

INVESTIGATING MTE QUESTIONING AS A RELATIONAL TEACHING PRACTICE

Alyson E. Lischka
Middle Tennessee State University
Alyson.Lischka@mtsu.edu

Signe Kastberg
Purdue University
skastber@purdue.edu

Susan L. Hillman
Saginaw Valley State University
shillman@SVSU.edu

As mathematics teacher educators (MTEs), we enact teaching practices in our mathematics methods courses as instantiations of practice for PTs. Questioning is a core practice in teaching (and learning to teach) mathematics that interacts with relationships between MTEs and prospective teachers (PTs). We engaged in a collaborative self-study to interrogate our questioning practice as part of relational teacher education with a goal of improving our questioning to reach all PTs. Observation and recordings of our questions during mathematics methods classes, collaborative conversations, and narratives were analyzed to describe characteristics of our questioning practice (Dillon, 1990) and determine how it is relational (Kitchen 2005b). We found commonalities in our questioning practice and identified ways to improve it. This serves as an exemplar for MTEs to inquire about their own questioning practice.

Keywords: Instructional activities and practices; Teacher Education-Pre-service

As mathematics teacher educators (MTEs), our teaching practice centers on the development of ambitious teaching practices (Kazemi, Franke, & Lampert, 2009) of the prospective teachers (PTs) with whom we work. We view our practice as relational in that it is complex and dependent on the strength of relationships developed between the participants (PTs and MTEs) involved (Bieda, 2016; Grossman et al., 2009a; Noddings, 2003). We extend our definition of relational practice beyond attending only to the mathematical or pedagogical thinking of the PT to include attending to the whole person (Kitchen, 2005a, 2005b; Noddings, 2003). Therefore, we strive to incorporate the experiences of our PTs as learners in our classes and interrogate our own practice as related to those experiences, thus valuing all learners.

Practices we enact in our mathematics methods courses become instantiations for PTs to experience and take up in formulating their own practices (LaBoskey, 2007). We promote the development of ambitious teaching practices by focusing on core practices (Grossman, Hammerness, & McDonald, 2009b). Asking questions of learners is one such core practice, as it occurs frequently in teaching mathematics, provides opportunities to find out about students' thinking, and is accessible to PTs learning to implement mathematics instruction. Although current research on questioning in the teaching of mathematics is available (e.g., Davis, 1997; Nicol, 1998; Parks, 2010), little research has focused on the instantiations of a questioning practice PTs experience in methods courses that prepare them to enact this practice. Yet, the form and function of questions asked in methods courses has potential for influencing PTs' views of questioning practices. We argue that the process of interrogating one's questioning practice as part of relational mathematics teacher education can inform ways to improve that practice as an instantiation which can be taken up by PTs.

Objectives of the Study

We interrogated our questioning practices as MTEs teaching mathematics methods courses to more fully understand the experiences of our PTs in these courses. The following research questions guided our self-study inquiry (LaBoskey, 2007): What are characteristics of our questioning practice? and, How is our questioning practice relational? Initial examination of our questions through the lens of Dillon (1981, 1990) illuminated tractable characteristics of our

practice. To explore the relational nature of our questions, we viewed them through Kitchen's lens of relational teacher education (2005a, 2005b, 2016). This lens afforded a view of our questions as drawing from our personal histories, experiences as MTEs, and our understandings of the PTs' histories and experiences and provided us a perspective which informed improvement of this practice.

Theoretical Framework

We define practice following Pinnegar and Hamilton (2009) as "engaging with others in ways that lead to the accomplishment of goals through the use of the knowledge, theories, and understandings" (p. 16). For us, questioning as a relational practice was always a goal directed activity informed by knowledge, theories, and understanding. We sought to build "knowledge from practice" (p. 17) as a way of "knowing to" (p. 18) question as a practice. In our inquiry we were driven to become aware of what informs our questions and ways we use questioning to build our relationships with PTs.

Relationships have consistently been identified as critical in teaching and learning (Russell & Loughran, 2007). Exploration of relationships in self-study has revealed the complexity of coming to know a PT and be known by a PT (Kitchen, 2009). The significance of relationships in teaching and learning gave rise to descriptions of relational practice. Grossman et al. (2009a), drawing from the work of Fletcher (1998), described teaching as relational practice in which relationship is used as a lever in teaching. This description highlighted the utility of relationships for PTs, but not ways in which teacher educators' practices could be characterized as relational. Kitchen's (2005a, 2005b) description of *relational teacher education* as teacher educators "knowing in relationship" (2005a, p. 18) illuminated how a relational practice is constructed through knowing: knowing oneself and knowing PTs. Like Fletcher (1998), Kitchen drew from notions of empathy (Rodgers, 1961) and vulnerability to describe relational practice. Kitchen identified seven defining characteristics of relational teacher education: understanding one's own personal practical knowledge, improving one's practice in teacher education, understanding the landscape of teacher education, respecting and empathizing with PTs, conveying respect and empathy, helping PTs face problems, and receptivity to growing in relationship. We hypothesize that core practices can be viewed as contributing to an MTE's relational practice. In particular, looking at questions an MTE poses through the lens of relational teacher education has the potential to unearth factors that influence the construction and posing of questions.

Questioning can be viewed as a strand of relational practice, since questions communicate the MTE's interests and aims to PTs and provide an opportunity to elicit PT's ideas. Each strand of one's practice contributes to the development of a relational practice, but one could question whether a single strand can be seen as relational. We suggest that one strand of practice can be viewed through a relational teacher education (Kitchen, 2005a) lens to gain insight into ways understandings of self and others are drawn upon in questioning. It is from this perspective that we can label questioning practice as relational. Research points to the complexity of questioning in mathematics classrooms (Davis, 1997; Parks, 2010), particularly when moving beyond evaluative questioning, and suggests that understanding the underlying influences on questioning can inform improvements in the practice. Questioning in a methods course introduces an additional level of complexity as MTEs use questioning to understand the mathematical thinking of PTs and their views of teaching and learning. Examination of MTEs' use of the core practice of questioning in teaching is then warranted as we strive to provide instantiations of effective questioning practice for PTs to draw upon, tacitly or explicitly, as they develop their own questioning practices (Mewborn & Tyminski, 2006).

Exploring questioning with self-study methodology (LaBoskey, 2008) created space for understanding questioning as a practice informed by philosophy (Berci & Griffith, 2005; Gadamer, 1975/2004) and empirical research (Dillon, 1982) with the goal of improving questioning. Our study of questioning, like that of Olsher and Kantor (2012), focused on question-asking and characterizing our questioning practice. We draw from Dillon's (1981, 1990) definition of questions as "interrogative utterances" which are "followed by answers" (Dillon, 1981, p. 51). Dillon (1990) described two sources of assumptions: assumptions in the logic of the question (question-sentences) called *presuppositions*, and assumptions about the context in which the question is asked (question-situations) called *presumptions*. Identifying our assumptions allowed us to identify characteristics of our questioning practices.

Methodology

LaBoskey (2007) described self-study methodology as interactive and improvement aimed. Drawing from LaBoskey's view, our interactions are best described as open, collaborative, and oriented toward reframing (Samaras & Freese, 2009). We opened our questioning practices to each other for scrutiny and engaged in collaborative conversations that created opportunities for constructing new perspectives on or reframing our questioning practice. These conversations further unearthed tensions underlying our questioning practice including ways that relationships informed our practice.

Data collection and analysis occurred in multiple ways as we studied our questioning practices. First, we observed each other teaching at least one class. In-person observations allowed us to situate discussions of questioning in particular contexts and teaching practice. In addition, each of us audio-recorded at least one class session. We then each catalogued questions we posed to PTs during at least one class session. What counted as a question was informed by our view of PTs' engagement. When PTs were exploring, whether prompted by a question or a directive, we considered the activity a question. Examples of questions from the transcripts illustrate differences in the content and approach (See Table 1).

Analysis of our questioning took place in three phases. First, we each identified questions, presuppositions, presumptions, purpose, and roles for PTs associated with questions from one class session and created a table (see Table 1). *Presuppositions* are assumptions conveyed in the logic of the sentence. *Presumptions* are beliefs conveyed in the question-situations (Dillon, 1990). *Purposes* refer to the reasons the MTE posed the question. *Roles* describe the ways in which PTs are positioned in responding to the question. We then summarized our findings, describing insights and remaining dilemmas about our questions, presuppositions, presumptions, purpose, and roles. We each read the summaries in preparation for our discussions of findings in four recorded online conversations (August 10 & 29 and September, 5 & 19, 2017).

Table 1: Examples of Questions

Alyson: The hat you are going to put on is that of the students that wrote the work. And you are going to look at the feedback that the other group wrote. And you are going to decide as the student who wrote that, that is the feedback that you got, what would you do next?
(9/13/2016)

Presuppositions:	Presumptions:	Purpose:	Role:
There is a next step to which mathematics-learners can reply.	PTs can pretend to be someone else and get into another person's thinking.	To mimic the act of receiving feedback with a chance to critically examine it after.	Mathematics-learner receiving feedback

Alyson: What I want you looking at now is what was the feedback and how did the math learner respond to it? Use your observations of those pairs to think about – do we have a complete list of what makes effective feedback? Are there some things you would suggest that we should not do? Are there some things you would suggest that we absolutely should do in responding? Can we use the feedback and student responses to that feedback to make some observations about, adding to or taking off of our list about feedback? (*1 minute pause.*) Are there some finer points that we need to add to this list about things we should consider when we are writing feedback to the students in the letter writing exchange? (9/13/2016)

Presuppositions:	Presumptions:	Purpose:	Role:
Our list of characteristics of feedback is incorrect and too generic.	PTs can draw conclusions from a mock example of feedback.	To examine instincts on providing feedback and position PTs to provide appropriate feedback in the actual activity with students.	Teacher-researchers

Susan: So, the text on this page [reads text on a page of a counting book]. So, what I want you to do is, if this were the question and you were reading this with a group of kids, I want to know what level of cognitive demand, based on the criteria for these levels of cognitive demand, where do you think this would fall? Is it a lower cognitive demand like memorization, or is it a procedure without a connection or is it more of a higher cognitive demand where it might be something related to a procedure with a connection or something that's more like doing mathematics, ... [elaborates by continuing to rephrase the questions] ... so think about that, and then of course I want you to think about how to justify your claim, there may be more than one answer here, ok, so, um I'll give you two or three minutes to work with your group or your partner, and see what you think. (9/12/16)

Presuppositions:	Presumptions:	Purpose:	Role:
Features of questions or tasks allow for classification according to cognitive demand. Depending on the question, the type of thinking is different.	PTs will use the chart describing the levels of cognitive demand to classify a task posed in a children's book.	Practice applying the levels of cognitive demand to questions or tasks and consider the type of thinking required in the task. Knowing the type of thinking required in a task is important in selecting tasks or questions for lesson planning.	PTs analyze tasks for thinking

Signe: What is a confusion you have seen out in the field? (3/6/17)

Presuppositions:	Presumptions:	Purpose:	Role:
Confusions can be seen in the field and are revealed through analysis of student thinking.	PTs are developmentally ready to identify confusions	Link lesson planning and insights about children's mathematics.	PTs conduct informal research to inform lessons

Our collaborative conversations served as a second phase of analysis. During this phase we focused on understanding the relational nature of our questions. We identified commonalities and differences in our presuppositions, presumptions, purposes, and roles for PTs. Our discussions focused on ways our questioning was influenced by our view of our own histories as learners and MTEs. For example, we recognized that our love of mathematics and interest in discussing mathematics learning and thinking with PTs influenced our questions. We further focused on ways our questions were influenced by the PTs, what we knew about them as people and learners. In particular, we pressed each other to explore how PTs' problems of practice were taken up or how empathy was conveyed (Kitchen, 2005b) in our questions. For example, Signe consistently wondered if the questions she was posing situated the PTs to respond from their own experiences rather than hypothesizing about the experiences of other teachers or mathematics learners. Discussions of these commonalities resulted in changes (or what we later called *fixes*) to the characteristics identified by the coding according to Dillon (1990). However, discussions of our fixes and the changes themselves provoked additional dilemmas about our questioning as a relational practice.

The third phase of analysis included writing narratives describing fixes we implemented in our questioning practice and dilemmas that remained. We read and discussed these narratives focusing on questioning as a relational practice. These discussions (December 12 & 19, 2017) were recorded and reviewed. From these discussions, we identified dilemmas, made sense of our questioning as relational, and developed assertions for action (Pinnegar & Hamilton, 2009).

Findings

We first present the common characteristics in our question practice as viewed through the lens of Dillon (1990). We then discuss the fixes applied individually in our practice as assertions for actions and highlight the dilemmas that remained relevant to our vision of relational practice.

Presuppositions and purposes

Presuppositions and purposes revealed reference to knowledge we consciously held and wanted to bring to PTs' attention. For example, Susan believed a teacher's awareness of the cognitive demand of mathematics tasks was important. The logic of her questions included the assumption that analyzing the demand of tasks is an essential part of planning lessons. For example: "I want to know what level of cognitive demand, based on the criteria for these levels of cognitive demand, where do you think this would fall?" (September 12, 2016). This example illustrates that, our questions contained expectations that PTs should accept our views of teaching and learning rather than developing views from their own experiences, including from their experiences in our courses.

Presumptions and roles

Presumptions and roles involved intent, contexts, and PTs. We consistently asked questions with the intent of learning what PTs knew. Signe asked about confusions PTs noticed in their work with children. "What is a confusion you have seen out in the field?" (March 6, 2017). Her intent was to gain insight into PTs' experiences. We wondered if we used PTs' responses in our teaching. We collected PTs' experiences with a desire to understand their insecurities and problems of practice (Kitchen, 2005b), yet our planned lessons played out without drawing from the issues PTs raised. We had empathy and respect (Kitchen, 2005b) for PTs, but struggled to convey it or help PTs face problems they described. Instead our questions focused on moving toward goals and implementing instructional activities we had planned before we knew the PTs. In this way we viewed our questions as "information-seeking" (Davis, 1997, p. 363) in that we wanted to understand PTs' thinking, but that thinking did not influence our teaching.

Additionally, our questions positioned PTs to take on a variety of roles during a single lesson. Alyson noticed that her questions positioned PTs in many different roles during one class meeting, roles such as reflective practitioner, researcher, teacher, and learner. She thought of *Whose Line is It Anyway?*, a television show where actors change roles or themes after a minute or two, generating chaos and comic situations. She felt she expected too much of PTs and wondered: What messages about teaching as reflective practice, might PTs gain through shifting roles so quickly and frequently?

Assertions for action and understanding (Pinnegar & Hamilton, 2009)

The analysis of our assumptions (Dillon, 1990) motivated fixes that improved our questioning practice. We eliminated long introductions, multiple roles, and identified the PTs as actors in questions. Dilemmas that remained focused on the relational nature of our questioning practice. Next, we describe the fixes each MTE made, improvements that resulted, and dilemmas that remained in terms of relational teacher education (Kitchen, 2005b).

Susan. Susan fixed her long introduction to questions by consciously posing planned questions. This fix unearthed a significant tension. Reducing the introduction to questions freed up time for PTs' interests and concerns. Their responses in whole class discussion surfaced their concerns and dilemmas or insecurities with teaching mathematics related to their experiences in their field classrooms. These interests and concerns turned the discussion in directions Susan had not anticipated, making it difficult to cover planned content. In addition, Susan wondered if she was listening to the PTs with empathy. Was she participating mindfully and thoughtfully, respecting PTs' contributions to the discussion (Kitchen, 2005a, 2005b)?

Susan found a dilemma between providing time and space for PTs to articulate their experiences, concerns, and insecurities about teaching mathematics (i.e., helping PTs face problems; Kitchen, 2005b) and being able to acknowledge and build on their ideas, while also trying to cover course content. Susan felt most comfortable when the discussions remained anchored around the mathematics content, and less so when the class discussions drifted into more general issues of pedagogical moves. Yet, teaching about mathematics teaching requires facility with the blending of mathematics content and teaching practices (Perks & Prestage, 2008). What is an appropriate balance and blend of content and methods that provides time and space for PTs to connect through sharing and raising their interests, concerns, dilemmas, and insecurities?

Alyson. Alyson began using a new planning method that provided for more concise questioning and positioned PTs consistently either as teachers or learners of teaching. Yet Alyson was left wondering if she was truly conveying empathy (Kitchen, 2005b) through those questions and positionings. Through the roles employed, Alyson was seeing PTs' thinking more clearly and better understanding their struggles but was left with questions about the relational characteristic of conveying empathy. Some PTs responded with favorable comments about Alyson's teaching during the semester, yet others struggled to find their way and began to doubt themselves as teachers. Alyson was left wondering whether the changes she had made had allowed her to convey empathy to *all* PTs?

Signe. Signe wondered if she was actually curious about learning about teaching. Raising this issue unearthed tensions for Signe about her receptivity to growing in relationship (Kitchen, 2005b). Signe felt that she wanted to learn from PTs, but perhaps her curiosity had a different focus than that of PTs. Wondering about her curiosity about teaching was difficult to admit and left Signe feeling distanced from her colleagues. Signe sincerely loved thinking about children's mathematics and teachers' insights about and use of this mathematics, while Signe viewed PTs as focused on improving pedagogical techniques. Neither seemed right or wrong, Signe simply

worried. As she tried to enact a questioning practice aligned with Dillon's (1981) suggestion that questions should be asked only when the teacher is actually curious about a learner's thinking, she was faced with her limits. How could she be curious about the more general practices and holistic views of learners PTs shared?

Discussion

Despite significant differences in our context, we identified common characteristics in our questioning practice when we applied Dillon's (1990) framework and examined our presuppositions, presumptions, purposes, and roles. Even though we work in different institutional contexts and programs (e.g., Signe and Susan work with elementary PTs and Alyson with secondary PTs), we could describe common characteristics in our questions, allowing us to answer the first research question. We saw our own histories and experiences reflected in the presuppositions and purposes of our questions. Presumptions and roles provided insight into our exploration of PTs' histories and experiences and how we engage PTs in drawing from those experiences to inform and inspire their practice. With surface level commonalities identified and fixes applied, we could then see the different ways these factors influenced the relational nature of our practice as we developed and posed our questions (Kitchen, 2005a, b).

The examination of our questioning practice in methods courses afforded each of us the opportunity to consider ways in which we were relating to our PTs through questioning and the types of instantiations of practice PTs were experiencing. Both Alyson and Signe found issues with the ways in which they positioned PTs during class sessions. Alyson was positioning PTs in a great variety of roles and Signe was positioning PTs to draw on experiences other than their own. For each, this inappropriate positioning of PTs could hinder their relational practice. The core practice of questioning as relational, assumes that the questioner draws insights from the learner and makes use of those insights to move the lesson forward. Davis (1997) has described the reciprocal relationship involved in such questioning in the domain of mathematics. In mathematics teacher education, feedback PTs provided that is not used may suggest the MTE is not listening, thereby introducing an unintended barrier between the MTE and the PT. As a result of this finding, both MTEs have introduced more careful positioning of PTs into their courses.

All three MTEs have found the results to indicate a need for clearer communication and purposeful word choice with PTs. Signe identified a need to phrase questions differently so as to position PTs to respond from their own perspectives. She accomplished this by attending carefully to the choice of words used in her questions. Susan and Alyson identified a tendency to ask a series of related questions in quick succession rather than one purposefully chosen question. They each addressed this issue in ways that ensured one clear question is asked and then time is provided for PTs to contemplate and respond. Improving the clarity of communication with PTs removes another unintended barrier to relational practice.

Through inspection of the core practice (Grossman et al., 2009b) of questioning in a mathematics methods course, we found ways to improve that practice so that it more closely aligns with our goals of relational teacher education (Kitchen, 2005a, b) and includes more opportunities to draw on our PTs' experiences hermeneutically (Davis, 1997) during class activities. Building public exemplars of practice such as this for instructors of mathematics methods courses provides much needed opportunity for MTEs to engage in inquiry about those practices in order to seek improvements in our work.

References

- Berci, M., & Griffith, B. (2005). What does it mean to question? *Interchange*, 36, 405-430.
- Bieda, K. (2016). Taking stock: MTE's contribution to building a knowledge base for the practice of mathematics teacher education. *Mathematics Teacher Educator*, 5(1), 3-7. <https://doi.org/10.5951/mathteacheduc.5.1.0003>
- Davis, B. (1997). Listening for differences: An evolving conception of mathematics teaching. *Journal for Research in Mathematics Education*, 28(3), 355-376.
- Dillon, J. T. (1981). To question and not to question during discussion. *Journal of Teacher Education*, 32(5), 51-55.
- Dillon, J. T. (1982). Cognitive correspondence between question/statement and response. *American Educational Research Journal*, 19, 540-551.
- Dillon, J. T. (1990). *The practice of questioning*. London: Routledge.
- Fletcher, J. (1998). Relational practice a feminist reconstruction of work. *Journal of Management Inquiry*, 7, 163-186.
- Gadamer, H. (1975/2004). *Truth and method*. (J. Weinsheimer & D. Marshall, Trans. Second ed.). London: Continuum.
- Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson, P. (2009a). Teaching practice: A cross-professional perspective. *Teachers College Record*, 111, 2055-2100.
- Grossman, P., Hammerness, K., & McDonald, M. (2009b). Redefining teaching, re-imagining teacher education. *Teachers and Teaching*, 15(2), 273-289. <https://doi.org/10.1080/13540600902875340>
- Kazemi, E., Franke, M., & Lampert, M. (2009). Developing pedagogies in teacher education to support novice teachers' ability to enact ambitious instruction. In B. Hunter, B. Bicknell, & T. Burgess (Eds.), *Crossing divides: Proceedings of the 32nd annual conference of the Mathematics Education Research Group of Australasia* (Vol. 1, pp. 11-29). Palmerston North, New Zealand: MERGA.
- Kitchen, J. (2005a). Looking backward, moving forward: Understanding my narrative as a teacher educator. *Studying Teacher Education: A journal of self-study of teacher education practices*, 1, 17-30.
- Kitchen, J. (2005b). Conveying respect and empathy: Becoming a relational teacher educator. *Studying Teacher Education: A journal of self-study of teacher education practices*, 1, 195-207.
- Kitchen, J. (2009). Relational teacher development: Growing collaboratively in a hoping relationship. *Teacher Education Quarterly*, 36(2), 45-62
- Kitchen, J. (2016). Looking back on fifteen years of relational teacher education: A narrative self-study. In J. Williams & M. Hayler (Eds.), *Professional learning through transitions and transformations: Teacher educators journeys of becoming*. Switzerland: Springer.
- LaBoskey, V. K. (2007). The methodology of self-study and its theoretical underpinnings. In J. Loughran, M. L. Hamilton, V. K. LaBoskey, & T. Russell (Eds.), *International handbook of self-study of teaching and teacher education practices* (pp. 817-869). Dordrecht, The Netherlands: Springer.
- Mewborn, D. S., & Tyminski, A. M. (2006). Lortie's apprenticeship of observation revisited. *For the Learning of Mathematics*, 26(3), 23-32.
- Nicol, C. (1998). Learning to teach mathematics: Questioning, listening, and responding. *Educational Studies in Mathematics*, 37(1), 45-66. <https://doi.org/10.1023/A:1003451423219>
- Noddings, N. (2003). Is teaching a practice? *Journal of Philosophy of Education*, 37(2), 241-251.
- Olsher, G., & Kantor, I. (2012). Asking questions as a key strategy in guiding a novice teacher: A self-study. *Studying Teacher Education: A journal of self-study of teacher education practices*, 8(2), 157-168.
- Parks, A. N. (2010). Explicit versus implicit questioning: Inviting all children to think mathematically. *Teachers College Record*, 112(7), 1871-1896.
- Perks, P., & Prestage, S. (2008). Tools for learning about teaching and learning. In B. Jaworksi & T. Wood (Eds.), *The international handbook of mathematics teacher education: The mathematics teacher educator as a developing professional* (Vol. 4, pp. 265-280). Rotterdam: The Netherlands: Sense.
- Pinnegar, S., & Hamilton, M. (2009). *Self-study of practice as a genre of qualitative research: Theory, methodology, and practice*. Dordrecht.: Springer.
- Rodgers, C. (1961). *On becoming a person*. Boston: Houghton Mifflin.
- Russell, T., & Loughran, J. (2007). *Enacting a pedagogy of teacher education: Values, relationships and practices*. New York, NY: Routledge.
- Samaras, A., & Freese, A. (2009). Looking back and looking forward: An historical overview of the self-study school. In C. Lassonde, S. Galman, & C. Kosnik (Eds.), *Self-Study research methodologies for teacher educators* (pp. 3-20). Rotterdam: Sense Publishers.