collection, analysis, and reflection. Thus, each PDI followed a reflective learning cycle, in which the participants planned for action, implemented their plan, and reflected on their actions, mirroring our theoretical framework for reflective practice.

After years of exploring various methods of accessing and viewing video from a distance (including mailing video cassette tapes), we chose VideoANT (http://ant.umn.edu) as a web-based tool to facilitate video reflection more efficiently. VideoANT is an Internet-based, browser-embedded, video annotation software application that allows a user to add time-marked text annotations to a

video of choice (Hosack, 2010). Figure 1 contains a screenshot of the software application in use.

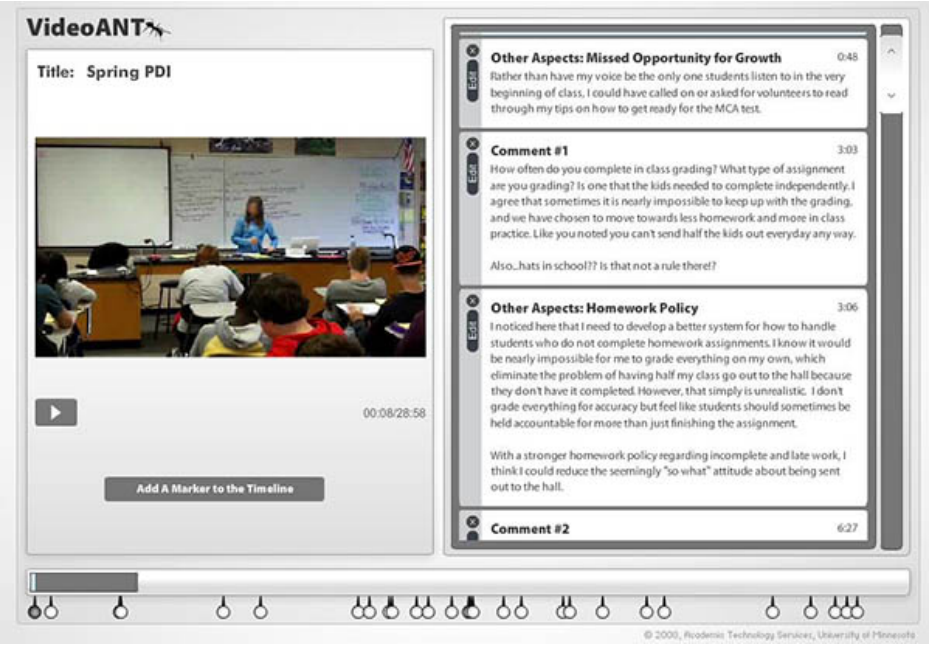

Figure 1. *VideoANT screenshot of Edith (a biology teacher) who is focused on improving her discussion and questioning techniques.*

In VideoANT, a timeline is laid out across the bottom of the screen below the video clip that contains place markers where previous viewers have placed annotations. Annotations created by multiple users are displayed vertically down the righthand column of the screen in alignment with the video being played for reading and response.

As part of the PDI, beginning teachers were directed to upload 20-30 minutes of classroom video and use VideoANT to provide evidence of their professional growth based on their specific goal or goals. After restating the goal for the PDI in their first annotation, a minimum of five annotations related to the goal were required with a clear explanation of how the selected moments provided evidence of growth related to the instructional goal. Beginning teachers were also required to add at least five more annotations related to any other aspects of teaching practices that they noticed.

Following the initial annotation by the beginning teacher, a peer was directed to respond to either the initial comments or events not noted in the beginning teacher's initial annotations. Peers were directed to include a minimum of eight additional annotations and a final annotation at the end of the video commenting on their partner's progress toward their goal. Otherwise, peers were not directed to comment on specific elements of practice or respond in a certain way.

This somewhat hands-off approach was intended to support the beginning teachers' development of self-efficacy while ensuring that crucial instructional

elements were not overlooked. The purpose of this study was to explore the nature of the peer responses in the absence of explicit directives from the instructor-facilitator.

Participants

Thirty-three beginning secondary science and mathematics teachers were enrolled in TIN between the academic years of 2009 and 2011. The vast majority of these teachers were engaged in their first or second year of classroom teaching in Midwestern K-12 schools and enrolled in this course in partial fulfillment of their M.Ed. requirements. The criteria for participant selection included (a) a complete PDI, including access to the beginning teachers' video, and (b) the availability of extractable peer annotations from the video for coding and analysis. Following these guidelines, a total of 19 teachers were included in the study (see Table 1). Participation in the study was voluntary, and the PDI was one of the primary graded course assignments in TIN.

Table 1
The 19 Beginning Teachers Who Comprised This Study

Teacher	Gender	Year	Partner(s)
Daria	Female	2011-2012	Clara
Lanie	Female	2011-2012	Natalie
Hank	Male	2011-2012	Bruce
Erica	Female	2011-2012	Chris
Briane	Female	2010-2012	Luke
James	Male	2009-2010	David
Alec	Male	2009-2010	David, Jasmine
Cindy	Female	2009-2010	David
Kari	Female	2009-2010	David
Mason	Male	2009-2010	Jasmine
Chris	Male	2011-2012	Erica
Jenna	Female	2009-2010	Morris
Paul	Male	2010-2011	Ben
Morris	Male	2009-2010	Jenna
Ben	Male	2010-2011	Pete
Cameron	Male	2010-2011	Steve
Bill	Male	2010-2011	John
Kathy	Female	2010-2011	John
Luke	Male	2010-2011	Briane

Data Collection

The data reported on here are digital peer annotations made by these 19 beginning science and mathematics teachers to their respective partners. Like themselves, their partners were developing their teaching practice by reflecting on their progress toward their PDI goal through the use of classroom video. VideoANT was used to share these videos and allow pairs of teachers to comment on their colleagues' progress while viewing the self-selected teaching episode.

Partners were asked to annotate responses made by their partner or remark on elements their partner had not noted. Each teacher was required to complete nine response annotations (eight related to events in the video and one related to the partner's PDI goal). These peer response annotations are the focus of this study.

Data Analysis

Nineteen videos of classroom teaching, ranging from 11 to 21 minutes and containing a total of 174 peer response annotations, were collated and categorized. Of these 174 annotations, 167 related directly to the events in the video, while 7 were comments relating to technical difficulties or other subjects beyond the scope of the video. The research team generated codes for peer response annotations inductively using constant comparative analysis (Patton, 1990).

The five codes for peer response annotations identified in this study were as follows:

1. Praise and/or general agreement of the initial annotation or teaching practice observed
2. Providing a suggestion concerning the teacher's practice
3. Posing a question (open-ended or yes/no)
4. Relating a teaching situation or initial annotation to one's own experiences
5. Summarization of a partner's progress toward a goal.

Table 2 presents these codes with their associated definitions and a brief example annotation that represents that code.

A single peer response annotation could be coded more than once. For example, a peer response annotation may offer praise and agreement in response to the initial poster's commentary and also provide a suggestion regarding the event in question. As a result, the research team generated a total of 242 codes from 167 original peer response annotations.

Results

A frequency analysis was performed on the 167 unique annotations posted by peers within VideoANT. Figure 2 shows the frequency of the categories for the annotation responses. From these data, we found that annotations coded as Praising and/or Agreeing With One's Partner formed the relative majority (40.5% of total codes). With the exception of the Summarization category, the three other response categories were represented relatively equally within VideoANT.

The following section provides exemplars of the generated codes, each followed by brief interpretive commentary.

Table 2
Summary of Identified Codes

Code	Definition	Example Annotation
Praise/Agreement	Approval of practice	What a great thing to do! You checked with another teacher as to the level of fairness of a test question. I like that a lot and try to do that as well (even though I often forget…) (Daria)
Suggestion	Recommendations for practice	While the students are up at the chalkboard writing, you could also be walking around and talking to you students here too. (Mason)
Question	Request for more information or inquiry into practice	How much time did you give to this project? Were they given as many attempts as needed in that time? (Paul)
Relate to Own Experience	Comparison of event to peer's prior experience	I like doing this too…it's worked well with my 9th graders this year. "Raise your hand when you know the answer but don't say anything…" (Alec)
Summarization	Commentary on teaching episode as a whole	It shows clearly that you have grown in your ability to engage students with questioning, simply from the engagement levels from the first few minutes to the last few minutes of this video. (Briane)

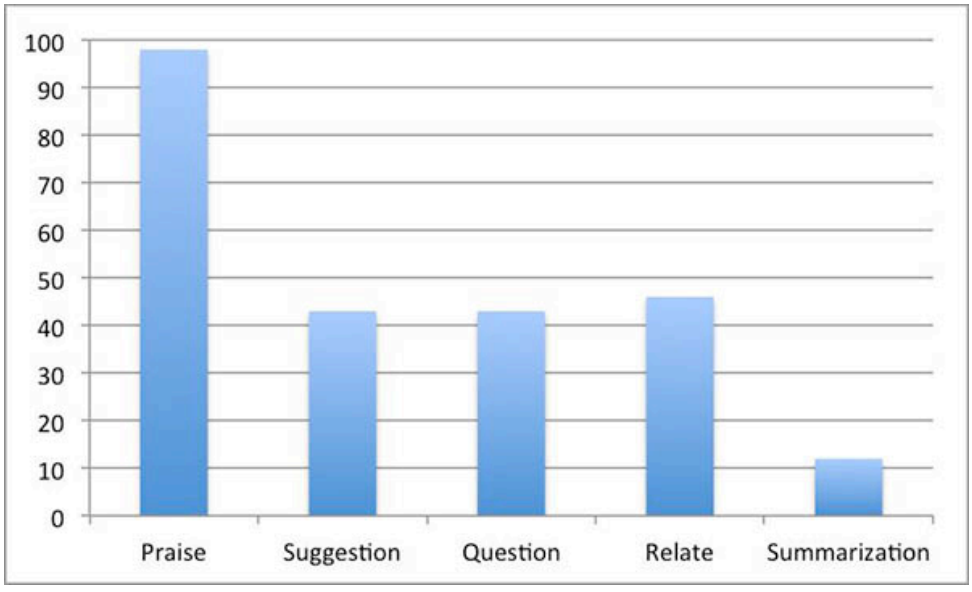

Figure 2. *Frequency count of response annotations and associated response category of teachers using a video annotation tool across all 3 years.*

Praise and/or Agreement

Peer response annotations coded as Praise and/or Agreement often contained comments that expressed the responder's similar views on a given subject or approval of a practice in the initial post. Others seemed more like pep talks, where the peer would provide support to a colleague's initial annotation. For example, John, a chemistry teacher, performed and explained a demonstration to his class. His partner Kathy provided the following annotations: "Good recognition...and explanation. It was very clear the second time. Everyone in class hits it hard after that!" and "Good movement around the room. You make sure to see everyone in the classroom."

Both annotations indicated praise and agreement with what was occurring in the video, but this kind of commentary does not promote deep reflection that could potentially lead to a change in teacher beliefs or practices. Instead, this commentary provides emotional support for beginning teachers, which is often found in induction programs and fails to help beginning teachers become good teachers (Feiman-Nemser, 2003).

Providing a Suggestion

The code Providing a Suggestion was given to peer response annotations where the peer offered recommendations for the initial poster's teaching practice. These suggestions ranged from recommendations of online resources to suggestions about teaching strategies. For example, in a lesson dealing with acids and bases, Ben responded to Paul as follows:

> Paul: [I] probably should have actually written that acids are below 7 and bases are above. [I] will need to fix that.
>
> Ben: Referencing stuff they've used in class helps connect the knowledge, and helps w/ the engagement factor. It's not something someone might think of, but every bit helps.
>
> Ben: I'd relate HCl being the same as stomach acid. Might not hurt to put a picture too, for those that remember through picture learning along with the words.

In this example, Ben supported Paul by providing a suggestion for future teaching situations. Paul concluded that a simple summary of the pH scale would have sufficed. Ben agreed that grounding current work in prior knowledge is helpful, and he went on to suggest a technique for increasing student engagement by relating the content to previous experiences in class as well as a real-life example. This suggestion may have served to extend Paul's thinking and provide him with a new strategy for when a similar situation arises again. This episode is an excellent example of the ability for classroom video to afford the discussion of critical incidents and dilemmas (Le Fevre, 2004).

Posing a Question

Annotations coded as Posing a Question demonstrated the responder's attempts to elicit more information about the event or push the initial poster to think more deeply about what transpired in the video. In some cases, both of these elements

were present within a single annotation. An example of a questioning peer response annotation follows:

> Did you notice a big difference in just general confusion during the lab? How well do you think the second class did just figuring out for themselves how to use the materials given? I think you mentioned this in a previous post, but how did you decide which class would get the cookbook lab and which would get the inquiry? (Jenna)

While some peer questions were posed in response to an annotation from the initial poster, this question is an example of the peer noticing events in the video that the initial poster had not addressed. As this example shows, posing a question can push the initial responder to compare situations, reflect on student direction, and think critically on actions in the lesson that they had not yet reflected on (Le Fevre, 2004).

Relating to One's Own Experience

In the category Relating to One's Own Experiences, the peer response annotations drew comparisons between the experience of the initial poster and the peer's experience in the peer's own teaching practice. For example, Bruce described the challenges he faced when conducting a lab simulation on classroom laptops, and Hank responded with an experience of his own:

> Bruce: Since my students are EL [English learners] and some have troubles following written directions I have to model how to use and run the site. I think this helps me avoid lots of questions regarding the program/lab but it takes away from class time.
>
> Hank: That's not an EL thing, I'm afraid. I had to do the same thing with my 9th graders who don't know what an address bar is.

In this example, Hank shared an experience from his classroom that may have helped to put Bruce's challenges in perspective or clarify the nature of his struggle. Without Hank's commentary, Bruce may have thought that modeling website navigation was only necessary for EL students. Through relating this challenge to his own experience, Hank demonstrated that this support can be helpful for non-EL students as well.

In many cases, a comment relating the event to the peer's own experience would be followed by the peer making a suggestion or posing a question. For example, Erica's partner Chris responded to her frustrations about her use of rhetorical questions and students' inability to analyze data and diagrams, providing an example of a peer response annotation that was coded as both Relating to One's Own Experiences and Providing a Suggestion:

Yeah this is always a tricky thing to lead students on a pathway of questions to elicit the correct response. We have done some of this in the form of POGIL's [Process Oriented Guided Inquiry Learning]....It is a worksheet/packet type activity, but it walks the kids through step by step objective questions about a diagram (much like those in the presentation) to more abstract and application type questions. It might be another tool to start your kids moving in that direction. It is also a good group/pair activity, and you get some good

discussions. Hard to do in lecture format though. I think you are tied to the white board...is there any way you could guide student writing within the presentation?? This is a tough thing though too, because they struggle to do two things at once such as writing and questioning or writing and listening.

Peers like Chris may have felt that their suggestions would be better received if they demonstrated that they had experienced similar situations. However, not all annotations with this code necessarily led to a question or suggestion; many peers simply expressed their solidarity or understanding of a success or challenge in the video without following up with a suggestion.

Summarization

The code Summarization was given to annotations that provided commentary on the video as a whole instead of on a particular event. The annotations that were made in relation to the partner's PDI goals frequently fell into this category. These annotations would wrap up the commentary that came before, usually occurring at the end of the video. For example, after reviewing his partner's video and making annotations that related to specific events or questions, Cameron summarized at the end of the video:

> I feel that you met the primary objective of providing timely feedback to students by being mobile in the classroom during this lab activity. I saw many examples of good evidence showing that you were very present as a resource for your students. Nice work-

By their nature, these annotations rarely referred to events happening at the time of the annotation itself, as was the case with the other annotation codes. Instead, these annotations served the instructor-facilitator's requirement for a final annotation at the end of the video commenting on their partner's progress toward their PDI goal.

Statistical Analysis

After discovering a high preponderance of peer commentary classified as praise and agreement, we explored possible correlations between response type and three factors. The first factor we investigated was the gender of the peer. Secondly, we looked for differences in peer commentary between the three academic years that comprised this study. Finally, we explored whether the responses from specific individuals were statistically significant from one another. Each of these three factors was analyzed using a chi-square test of independence.

The results of these analyses revealed no significant correlations between any of the three factors and response type. For differences by gender, $\chi^2(2, n = 242) = 1.74, p = .784$. For differences by academic year, $\chi^2(3, n = 242) = 11.20, p = .191$. For differences between individuals, $\chi^2(19, n = 242) = 77.60, p = .305$. Based on these results, we did not find any statistically significant correlations between gender and code frequency, year in TIN and code frequency, or individual peer and code frequency. These results suggest that the distribution and frequency of codes were independent of these factors.

Discussion

Beginning teachers face a wide array of challenges during the starts of their careers, and video clubs provide teachers the opportunity to reflect continually on and analyze their practice (Sherin & van Es, 2005, 2009). The ability to work with partners and colleagues within VideoANT afforded the teachers in our study the opportunity to struggle together (i.e., relate to their own experience), further analyze their teaching practice (if asked a question), and receive suggestions and guidance as they navigate obstacles in their first few years in the classroom. The video annotation activities embedded within TIN align with the views of Dewey (1933) and Rodgers (2002) relating to the development of reflective practitioners in the classroom. Furthermore, the emphasis on collaboration (Dewey, 1933; Rodgers, 2002) was maintained despite the potential challenge of facilitating the course completely online.

However, these results suggest that the mere presence of an online video club is not enough to encourage beginning teachers to reflect on their practice critically. Instead, the relative majority of peer commentary praised and affirmed the practices of these teachers, and commentary that would probe deeper into teacher practice and offer alternative solutions was less frequent.

This issue is particularly problematic in the context of an induction program. Luft et al. (2003) demonstrated that induction programs can promote inquiry-based and student-centered teaching strategies. It is possible but unlikely that peers' praise and agreement was directed toward beginning teachers' enactment of these strategies; indeed, the bulk of praise/agreement commentary was in response to classroom management and behavioral issues.

Within TIN, we want beginning teachers to develop their "analytic mind set" (Sherin, 2003) and define the bridge between theory and practice through reflective practice (Harford & MacRuairc, 2008; Zeichner & Liston, 1987), but this outcome is not possible when peers praise one another regarding nonreformed teaching practices. The fact that many peers engaged in critical commentary demonstrates that VideoANT is capable of supporting reflective and analytic discussions around beginning teacher practice. However, these results indicate that supports are needed to increase reflective commentary in this environment among beginning teachers.

Conclusions and Implications

The intent of the VideoANT activity in TIN is to provide teachers with a social and technological affordance (Kirschner et al., 2004) for reflecting on past teaching practice by sharing and commenting on a video of their instruction. The purpose is to allow teachers to explore their successes and struggles, identify elements of their teaching that contribute to those successes and struggles, and elicit feedback from peers that may guide the teacher toward improving their practice (Le Fevre, 2004). However, without explicit direction regarding the nature of the commentary, peers responded most frequently with praise and agreement, neither of which supports teachers in improving their practice (Feiman-Nemser, 2003). On the contrary, this kind of commentary may confirm and entrench current practices and inhibit the pursuit of new ways of teaching.

For example, there is one likely outcome of Kathy's simple statement of praise and agreement: John continues to teach as he has taught in the past without questioning his teaching practices or decisions. Praise and agreement cannot lead to teachers reforming their teaching practices; it can only confirm and entrench teachers' current practices. Feiman-Nemser (2003) noted that those who mentor and support beginning teachers need to be "teachers of teaching, not buddies" (p. 28) in order to help beginning teachers reach their goals.

As the purpose of TIN is to promote the development of teacher practice, this buddy effect can, in fact, be detrimental to beginning teachers. Additionally, a preponderance of praise may potentially lead to frustration, as new teachers are being told their practice is fine while they continue to struggle with "reality shock, the lonely struggle to survive, and a loss of idealism" (Feiman-Nemser, 2003, p. 27). In short, being nice could actually hinder teacher development and lead to continued frustration in the classroom.

The results of this study indicate that specific, explicit supports for teacher discourse in VideoANT are needed in order to foster the reflective practice that course designers and instructor-facilitators desire. Within VideoANT, this support may take the form of requirements regarding the nature of peer feedback commentary.

Based on the codes generated in this study, we intend to generate a set of guidelines for beginning teachers to consult as they provide feedback to their peers' videos of teaching practice. These guidelines would not only increase teacher awareness of the purpose of the VideoANT activity, but also formally guide them as they practice providing substantive feedback to their peers and receiving it in kind. Such explicit supports for reflective commentary may prove valuable in other TIN activities, where reflective practice is developed through other means, including individual reflective journals and problem-solving group forums.

Limitations and Future Work

A handful of limitations are associated with this study. First, the context of this study is a single course at a Midwestern US institution, where many of the participants had also enrolled for their initial teaching licensure. The effects of participation in the licensure program on teacher performance in TIN have not been explored. Second, two different instructors led TIN during the span of time encompassed by this study. Although we did not observe a statistically significant difference in response types between years, there may be other effects associated with different teaching styles and strategies enacted by the instructors. Finally, the fact that the context for this study is a single course with a small number of participants prevents us from generalizing these results to a larger context. However, the findings from this study can serve to inform future work in larger contexts as research in this area continues.

Video and its place within science teacher education are becoming more established as new technologies and opportunities for learning and reflection emerge. As researchers and instructors in TIN, we are actively seeking ways to change positively the course design in order to promote science teacher development. A future research avenue in this online induction environment could explore the relationships between teacher posts and peer responses in VideoANT annotations.

McFadden et al. (2014) considered how teachers used VideoANT to reflect on video of their own teaching. In this study, we have investigated how these teachers' peers provided feedback through VideoANT. While it was beneficial to investigate these two kinds of video annotation separately, future work might consider possible relationships between the nature of the initial posts from the teacher and the responses that the peer provides. For example, do more reflective initial posts influence the nature of the peer responses? Does the subject of the initial post have an effect on the reflective nature of the response? Work that explores questions such as these could shed light on the factors that influence teachers to respond more critically and provide more support to the teachers who are eliciting commentary on their teaching practice.

References

Brophy, J. (Ed.). (2003). *Using video in teacher education: Advances in research on teaching* (Vol. 10). Greenwich, CT: JAI.

Brown, J., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning.*Educational Researcher*, *18*(1), 32-42.

Clandinin, D., & Connelly, F. (1987). Teachers' personal knowledge: What counts as 'personal' in studies of the personal. *Journal of Curriculum Studies*, *19*(6), 487-500.

Council for the Accreditation of Educator Preparation. (2013). *CAEP accreditation standards*. Retrieved from http://caepnet.files.wordpress.com/2013/09/final_board_approved1.pdf

Danielson, C. (2007). *Enhancing professional practice: A framework for teaching*.Alexandria, VA: Association for Supervision and Curriculum Development.

Dewey, J. (1933). *How we think*. Chicago, IL: Henrey Regney.

Eilam, B., & Poyas, Y. (2009). Learning to teach: Enhancing preservice teachers' awareness of complexity of teaching-learning processes. *Teachers and Teaching: Theory and Practice, 15*(1), 87-107.

Feiman-Nemser, S. (2003). What new teachers need to learn. *Educational Leadership*,*60*(8), 25-29.

Feiman-Nemser, S., & Parker, M. (1990). Making subject matter part of the conversation in learning to teach. *Journal of Teacher Education*, *41*(3), 32-43.

Harford, J., & MacRuairc, G. (2008). Engaging student teachers in meaningful reflective practice. *Teaching and Teacher Education*, *24*(7), 1884-1892.

Harford, J., MacRuairc, G., & McCartan, D. (2010). 'Lights, camera, reflection': Using peer video to promote reflective dialogue among student teachers. *Teacher Development*, *14*(1), 57-68.

Hosack, B. (2010). VideoANT: Extending online video annotation beyond content delivery.*TechTrends, 54*(3), 45-49.

Ingersoll, R. (2012). Beginning teacher induction: What the data tell us. *Phi Delta Kappan, 93*(8), 47-51.

Ingersoll, R., & Merrill, L. (2011). The changing face of the teaching force. In D. Drury & J. Baer (Eds.), *American public school teacher: Past, present, and future* (pp. 143-152). Cambridge, MA: Harvard Education Press.

Kirschner, P., Strijbos, J. W., Kreijns, K., & Beers, P. J. (2004). Designing electronic collaborative learning environments. *Educational Technology Research and Development*,*52*(3), 47-66.

Lampert, M. (2003). *Teaching problems and the problems of teaching*. New Haven, CT: Yale University Press.

Le Fevre, D. (2004). Designing for teacher learning: Video-based curriculum design.*Advances in Research on Teaching*, *10*, 235-258.

Luft, J., Roehrig, G., & Patterson, N. (2003). Contrasting landscapes: A comparison of the impact of different induction programs on beginning secondary science teachers' practices, beliefs, and experiences. *Journal of Research in Science Teaching*, *40*(1), 77-97.

McFadden, J., Ellis, J., Anwar, T., & Roehrig, G. (2014). Beginning science teachers' use of a digital video annotation tool to promote reflective practices. *Journal of Science Education and Technology, 23*(2), 458-470.

McKenney, S., & Reeves, T. (2013). *Conducting educational research design*. New York, NY: Routledge.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.

National Research Council. (2007). *Rising above the gathering storm: Energizing and employing America for a brighter economic future*. Washington, DC: The National Academies Press.

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academies Press.

Patton, M. (1990). *Qualitative evaluation and research methods*. Thousand Oaks, CA: SAGE Publications.

Rich, P., & Hannafin, M. (2009). Video annotation tools technologies to scaffold, structure, and transform teacher reflection. *Journal of Teacher Education*, *60*(1), 52-67.

Rich, P., & Tripp, T. (2011). Ten essential questions educators should ask when using video annotation tools. *TechTrends*, *55*(6), 16-24.

Rodgers, C. (2002). Defining reflection: Another look at John Dewey and reflective thinking. *The Teachers College Record, 104*(4), 842–866.

Roehrig, G., Donna, J., Hoelscher, M., & Billington, B. (in press). Design of online induction programs to promote reform-based science and mathematics teaching.*Contemporary Issues in Technology and Teacher Education.*

Schön, D. (1984). *The reflective practitioner*. New York, NY: Basic Books.

Sherin, M. (2003). New perspectives on the role of video in teacher education. In J. Brophy (Ed.), *Using video in teacher education,* (pp. 1–27). New York, NY: Elsevier Science.

Sherin, M., & van Es, E. (2005). Using video to support teachers' ability to notice classroom interactions. *Journal of Technology and Teacher Education*, *13*(3), 475-491.

Sherin, M., & van Es, E. (2009). Effects of video club participation on teachers' professional vision. *Journal of Teacher Education*, *60*(1), 20-37.

Simmons, P. E., Emory, A., Carter, T., Coker, T., Finnegan, B., Crockett, D., ... & Labuda, K. (1999). Beginning teachers: Beliefs and classroom actions. *Journal of Research in Science Teaching*, *36*(8), 930-954.

Smith, T., & Ingersoll, R. (2004). What are the effects of induction and mentoring on beginning teacher turnover? *American Educational Research Journal*, *41*(3), 681-714.

Staver, J. (1998). Constructivism: Sounding theory for explicating the practice of science and science teaching. *Journal of Research in Science Teaching, 35,* 501–520.

van den Berg, E. (2001). An exploration of the use of multimedia cases as a reflective tool in teacher education. *Research in Science Education, 31*(2), 245-265.

van Es, E., & Sherin, M. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*,*10*(4), 571-596.

van Es, E., & Sherin, M. (2008). Mathematics teachers' "learning to notice" in the context of a video club. *Teaching and Teacher Education*, *24*(2), 244-276.

Wang, J., & Hartley, K. (2003). Video technology as a support for teacher education reform. *Journal of Technology and Teacher Education*, *11*(1), 105-138.

Zeichner, K., & Liston, D. (1987). Teaching student teachers to reflect. *Harvard Educational Review*, *57*(1), 23-49.

Zeichner, K., & Liston, D. (1996). *Reflective teaching: An introduction*. Mahwah, NJ: Lawrence Erlbaum Associates.

Author Notes

This study was funded by National Science Foundation grant 0833250. The findings, conclusions, and opinions herein represent the views of the authors and do not necessarily represent the view of personnel affiliated with the National Science Foundation.

Joshua Ellis
Michigan Technological University
Email: ellisj@mtu.edu

Justin McFadden
University of Louisville
Email: mcfad062@umn.edu

Tasneem Anwar
University of Minnesota
Email: anwar013@umn.edu

Gillian Roehrig
University of Minnesota
Email: roehr013@umn.edu