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Kim Hales

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About This Issue

Kim Hales, Editor-in-Chief
Utah State University

The goal of the Journal on Empowering Teaching Excellence (JETE) is to benefit faculty who teach by providing a place where they can share their ideas, practices, and research around teaching. The past few months, we have received many submissions that showcase the robust academic approach many of you are using to improve your classrooms and your level of professionalism. We have selected two especially focused articles that emphasize the use of meta-analysis to improve teaching in higher education.

Ekaterina **Arshavskaya**'s (2019) article, "Teachers' stories about teaching: Collaborative dialogues as Open Educational Resources" uses social constructivist theory to examine the collaborative nature of learning and how this can be applied when training new or pre-service teachers. By pairing video examples of expert teachers modeling successful classroom strategies, novice teachers are prompted to engage in "thought-provoking and relevant discussions" about best practice. By using Open Educational Resources (OER) to create a video database, prospective teachers are presented with meta-analysis of classroom variables such as instructor-student relationships (from formal to more informal) or the effects of body language. As Arshavskaya points out, "such videos can create spaces for reflection, knowledge exchange, and inspiration."

Diana Moss and Lisa Poling's (2019) article also uses social constructivist theory to build upon pre-service math teachers' pedagogical content knowledge "related to knowledge of student thinking through the use of professional noticing." Moss and Poling advocate for the use of "professional noticing" when developing pre-service teachers. They argue that "the work of mathematics educators is to scaffold what is attended to and how that information is being interpreted by prospective teachers." This practice fits with Vygotsky's social constructivist theory by framing math teaching conceptually rather than procedurally. This article, like

Arshavskaya's, encourages a meta-analysis of instruction through noticing. Use of the "attend, interpret, and decide" framework is carefully outlined in this articles and leads the reader to a better understanding of ways to make sense of student work, respond to student thinking, and become better educators.

As we prepare for the upcoming Empower Teaching Excellence (ETE) Conference in Logan Utah on Aug. 14th, we thought it would be useful to continue this theme of meta-cognition, regarding striving for excellence in higher education, by including a section on the upcoming conference. We invite our readers to attend the conference, if able, and look for selected proceedings papers in the Spring 2020 issue. We also invite those who wish to share innovative teaching practices and efforts in the scholarship of teaching and learning to submit a paper to for one of our upcoming issues.

We thank this issue's authors for their intelligent, thought-provoking work and welcome additional contributions to our future issues.

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Arshavskaya, E. (2019). Teachers' stories about teaching: Collaborative dialogues as open educational resources. *Journal on Empowering Teaching Excellence, 3*(1).

Moss, D. & Poling (2019). Using a noticing framework in a mathematics methods course. *Journal on Empowering Teaching Excellence, 3*(1).

Teachers' Stories about Teaching: Collaborative Dialogues as Open Educational Resources

By Ekaterina Arshavskaya, Ph.D.
Utah State University

Abstract

This paper examines the nature of teacher learning through a social-constructivist perspective and describes instructional strategies utilized with teachers during an international teaching assistants' (ITAs') training workshop offered at the Utah State University (USU). The strategy used involved eliciting and structuring exemplary teachers' stories about teaching to serve as a basis for class discussions and other assignments. These teachers' stories, recorded on video, were then shared online through the university website and YouTube. In this way, new teachers gained access to co-constructed and pedagogically appropriate teacher knowledge represented by authentic teachers' voices.

Introduction

> *"It's like everyone tells a story about themselves inside their own head. Always. All the time. That story makes you what you are. We build ourselves out of that story."*
>
> - Patrick Rothfuss, The Name of the Wind

Teacher education research has noted great benefits associated with the use of teachers' stories about teaching. For example, Elbaz (1991) contended that the sharing of stories produces collaborative dialogues that bridge the divide between classroom teachers and education researchers. Elbaz (1991) insightfully noted that "the story affects those who listen, and possibly also the teller, through the dialogue

that may take place between story-teller and audience, sometimes even changing the story" (p. 16). Teacher-authored narratives about teaching have been recognized as legitimate forms of teacher knowledge (Johnson, 2009; Park, 2013; Verity, 2000) and have been acknowledged as effective tools to prompt teacher learning, reflection, and even engagement with new instructional ideas and practices (Johnson & Golombek, 2011). Although many studies have been conducted utilizing teachers' written accounts and reflections on teaching (for a review, see Borg, 2006; Farrell, 2012), less attention was paid to teachers' oral accounts of their teaching beliefs and practices, and this paper aims to address this gap.

Besides, given the increased interest and spread of online technologies to promote teacher learning (Choppin, Amadour, Callard, & Carson, 2017; Hood, 2018; Tour, 2017), it is particularly important to implement and research the effects of these new technologies for teachers. The use of video-recorded interviews of expert teachers available online is one of the ways to promote thought-provoking, and relevant discussions with novice teachers enrolled in a teacher preparation course. While teacher educators have been utilizing online technologies in teacher education programs for an extensive amount of time, the research about how teachers utilize these technologies in their practice and for self-learning and what makes online learning particularly relevant for teachers is only beginning to emerge (Tour, 2017).

In this paper, I argue for the use of teachers' oral narratives about their teaching facilitated by video recordings and the Internet. The paper is grounded in a social-constructivist perspective (Lave & Wenger, 1991) on teacher learning and suggests pedagogical implications for using this instructional practice with international teaching assistants (ITAs) at the Utah State University (USU) and other American universities and in higher education more generally.

Literature Review

Use of teachers' stories about teaching

Many research studies have shown benefits from engaging teachers in writing self-authored accounts of pedagogical beliefs and practices (Johnson & Golombek, 2011; Whitney, 2008; Verity, 2000). Teachers' experiences with writing about teaching can be transformational. Some teachers can experience important changes in their

professional identity, such as gaining more confidence as a teacher, while others can realize various contextual constraints of educational institutions, such as standardized tests, and express commitment to creating meaningful educational experiences for students despite these constraints (Whitney, 2008). In another study, an experienced American language teacher used a personal journal to generate ideas about effective instructional strategies she could use in a new instructional context. She taught English as a Foreign Language (EFL) at a Japanese university (Verity, 2000).

International teaching assistants (ITAs) are graduate students from a variety of educational and cultural backgrounds assigned to teach undergraduate-level courses at American universities. While there exists an extensive body of literature examining ITAs' experiences in the U.S. universities (Gorsuch, 2011; Hebbani & Hendrix, 2014; Kuo, 2002; Trebing, 2007), less research was conducted on ITAs' engagement in oral and written discussions of their teaching while in the U.S. (Arshavskaya, 2016; Stevenson & Jenkins, 1994), and this paper aims to fulfill this gap.

Open Educational Resources (OER) and Use of Technology for Teacher Training

The Internet and other technologies have dramatically changed the ways we as teachers engage with our students in the classroom. One of the recent innovations involving instructional technologies is the use of free online educational resources, known as Open Educational Resources (OER). These resources can be freely shared, edited, copied, and used. The Open Courseware offered by the Massachusetts Institute of Technology (MIT) is considered the precursor of the OER overall (Weller, de los Arcos, Farrow, Pitt, & McAndrew, 2014). Despite the increasing interest in the OER, little research addresses the specifics of the use of the OER with non-native speakers of English (Thoms, Arshavskaya & Poole, 2018; Filatova, 2019).

More generally, given the characteristics of our students today, it seems impossible to imagine today's classrooms without the use of instructional technology. In fact, "digital natives" (Prensky, 2001) may also think differently since they learn information using technology, and this experience may affect how their brains form and develop. Because of this characteristic, more and more language instructors start to utilize the OER in their classrooms (Thoms et al., 2018). While many of these instructors have doubts about the quality of these materials and as a consequence, are uncertain about the ways to locate necessary and high-quality materials online, the

benefits of using the OER are numerous, including saving textbook costs for students and professors, providing more authentic language input, and allowing for various forms of media.

In the context of teacher training, research shows multiple possibilities and benefits associated with the use of technologies and the Internet to facilitate and enhance teacher learning. For example, research (Killeavy and Molloney, 2010) showed that blogging allowed language teachers to exchange ideas and created an interactive environment for learning. Blogs also enable teacher educators to further mediate novice teachers' learning through monitoring course participants' conversations and providing comments. Among other common instructional technologies used with teachers is the use of video-recorded teaching sessions to promote reflective teaching (Williams & Case, 2015).

More recent studies (Choppin et al., 2017; Hood, 2018; Tour, 2017) highlight the importance of using online technologies in teacher education programs, yet point out that despite this increased interest and use, little is known about how teachers utilize these resources in their practice and for self-learning. Among the characteristics that teachers name that make their learning in online contexts particularly useful are the social dimension of learning online and its personalized nature (Tour, 2017). Similarly, in this paper, I discuss how after exposing prospective ITAs to video-recorded interviews of former successful peers, the ITAs engage in collaborative discussions with each other (the social aspect) as well as can focus on the parts of interviews that seem particularly relevant to them (personalized learning).

Following a recent call to investigate the use of videos with the ITAs (Williams & Case, 2015), this paper describes a pedagogical innovation involving the creation of the OER through video-recorded interviews of several exemplary ITAs. Given recent educational developments, it is necessary to provide both teachers and students with high-quality and easily accessible educational materials. Creating online instructional videos seems one of the ways to move the field forward in this regard.

Theoretical Framing

According to the situated learning theory (Lave & Wenger, 1991), learning is primarily social. We learn through participating in social activities and engaging in various discursive practices with our family, peers, co-workers, and others. In their

seminal work, Lave and Wenger (1991) provide several examples about how humans learn various skills and kinds of knowledge, such as the apprenticeship among Yucatec Mayan midwives. This model can be as well applied to other contexts, such as educational settings where most of the teacher learning occurs.

Through the lens of the situated learning theory (Lave & Wenger, 1991), an expert teacher telling stories about his or her teaching is conceptualized as a mentor who has gained legitimacy of participation through engaging in the social activities of a given community and appropriating its discourse, while a novice teacher can be viewed as a mentee whose goal is to change his or her participation in the given community from peripheral to full. This process occurs through acquiring the discourse, knowledge, and skills required by the desired community of practice and is accompanied by the development of a professional identity (Lave & Wenger, 1998).

The process of gaining this legitimacy is embedded in power struggles in various hierarchical communities of practice. For example, Warhurst (2008)'s account of the mentoring experiences of new lecturers in a research-oriented U.K. university illustrated how institutional factors influenced the quality and quantity of feedback to newcomers. In particular, given the institutional focus on research, mentors provided limited feedback on the new lecturers' teaching and left the newcomers feeling isolated, inhibiting their professional growth.

From the situated learning perspective, acquiring the discourse of a desired community of practice is of key importance and, therefore, sharing exemplary teachers' stories about teaching is one of the ways to expose this discourse and engage viewers in virtual dialogue and thinking. Elbaz (1991) highlighted that "the sense of a community of teachers and researchers, working together, listening to one another, is especially important" (p. 16). The co-constructed nature of the dialogues with exemplary teachers and myself allowed to structure conversations in a way that highlighted the most relevant aspects of these conversations for the new teachers, yet it presents this knowledge in a highly accessible form, such as a story. Moreover, the genre of a story does not only presuppose the sharing of success stories but also may contain stories of instructional challenges, and their overcoming and lessons learned through this process. In what follows, I describe a pedagogical practice to create a community of story-tellers and listeners online, thus offering a possibility for collaborative learning experiences for teachers now and in the future.

Methods

Educational Context

Utah State University (USU) offers specialized training workshops for incoming foreign graduate students who elect to work as international teaching assistants (ITAs). ITAs come from several countries, such as India, South Korea, Brazil, Russia, China, and Columbia. Therefore, the goal of ITA training workshops is to familiarize ITAs with characteristics of the U.S. higher education system and support them in becoming effective teachers for undergraduate students enrolled at the university. ITA training workshops focus on the characteristics of teaching in the U.S. higher education system and involve several teaching demonstrations, some of which are video-recorded and reflected on by the presenters themselves. The workshops as well as involve U.S. undergraduate students who serve an audience for the teaching demonstrations and provide feedback to help improve these demonstrations for the ITAs.

Instructional Project

The project involved creating a series of video recorded interviews. First, during the spring of 2018, I met and discussed various aspects of teaching at the USU with several exemplary ITAs from India, Jordan, and Russia. I approached these ITAs based on the positive feedback of their professors, on their department recognition awards (i.e., one of these ITAs received the Best Graduate Instructor Award in his respective department), and, of course, on their outstanding performance in the training workshops led by me. The videos addressed the following topics:

- Potential challenges for ITAs;
- Insights from experience;
- Advice for new ITAs.

To elicit corresponding teachers' narratives, the following questions were asked to the participating ITAs:

- What are the instructional challenges you encountered while teaching in the U.S.?

- How does teaching in the U.S. compare to teaching in your home country (if this applies to your situation)?
- What insights did you gain through the ITAs' training workshops and teaching itself?
- What advice can you offer to new in-coming ITAs?

Our conversation started with these questions, but then I also asked several clarifying and follow-up questions in an attempt to elicit full and interesting responses from my participants. The videos were also illustrated by snapshots of the ITAs' actual teaching at the USU.

The Use of the Videos in the ITAs' Workshop

In this section, I highlight several interesting findings that I encountered while using the video-recorded interviews with the ITAs enrolled in the ITAs' training workshops. The video focusing on the challenges that the ITAs encountered while teaching in the U.S. for the first time mentioned that students would sometimes question their authority as a teacher due to their similar ages, and this challenge was hard to face by some of the interviewees. On the other hand, another interviewee emphasized the benefits of establishing more informal relationships with his students and even building long-term friendships with some of them. The nature of student-teacher relationships (from formal to more informal) and its consequences on classroom learning environments caused a thought-provoking discussion for new ITAs in the workshop and made them think of their own desired teacher identities that they wished to project in the classroom.

Another video in this series focusing on the insights gained by the ITAs through the training workshops and teaching itself showed that previously one of the ITAs had not been aware of some distracting body language he used while presenting. Upon being video recorded as part of the ITAs' training program, he realized this mistake and was able to subsequently improve this aspect of his teaching. When used during the workshop, this particular excerpt helped new ITAs to get familiar with some of the concepts related to teacher education and learning, such as the concept of teacher presence in the classroom manifested through confidence and certain body language. In other words, the new ITAs were introduced to some important educational discourse through a relevant, easy-to-grasp example.

Lastly, through the use of these videos, it was possible to establish a sense of learning community during the ITAs' training workshops. The final video about advice by the participating ITAs that can be useful for new in-coming ITAs mentioned continuing working on language skills. For example, instead of choosing roommates or friends from the same country, this ITA encouraged prospective ITAs to choose English-speaking roommates or friends. This arrangement could increase the non-native English-speaking T.A.s' opportunities for interaction in English. During the in-class discussion of this excerpt, many of the ITAs admitted their lack of confidence in their language skills and found this piece of advice particularly useful. This advice given by one of their more experienced peers who had faced a similar challenge while teaching in the U.S. helped to create a more relaxed and open atmosphere during the ITAs' workshop, allowing the new ITAs to acknowledge certain challenges they will face and to realize that they were not left alone with this issue. There were resources in the community (U.S. peers and roommates) as well as in their ITAs' workshop (several Canadian students) that they could utilize to improve their language.

Discussion

Overall, the project discussed in this paper has allowed creating the community of story-tellers and listeners that Elbaz (1991) proposed as an ideal environment for teacher learning. It is important that in terms of story-tellers, I selected the most deserving ITAs who gained their legitimacy of participation (Lave & Wenger, 1991) through effective teaching and overall academic excellence. Also, given the international background of most of my interviewees, the project expands the concept of the community of practice (Lave & Wenger, 1991) and blurs its clear boundaries due to the globalized and diverse nature of today's educational and work environments.

In their subsequent work, Lave and Wenger (1998) shifted the focus of their theory on identity formation and skills learned to achieve the desired identity. These identities and skills are often formed and learned through an informal kind of learning, such as through a conversation with a co-worker with regards to how to solve a particular issue at work. Similarly, we gain many aspects of teaching insights through informal office conversations with colleagues. The semi-structured interviews with exemplary ITAs allowed for some aspects of this informal learning to take place since

the conversations prompted the participants to share informal stories related to their teaching experiences that may be relevant to the new in-coming ITAs at different points of their careers. While I prepared a list of questions to ask, I also allowed the ITAs to share additional stories by asking them if there was anything else that they wanted to share at the end of our interviews. As I interviewed my participants, I paid attention to leaving some pauses between my questions to let them think, reflect on, and perhaps even question my assumptions. From the point of view of creating a community of story-tellers and listeners (Elbaz, 1991), it seemed particularly important to allow my participants to have this space to think and perhaps even to disagree with me.

Similarly to Killeavy and Moloney (2010), the online videos allowed to create a space for teachers' exchange of ideas about teaching. Besides, through externalizing their feelings and thoughts on teaching, my interviewees were invited to critically reflect on their experiences in the classrooms. The importance of teacher reflection is well-established in teacher education literature (Borg, 2006; Farrell, 2012), and this pedagogical practice offers a new way to promote teacher reflection, such as through semi-structured video-recorded conversations with a mentor teacher. Less research addresses the specifics of the use of the OER with non-native speakers of English (Thoms et al., 2018; Filatova, 2019), and this paper adds to this literature by sharing this pedagogical practice.

The telling and re-telling of stories about teaching also help the story-tellers realize the most important aspects of their teaching philosophy, allows a deeper reflection, and perhaps may even have a positive effect on teaching in the long term. Taken more broadly, the stories told by exemplary ITAs serve as platforms for class discussions during the workshops. Also, they weave into the discourse about teaching during the workshops and help build the professional identities of the participating ITAs since it is through acquiring the professional discourse and skills that we become central members of the desired communities of practice (Lave & Wenger, 1998).

The next video in this project will highlight experiences and advice from the U.S. and international faculty currently teaching at the USU as well as from ITAs' current mentors. It is expected that ITAs can greatly benefit from being exposed to various perspectives on teaching and teaching experiences before their actual teaching. In addition to asking the professors the questions I asked the ITAs, I will also inquire about how they were able to adapt their instructional practices to better fit the U.S.

educational context. These conversations about change and adaptation can be particularly useful for the ITAs who previously taught in their countries as T.A.s or even lecturers. All videos in this series are available at the following address: https://ieli.usu.edu/about/international-teaching-assistant-training

Pedagogical Implications

The online depository of the instructional videos discussed in this paper can be used in various ways by instructors teaching workshops at the USU and other universities. One of the ways to utilize them in the coursework is to watch them in class and ask ITAs to note interesting and arguably quotes from the video. New ITAs can also be asked to compare the educational systems of their respective countries to those mentioned in the videos. Besides, ITAs can be asked to reflect on the similarities and differences of teaching in their majors rather than those represented in the videos, such as engineering, language, and computer science. As a current instructor for these workshops, I noticed that my ITAs were particularly interested to watch and discuss these instructional videos since they feature someone to whom they can relate due to the similarity of their situations. At the same time, the ITAs in the video represent certain positive role models that new ITAs can aspire to become.

More generally, this practice can be used in higher education in other instructional contexts. For example, teacher educators working with both more experienced and novice teachers can invite both groups of instructors to share insights and challenges from their work environments. Such videos can create spaces for reflection, knowledge exchange, and inspiration.

Research Implications

This description of a pedagogical innovation offers implications for future research. The videos have been used and discussed by the ITAs at USU; however, no rigorous data collection or analysis has yet been conducted. In the future, it is worthwhile to evaluate the impact of these instructional videos on ITAs' learning during the workshops and perhaps subsequent teaching at USU.

Conclusion

Overall, the project has been particularly satisfying for all involved, including the participants, the audience, and myself. Creating a learning community is particularly important not only for our students but also for teachers. The video-recorded interviews containing both insights and challenges of teaching experiences can be used with ITAs at the USU and other U.S. universities. Moreover, this pedagogical practice can be utilized in other higher education contexts, such as teacher education programs.

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Using a Noticing Framework in a Mathematics Methods Course

By Diana Moss, Ph.D., Utah State University.
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Abstract

A noticing framework was introduced to prospective teachers (PTs) as a tool to use for analyzing student work. The purpose of this study was to determine the impact of PTs' use of a noticing framework for: 1) interpreting students' mathematical thinking; and 2) reflecting on and discussing future implications for teaching. The study also sought to determine where PTs needed, if any, further support in engaging in the process of noticing. Using a coding schema that reflected three levels of understanding (periphery, transitional, and accomplished), a frequency table was constructed that allowed PTs' use and understanding of a noticing framework to be analyzed.

Introduction

As prospective teachers (PTs) make the arduous journey from being learners of mathematics to becoming teachers of mathematics, the requirements of teacher education programs ultimately support or fail to support the understanding and knowledge gained (Dewey, 1933; Barnhart & van Es, 2015). Researchers have stated that to improve the practice of teaching one must be engaged in the sense-making of student conceptual knowledge and procedural knowledge with purposeful guidance (Dewey, 1933; Schon, 1983). According to Barnhart and van Es (2015), the work of mathematics educators is to scaffold what is attended to and how that information is being interpreted by PTs. Mathematics teacher educators (MTEs) then hold the responsibility to guide PTs in making instructional decisions that align with student understanding (Darling-Hammond & Bransford, 2005; Davis, Petish & Smithey,

2006; Zeichner & Liston, 1996). Without structured support, research has shown that PTs' analyses of student knowledge tend to focus on aspects of the classroom typically related to management rather than to student understanding of content (Barnhart & van Es, 2015).

Shulman (1986), with the introduction of pedagogical content knowledge, shifted the way in which MTEs thought about and taught mathematics to PTs. Shulman (1986) defined pedagogical content knowledge (PCK) as, (a) knowledge of ways of representing content and (b) knowledge of students' thinking regarding content including conceptions, preconceptions, and misconceptions. Vygotsky (1962), relating to the notion of PCK, stated that scientific knowledge provides a means for teachers to "interpret, transform, and reframe their information or spontaneous knowledge about students' mathematical thinking" (Carpenter, Fennema, & Franke, 1996, p. 5).

In their research, Stevens and Hall (1998) utilized disciplined perception, the act of noticing based on a particular profession. MTEs' use of disciplined perception becomes essential to the success of PTs and the manner in which PTs navigate the transition from learner to teacher of mathematics. Often, noticing is focused on the students' reaction to content, but for this study, we chose to focus on the way in which MTEs may or may not notice what their students bring into the classroom. For example, not only noticing students' understanding of content, but also pedagogy related to mathematics instruction. For this study, we focus on how MTEs support the development or fail to develop PTs' PCK related to knowledge of student thinking through the use of professional noticing.

Theoretical Framework

Professional noticing consists of three interrelated stages: Attending to students' strategies, interpreting students' mathematical understandings, and deciding how to respond (Jacobs, Lamb, & Philipp, 2010); it develops with practice as opposed to naturally with teaching experience (Jacobs et al., 2010). Employing the framework of professional noticing is based on intentional moves within a classroom setting, where individuals focus on specific aspects related to student learning. Professional noticing aligns with the *Standards for Preparing Teachers of Mathematics* (AMTE, 2017) and the

Principles and Standards for School Mathematics (NCTM, 2000) because it is a framework for teachers to build on students' mathematical thinking.

The Association of Mathematics Teacher Educators (AMTE) advocates that beginning teachers should "anticipate and attend to students' thinking about mathematics content" (AMTE, 2017, p. 6). Moreover, the National Council of Teachers of Mathematics (NCTM) states that "effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning" (NCTM, 2014, p. 10). Thus, MTEs need to provide experiences for PTs that allow them to analyze how students think about mathematics and support them in using this knowledge to plan and modify their instruction (Ball & Forzani, 2009; Clements & Sarama, 2014). MTEs can help PTs analyze mathematical thinking that, subsequently, informs teaching by including *the action* of professional noticing (Jacobs, Lamb, & Philipp, 2010) in their courses.

In their work, van Es and Sherin (2008) describe a three-part learning to notice framework which we chose to implement for this study: 1) select a noteworthy aspect within a classroom, 2) use knowledge about the context, and 3) make connections between classroom events and aspects of teaching and learning. When introducing professional noticing, we intentionally selected activities that were complex so that as PTs entered into the work we were able to define their level of understanding clearly. As an exploratory exercise, we asked our students to use professional noticing based on a series of student responses related to the question, "Mishaa has three dogs: Jason, Boy Blue, and Dakota. Jason is 5 years older than Boy Blue. Dakota is 3 years younger than Boy Blue. Their ages right now total 23. Figure out the age of each of Mishaa's dogs. Write down each dog's age and explain how you figured it out" (Seymour, D., DeGraw, M., & Ott, D., 1999).

Figure 1. Example student response (Seymour, D., DeGraw, M., & Ott, D., 1999)

By providing a specific and structured experience, we were able to scaffold student thinking and articulate the nuances of the professional noticing framework.

The third and final aspect of the van Es and Sherin (2008) model is the manner in which the professional noticing is tied to the teaching and learning within the classroom. Shulman's (1986) pedagogical content knowledge work is the foundation for this criterion.
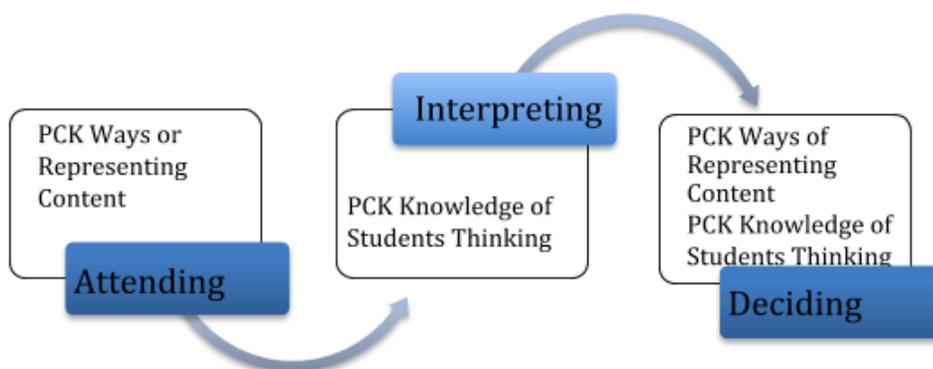

Figure 2. Relationship between PCK and Professional Noticing

The amalgamation of the concepts related to PCK and the professional noticing framework depicts the intersection of theory and practice (see Figure 2). PCK is a construct that develops over time but requires experience and integration in meaningful ways to support developing PTs. Philipp (2008) stated that PTs gain more "by learning about children's mathematical thinking concurrently while learning mathematics" (p. 8). Findings suggest that it is important for PTs to learn mathematics conceptually, as opposed to learn mathematics procedurally, so that they can teach their future students mathematics for understanding (Philipp et al., 2007). Although teacher noticing can be developed (Miller, 2011), learning how to notice develops with deliberate practice with purposeful experiences (Jacobs et al., 2010).

We describe an activity and the results of the activity in which the Noticing Framework, Attend, Interpret, Decide, (Thomas, Fisher, Jong, Schack, Krause, & Kasten, 2016; Jacobs, Lamb, & Philipp, 2014) was used and completed within a mathematics content/pedagogy class. PTs at our university experience three mathematics content/pedagogy courses. This activity was completed during their third and final mathematics course. The purpose of this activity was to: 1) to illustrate how to implement the Noticing Framework; 2) to encourage PTs to describe student understandings of mathematical content, based on their understanding of

mathematics education literature; 3) to allow PTs to see differences in how children respond to the same mathematical content and; 4) to identify gaps in PTs pedagogical content knowledge through the use of the Noticing Framework. The study aimed to explore the following questions:

1. How do PTs interpret students' mathematical thinking based on the Noticing Framework?
2. How do PTs reflect on and discuss future implications for teaching?
3. How can mathematics educators attend to PTs' novice interpretation of the Noticing Framework?

We fully understand that this research study is only a snapshot of the PTs ability to utilize the Noticing Framework, and do not expect a comprehensive understanding of the framework. However, an anticipated outcome for this study was to identify gaps in content knowledge, as well as, pedagogical decisions related to the PTs' interpretation of individual student needs. The Information gained through this study may focus MTEs' instructional practices with the intent of supporting the comprehensive development of the Noticing Framework.

The Instructional Activity

Before engaging in professional noticing, the PTs read the article *A New Lens on Teaching: Learning to Notice* (Sherin & van Es, 2003). In this article, the authors provide examples of how in-service teachers reflect on their teaching through noticing. It is essential for PTs to read this article to realize that noticing will help them make in-the-moment decisions (NCTM, 2000) and that there are a variety of ways to use noticing in their future classrooms. After the PTs have read and discussed the Sherin and van Es (2003) article, the MTE introduced the noticing framework to the whole class. PTs were prompted to come up with one to two questions that would help them to attend, interpret, and decide when analyzing student work. Figure 3 is an example of the questions.

Attend	What did the student(s) do?
	What strategies did the student(s) use?
Interpret	What does this mean about the student(s) understandings or misconceptions of the mathematics?
Decide	What are the next best instructional steps based on attend and interpret?
	What types of questions would you want to ask the student(s)?

Figure 3. Questions Corresponding to each stage of Professional Noticing

Once the PTs made sense of how to use professional noticing, the MTE gave them a mathematics problem to complete and provided them with student work to analyze in small groups using professional noticing. As a whole class, the PTs shared their analyses and discussed similarities and differences. Finally, the MTE posed the following questions (Figure 4) to the PTs. These questions are meant to stimulate the PTs' thinking about how to scaffold student learning and the next best instructional steps.

Summary Question 1	What is your mathematical agenda?
Summary Question 2	In a whole class discussion, in what order would you have the students share their work and why?

Figure 4. Summary Questions for PTs

At this point in the instructional activity, the MTE took on the role of a facilitator to encourage and manage discussions among the PTs. For example, there are often many different ways to interpret a student's mathematical understandings based on student work and, based on the interpretation, there are many different directions to go for the next best instructional steps. The MTE must have a robust knowledge of the mathematical content in order to guide the PTs to *notice* effectively. Indeed, this is a prime example of Shulman's (1986) PCK in action. In this instructional situation, the MTE modeled for the PTs what it looks likes for an instructor to call upon mathematical knowledge as well as drawing upon the MTE's knowledge of the ways students tend to engage with a particular problem representation, and what different responses tend to suggest to us about students' understandings. The MTE

emphasized that although the steps are interrelated, it is important to first understand what the student did before deciding on the next best instructional steps. A challenge for the PTs is thoroughly analyzing student thinking of the mathematics before making recommendations for further instruction.

Methodology

The study reported here was conducted in the Spring 2017 semester at a state university in the southeastern United States. Participants included 21 elementary school PTs enrolled in a mathematics methods and content course focused on the development of children's mathematical knowledge, skills, and dispositions over time and ways to adapt instructional strategies to children's learning needs. For this paper, we report on the qualitative analysis of data related to three PTs who were selected because they were present for all class sessions and their responses on the professional noticing assignment were more complete and detailed than others in the course.

After the PTs had completed the instructional sequence as outlined above, we provided them with a packet of a sixth-grade student's work on algebra problems. The packet included five assessments conducted over four-weeks on algebraic expressions and equations that align with the sixth-grade Common Core State Standards for algebraic thinking (NGA/CCSSO, 2010). The PTs were instructed to individually analyze the student work to address the sixth-grader's mathematical understandings using the Attend, Interpret, and Decide Framework described by Sherin, Jacobs, and Philipp (2011). We analyzed the PTs' written responses on each question for Attend, Interpret, Decide, using a coding scheme to assess what PTs' noticed which we adapted from van Es' (2011) framework for learning to notice student mathematical thinking. The coding scheme is described in Figure 5. To analyze PTs' work, we used open coding (Corbin & Strauss, 2014) to determine the noticing level for "attend", "interpret", and "decide" on each problem of the algebra assessments.

Noticing Level	Description
Periphery	Made general impressions (e.g. "Student understands the questions.")
Transitional	Highlighted noteworthy events, general impressions—but included why they believed something occurred (e.g. "The student used logic to reason through the problem.")
Accomplished	Used evidence to elaborate on student understanding, made connections between the work and the next steps

Figure 5. Coding Scheme for Professional Noticing

Figure 6 is an example of a sixth-grade student's work that the PTs analyzed using the professional noticing framework (see Figure 3 and Figure 4), an MTE exemplary example, an example of how three PTs *noticed* the student work and how each part of the framework was coded. To solve this problem correctly, the values for x and y must be substituted into the expression and simplified. For example, $2x + 5y = 2(4) + 5(7) = 8 + 35 = 43$.

Evaluate the expression for the given replacement values:
2x + 5y for x=4 and y=7

$$2·4 + 5·7 = \boxed{81} = Answer$$

	Attend	Interpret	Decide
MTE exemplary example (Accomplished)	The student plugged in 4 for x and 7 for y, but did not multiply by the coefficients. Students added 24 + 57 = 81.	The student understands that the variable is a quantity, but does not understand that 2x means 2 times x and 5y means 5 times y.	Provide the student with pennies and show that 2 pennies is 2p and then provide students with 5 one dollars and show that 5 one dollars is 5d, then do the problem in a context so that the student is given 4 cents and 7 dollars to plug into the expression.
Student 1	the student inserted the given numbers for the variables (periphery)	the student did not understand that you must multiply the variables (transitional)	go over variable +their function w/ this student (periphery)
Student 2	insert value of variable for variable next to preceding # (transitional)	doesn't understand distributive property (periphery)	explicit instruction w/parentheses (periphery)
Student 3	the student replaced x+y w/their values in the ones' place and student added 2 values together (transitional)	the student doesn't understand that a variable is multiplied by its paired value (transitional)	give the student values (single values) paired w/ a variable + have them multiply by replaced variable's # (periphery)

Figure 6. Student Work and exemplary example, an example of three PT's analyses of the student work and how they were coded

Results

Once all of the PTs responses to the sixth-grade student work were complete, and the responses were coded using the scheme developed for this project, results of the noticing levels of understanding were analyzed. Table 1 shows the overall frequency of each response coded as periphery, transitional and accomplished within the three sections of the noticing framework used.

Table 1. Frequency of Response Type

	Attending	Interpreting	Deciding
Periphery	34	46	73
Transitional	18	35	40
Accomplished	84	56	24
Blank	35	34	34
Total	171	171	171

Table 2 provides the percentages of responses based on level of understanding divided by the total number of responses minus all blank responses.

Table 2. Percentages for the Level of Understanding

	Attending	Interpreting	Deciding
Periphery	.25	.3358	.5328
Transitional	.1324	.2554	.2920
Accomplished	.6176	.4088	.2482

When relating the results to the first research question, how do PTs interpret students' mathematical thinking, PTs we able to correctly identify student thinking related to content 34% at a periphery level, 26% at a transitional level, and 41% at an accomplished level.

The results indicate that PTs have little experience with examining student work prior to this course. As PTs struggle to understand mathematical content related to algebra, it impedes them from being able to succinctly describe and understand what students are doing as they engage in mathematical thinking. The results also show that PTs seem to rely on their own experiences of learning mathematics when noticing student work. For example, many PTs commented on mathematical procedures and recommended explicit, direct instruction for the student (see examples in Figure 6).

The more telling results refer back to the second research question, how do PTs reflect on and discuss future implications for teaching? The results of this study indicate that PTs are unable to decide on appropriate instructional steps at an accomplished level. Seventy-five percent of the time, PTs responded at a periphery or transitional level when making decisions regarding instruction. For example, PTs made very general recommendations for teaching such as, "show how to better organize a problem" and "have student show work" as opposed to an exemplary example of "include more variables, progress into multiplication and division once the student understands addition and subtractions". These results guide MTEs to consider the additional support required to promote a more comprehensive understanding of pedagogical content knowledge. Based on this study, PTs also need more practice with analyzing student work with a focus on the mathematical content, reflecting on one's interpretation of student work based on the noticing framework, and making sense of analyses through discussion with other PTs.

Conclusion and Implications

In this study, framed by research on PCK and professional noticing, and with the implementation of a Coding Scheme for Professional Noticing (adapted from van Es, 2011) we were able to assess the development of PTs' use and understanding of noticing in the mathematics classroom. A focus on mathematical content knowledge, children's mathematical thinking, and ways of representing content were particularly important as PTs participated in the instructional activity. Preliminary findings

indicate that through a deliberate scaffolding of course activities and projects, MTEs can help PTs learn to identify some components of pedagogical content knowledge using the noticing framework. PTs were somewhat successful in identifying a student's level of understanding (interpreting) but demonstrated a decrease in their conception of deciding what would be appropriate future instructional steps.

PTs' noticing, especially deciding, did not progress as hoped and more research is needed to determine how to scaffold PTs' learning. Analysis of the student work data suggests that PTs have had little experience with examining student work prior to this course and struggle to decide on how to proceed once student understanding is analyzed. PTs' initial interpretations seemed to rely on their own content understanding related to algebra only and limited the PTs in their ability to apply appropriate strategies to promote conceptual understanding for students. These results indicate the need for MTEs to spend more time reflecting on and discussing implications for teaching.

Engagement in this work allowed us to see PTs' understanding of the Noticing Framework and their development related to PCK, so that we, MTEs, can better identify strategies that will scaffold PTs' understanding related to mathematical content and pedagogy. Based on the results of this study, we need to focus more time and attention on the pedagogical decisions related to classroom tasks. When working with PTs we often spend a significant amount of time focused on content, but this study has shown that content alone will only allow students to progress so far. It is the comprehensive nature of PCK and the Noticing Framework that will change PTs' understanding of what it means to be a teacher of mathematics. Learning in teaching is life long; MTEs need to provide PTs with the capacity and support to realize the nuances of productive and meaningful engagement.

While the results of this study are promising, we acknowledge that limitations exist. First, although the findings took into account PTs' noticing of five assessments completed by one sixth-grader conducted over four-weeks on algebraic expressions and equations, the small sample size of participants (PTs) reported in this paper mitigates the broader implications that can be inferred from the findings. Second, the same instructor taught the mathematics methods and content course in which the data was collected. Thus, the PTs' noticing that is reported in this study might have been influenced by the instruction that they received on how to analyze student work and reflect on the content systematically. Third, we only looked at the PTs' responses

for each question, rather than their overall level of noticing across the entire assessment. That being said, by analyzing their written responses on each question for Attend, Interpret, Decide, we have insight into how PTs make sense of student work and respond to student thinking. A more robust study would provide multiple data sources that capture the development of PTs' use and understanding of noticing in the mathematics classroom.

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Coming up: The USU Empowering Teaching Excellence Conference

Each year Utah State University hosts its annual Empowering Teaching Excellence Conference, designed primarily for instructors across the USU system to energize and inspire teaching innovation for the coming year. Presentations are faculty submitted, faculty led, and focused on teaching techniques that have worked well. Topics and presenters span multiple disciplines and delivery formats, and the proceedings of several presentations will be included in the Spring 2020 issue of the Journal on Empowering Teaching Excellence.

Those able to attend the conference on August 14 can find more information on the keynote and other speakers, plus a registration link, at https://empowerteaching.usu.edu/conference.

Session and Upcoming Proceedings Topics:

A sample of topics, intended for inclusion in the Spring 2020 Conference Proceedings issue, include the following:

Supporting Students: Engagement with Challenging Course Readings. Presented by Jessica Rivera-Mueller.

Many instructors assign course readings to purposefully enlarge students' perspectives. In doing so, though, instructors may face resistance from students who feel that such readings negatively press upon their belief systems and values. "Rhetorical listening," a concept developed by Krista Ratcliffe, however, can be used as a tool to navigate this tension. Because rhetorical listening revels how our readings of texts are always constructed, it can help students see their readings of texts as

constructed, rather than inevitable. Making this process visible is one approach for supporting students and engagement with challenging course readings.

An interdisciplinary approach to using rubrics for assessment, grading and feedback. presented by Anne L. Larson

Rubrics are traditionally defined as specific criteria for grading or scoring academic papers, projects or tests. In addition to streamlining grading, rubrics also provide clear expectations for student work, and structure to evaluations and feedback. Rubrics can also provide instructors with formative assessment of their own teaching practices. In this session, presenters will discuss the purpose and use of rubrics across disciplines. Presenters will provide step-by-step instructions for creating and using rubrics in Canvas, as well as example rubrics used for assignments with peer feedback, student groups, essays, etc.

Fintech and Finance Teaching: A Monte Carlo Approach, presented by Danjue Shang

We adopt the concept of Fintech that applies technology to improve financial activities (Schueffel 2018) and apply it in finance teaching. We suggest integrating programming into teaching of abstract or complex concepts. We also suggest teaching programming as a tool to serve students' learning of finance material, instead of as a pure computer science subject. It helps students better process both the class material and the programming technique. We demonstrate this approach in a case study, which also highlights how leveraging the power of programming helps mitigate the persistence of student difficulties in understanding the stochastic nature of statistical concepts.

Using Video Recordings to Assess Student Performance in Field-Based Experiences and Course Assignments. presented by Karen Hager Martinez

Panel members from the Department of Special Education will present examples of different ways they use student recorded video to assess student performance. All panel members are using GoReact, an online video feedback platform that allows the instructor to provide feedback on student-submitted videos using time-stamped comments. Examples include having students video record lessons they deliver in Pre-K-12 classrooms, interviews they conduct in family homes, and research

presentations. Panelists will also share strategies for providing feedback directly on the submitted video, and how they use video recordings for peer feedback.

ZOOM OUT and ZOOM IN: Engaging students in the art of revision. presented by Lianne Wappett

The word "revise" means to "see again" and this is exactly what students need when creating projects, proposals, and writing for public consumption. When creating, students are zoomed in. To revise, students need to learn how to zoom out, then in again. This workshop will cover a technique called ZOOM. It is a four-step process that gives students scaffolding to zoom in and out with specific criteria. Examples will be examined, and attendees will leave with a tool to help students embrace the art of revision.

Paper. Colored Pencils. One-pagers. A Creative Approach to Student Engagement. Presented by Denise Stewardson

A one-pager assignment is a student's visual representation of a specific area of study. Through the use of paper and colored pencils, students synthesize their knowledge of a topic by producing a creative one-page response to a reading or question. This activity requires critical thinking and reflection as students express their connections with, and reactions to a given subject. This strategy is used in a university breadth social science course with both small and large populations. The results are imaginative, creative, and insightful!

Ensuring Student Learning: How to Develop SoTL Projects. Presented by David Law

Good teachers ask themselves: Are my students really learning what I think they should be learning? Participants in this workshop will learn how to answer this question by developing SoTL (The Scholarship of Teaching and Learning) projects. There are five steps in developing SoTL projects: 1) generating the research question, 2) designing the study, 3) collecting the data, 4) analyzing the data and 5) presenting and publishing your SoTL project. After participating in the workshop, participants will be able to apply these five steps to ensure their teaching is resulting in student learning.

Engaging Students through Inquiry and Project-Based Learning in Interactive Video Conferencing Courses. Presented by Amy Piotrowski and Marla Robertson

Engaging students in distance courses can be challenging. Presenters will share ideas for incorporating authentic inquiry and project-based learning in these courses to enhance engagement and learning. These experiences can build a learning community and provide real-world applications of course objectives.

Hitting Pause: Practical Ways to Incorporate Reflective Learning Experiences in Teaching. Presented by a faculty panel moderated by Marlene Israelsen Graf

The objectives of this oral presentation are to (1) to demonstrate practical ways to effectively incorporate 'pauses' (reflective learning experiences) into teaching and (2) to highlight the powerful benefits of faculty-based Learning Circles. A Learning Circle is a community of faculty who meet on a regular basis to share ideas for active teaching strategies and discuss research and literature focused on effective pedagogy. The presenters have been participating in a Learning Circle at Utah State University since September 2018. As part of a larger group, they spent several months reading and discussing the book, Hitting Pause, by Dr. Gail Taylor Rice and worked together to understand and effectively implement 'pauses' in a variety of course types, sizes, and formats. Pauses or 'lecture breaks' are an example of an innovative teaching approach that facilitates student-centered learning, deep processing and meaningful reflection, student engagement, and student empowerment. The presenters will discuss some of their favorite 'pauses' and talk about their biggest challenges for application.

Scaffold Students as They Learn, Discover, and Engage by Writing in the Disciplines. Presented by Sylvia Read

This session will demonstrate and allow participants to experience strategies to support student writing in the disciplines. As students learn, discover, and engage with new genres of writing, they benefit from inquiry into the features of the genre, teacher modeling of how to write in the genre, and opportunities to collaborate with other writers. In addition, research supports rubrics that provide specific guidance and feedback.

Learn how to engage students online: A guide to strategies, content creation and design for successful online classes. Presented by Antje Graul

Being awarded the Best Online Bachelor‚Äôs Programs award in 2018, it is a priority to USU to launch high quality online classes that allow students to peruse their education while fitting it around job and family commitments. Thus, more than ever, guidance is needed on how to design an online class successfully. Drawing on the MSLE4545 design, this presentation exemplifies the strategic decisions regarding content creation, Canvas layout and design tools, as well as assessment ideas that increase students‚Äô engagement in an online class. Examples include video recordings, expert videos, skype calls, simulations, discussion boards, weekly quizzes and reflective statements.

International Students in Your Classroom: Understanding Challenges and Providing Support. Presented by Elena Shvidko

International students often experience challenges in their cultural adaptation and the development of listening, speaking, reading, and writing skills. Therefore, it is important for instructors to know how to help these students succeed in their academic environment. The purpose of this session is to help instructors understand these student's difficulties and find appropriate support. The presenters will first discuss student's most common academic and cultural challenges and then provide a list of suggestions to university instructors how to help students overcome these challenges. The suggestions include instructor's scaffolding, use of instructional technologies, and referring struggling students to university student services.

Dialogue vs. Discussion: Creating an Environment of Civility, Mutual Respect, and Acceptance. Presented by Avery Edenfield

This interdisciplinary session considers how educators can engage students in meaningful dialogue, particularly around controversial topics. Regardless of the discipline, rather than referee of a series of monologues on a topic, educators can use their role to facilitate/mediate dialogue that draws students into impactful conversations. Our goal is help educators to guide students into dialogue with each other as co-equal members of a learning community. And we see facilitation techniques drawn from grassroots community organizing as one way to start having those productive conversations.

Effective ways of using technology in college language classes. Presented by Arshavskaya, Ekaterina

Contemporary educators are surrounded by a huge variety of powerful teaching resources. Their success depends on their ability to design effective instruction which can be used by a diverse population of students regardless of what topic or subject they teach. In this session, we will introduce several technologies that were effective in our language classrooms by helping to increase student motivation and facilitate instruction. We will share our experiences of utilizing videos, digital portfolios and online games, and also will provide you with students' feedback on the use of these technology tools in our classrooms. Session attendees will walk away with a clear understanding of benefits of instructional technology in language classrooms and will be offered some tips on how to adapt these tools for the different levels and language skills of their students.

The Power of "The Ask": A Look at the Effect of Asking Students to Frequently Analyze Course Quality. Presented by Kristy Bloxham

Online courses can be difficult to improve because we don't get quick feedback from our students. By giving the students the opportunity to give anonymous feedback during the course you can not only improve the course more quickly but you also build student buy-in. By using this formative evaluation survey method you will not only improve the quality of the course more quickly but will likely raise end-of-course evaluations while you are at it.