

Investigating and Supporting Teacher Learning by Attending to the Coevolution of Participation across Settings

Elham Kazemi

University of Washington, USA

Paper prepared for Working Group 2: *The Professional Formation of Teachers*
Symposium on the Occasion of the 100th Anniversary of ICMI. Rome, Italy, March 5–8th, 2008

In this brief paper, I discuss my concerns with how we investigate teacher learning in and from professional development (PD) and how we design professional education to support teacher learning in mathematics.

A perennial concern of research on PD has been to focus on what teachers learn as a result of their participation in PD. Questions are framed unidirectionally: to what extent does participation in PD impact teachers' classroom practice? As we look to the future of research in mathematics education, I argue that we need to disrupt this prevalent view and offer a new way of conceptualizing the relationship between teachers' experience in PD and their classroom practice. We should examine whether and how teachers' participation across these settings *coevolve* over time and how this coevolution affects teachers' participation in each setting. My goal is to explain the significance of this re-conceptualization and show how it may advance our studies of and designs for PD.

Images of Learning

Let me begin with a brief image of teacher learning. Imagine a series of PD sessions. A group of teachers meet regularly. Each time, they bring in examples of student work from their classrooms and talk about how their students reasoned about a common problem every teacher in the group had just tried in their classroom. After sustained participation in these sessions, we notice that some teachers' classroom practice has transformed dramatically. But this is not true in all classrooms. The footprint of the PD experiences is pronounced in some and less so in others. As we study what teachers experienced in the PD and what they tried in their classrooms, we notice a striking pattern. Consider Lupe's experience, for example. She came to each PD session with questions about what she tried in her classroom and what she noticed. She left those discussions with ideas about what to investigate or experiment with next in her classroom. Her participation in PD helped her rework her classroom practice, and her classroom practice helped her make sense of her engagement in PD activities. Other teachers, like Juan, also got ideas from the PD sessions that they tried in their classroom. They searched for worthwhile tasks that would help their students develop their knowledge. They shared these strategies during PD sessions but provided less detail about what their students did and thought than the first group of teachers I described. In contrast to teachers like Lupe, their work in the classroom rested more on posing tasks and managing time rather than finding ways to bring students' ideas into more purposeful engagement with one another. Their engagement across settings was more loosely coupled whereas for teachers like Lupe, their participation in one context propelled their participation in the other and vice versa. It is precisely this relationship across contexts over time that is the focus of this short paper.

Examining the Coevolution of Participation Across Settings

I am concerned with the dynamism across settings and how that shapes teacher learning.

To develop this idea further and specify a way of talking about learning, I draw on Cook and Brown's (1999) distinction between knowledge and knowing. Knowledge, in their view, is something that we "possess." We "deploy" this knowledge in our actions. In their words, "Knowing refers to the epistemic work that is done as part of action or practice, like that done in actual riding of a bicycle or the actual making of a medical diagnosis" (p. 387). Knowledge, then, can be seen a tool of action because individuals or groups can use knowledge (whether tacit or explicit) to discipline their interactions with the world. This distinction seems both relevant and important in thinking about teacher learning. Much has been written about the kinds of specialized knowledge that teachers need, among them, knowledge of the discipline, their students, and instructional strategies (Ball & Bass, 2000; Shulman, 1986). PD efforts clearly need to impact teachers' knowledge, and we have been rightfully concerned with figuring out what kinds of knowledge teachers gain through PD.

Cook and Brown would agree that knowledge is essential for practice but it's not sufficient for explaining what it takes to be good at what you do: "An accomplished engineer may possess a great deal of sophisticated knowledge; but there are plenty of people who possess such knowledge yet do not excel as engineers" (p. 387). In addition to all the kinds of knowledge that teachers need, they also have *to be able to teach*. This means that we have to attend to the interplay between knowledge and knowing in the PD context itself and in the teachers' instructional context. We need to link the knowledge and ways of knowing that teachers develop as they work with colleagues in the PD context with what happens as teachers try to use the knowledge and ways of knowing they gain in PD sessions in the context of their classroom teaching. Lupe and Juan may have developed ways of examining and talking about students' mathematical thinking and they have developed similar knowledge about students' mathematical thinking through the PD sessions. But we need to concern ourselves with how they are drawing on that knowledge when they interact with students, or in Cook and Brown's terms, how knowledge is deployed in the service of disciplining action (knowing). Moreover, researchers should examine what teachers are learning during and after PD, looking at the *coevolution* of participation between classroom practice and PD. I claim that this coevolution between the PD and classroom context(s) should itself be a key unit of analysis as we try to explicate the mechanisms by which teachers learn in and through PD. By seeing how teachers' participation across these contexts coevolve, we will have better views of what contributes to teacher learning and the development of classroom practice.

Implications For Studying and Designing Professional Development

A multidirectional analysis of teacher learning across PD and classroom contexts leads us to the following implications for the study and design of PD efforts. We should: (1) understand and elicit the diversity of teachers' experimentation and incorporate depictions of that work in PD; (2) examine the situated nature of primary artifacts; and (3) explore how enactments, and specifically enactments of routine activities, can support the generation of new knowledge and ways of knowing.

Understanding and Eliciting the Diversity of Teachers' Experimentation, and Incorporating Depictions of that work in PD

In order to understand the relationship between PD and the classroom, and how teachers' participation in these two settings coevolve, we must understand individual teachers' classroom experimentation, and how this influences their participation in PD. How do teachers deploy their knowledge in the classroom? What ways of knowing do they demonstrate in their instructional

practice? What do teachers bring to the collective as a result of their experimentation? In addition to documenting the diversity of individual teachers' classroom experimentation, we also need to document and study what actually happens in PD and the *collective* learning trajectories of teachers as they participate in PD. It is essential that we document the diversity of teachers' classroom experimentation and study the nature of how this experimentation relates to their PD experiences over time and to their developing identities – what kinds of teachers do they want to become? What ways of knowing are developed over time? How and what knowledge do teachers develop of subject matter, students' thinking, and practice as they engage in collective analysis around common objects of inquiry?

While the argument here is about research on teacher learning, there are also implications for the design of PD. I argue not only that teachers' experimentation should be studied, but that facilitators should incorporate *depictions* of teachers' classroom experimentation in their PD. Depictions of practice are images or stories that seek to capture the events in the classroom as they played out. They are created intentionally to support the analysis of teaching. Written cases and videocases are perhaps the most visible example of depictions available in the literature. But there are other examples: replays (Horn, 2005) are depictions that are created through teachers' talk. A teacher's journal can also serve as a depiction. Little (2002) argues that we should attend to the "face" and "transparency" of depictions. The *face* of practice refers to "those parts of practice that come to be described, demonstrated, or otherwise rendered in public exchanges among teachers" (Little, 2002, p. 934), which may include artifacts such as student work. *Transparency* of practice conveys "how fully, completely, and specifically various parts of practice are made visible or transparent in the interaction" (Little, 2002, p. 934).

If professional educators sought openings to elicit teachers' experimentation in a principled way, PD could serve as a place to pursue questions and dilemmas teachers encounter as they engage in transforming their practice. While it is easy to advocate that we incorporate depictions of practice and discuss teachers' classroom experimentation in the PD context more extensively, I recognize that it may undercut the main goals of centering PD discussions on making sense of mathematics and student thinking. Sharing episodes from the classroom can easily and unproductively spiral into a show-and-tell. Facilitators of PD will need to become more knowledgeable and skilled about how to use teachers' classroom experiences in PD. For example, how can the dilemmas teachers face about modifying tasks, managing pacing, and orchestrating classroom discourse be usefully depicted and used as a springboard for discussion? How can professional developers utilize one teacher's experiences to support another to develop more focused and reflective attempts to experiment in the classroom? Many researchers have written extensively about the intentional use of records of practice (e.g., Sherin, 2004; Lampert & Ball, 1998; Little, 2004), arguing that we must attend not only to the careful selection of representations but also how they are negotiated in practice.

Examining the Situated Nature of Primary Artifacts

Primary artifacts are objects that originate (or are produced for use) in instructional practice. In the case of teaching, primary artifacts include copies of student work, lesson plans, mathematical tasks, and curriculum materials. They can travel across boundaries, into the context of PD, but they are not created solely for the purpose of collectively analyzing teaching. Primary artifacts allow particular components of teaching to be extracted from the context of instructional practice, lessening the complexity by narrowing teachers' focus.

Primary artifacts are produced and used in practice, and so ways of knowing include the use and production of primary artifacts. If we are concerned with teachers developing new ways of knowing in their classroom practice, then we should attend to the relationship between ways of knowing in PD and in the classroom. And if we are going to use primary artifacts as a tool in PD, we must attend to how they are situated in particular activities, and how this affects their meaning. For example, student work is a primary artifact commonly used in PD. The way student work is situated in PD may look very different from its use in the classroom. In PD, teachers may sit together to analyze a pile of student work they have pre-selected to illustrate the range of strategies students used in their classroom. They may spend extended time debating what the students understand, generating questions they might ask to better understand the students' thinking, or considering which strategies they would choose to highlight in a whole class discussion. In contrast, in their classrooms, teachers may only have a few minutes to survey students' written work in order to make assessments and instructional decisions. The teacher most likely engages in this work alone, in the midst of a lesson, while students are working on the task. While the PD activity may certainly help teachers develop knowledge they can deploy in this classroom situation, it may not help them develop the ways of knowing they need to monitor students in the moment and to interact with them in ways that assess and advance students' mathematical thinking. Researchers and PD facilitators must attend to the meaning teachers make of primary artifacts across contexts as these artifacts are situated in different activities. We need to better understand how the ways of knowing involved in these activities differ, and how they influence one another.

Exploring How Enactments of Routine Activities Can Support the Generation of New Knowledge and Ways of Knowing

The investigation of practice is at the heart of the kind of professional education we are discussing. Both of the implications we have presented thus far are an attempt to support and extend how teachers develop identities as learners that reflect a "pedagogy of investigation" in PD (Lampert & Ball, 1998). This last implication seeks to move us one step closer to the ways of knowing needed for teaching. As Grossman and Shahan (2005) have stated, we need to couple a *pedagogy of investigation* with a *pedagogy of enactment* in order to support the development of new ways of knowing in the classroom.

The term *enactment* refers to simulations of instructional practice designed to enable collective analysis of practice (Grossman & Shahan, 2005). The breadth and depth of enactments can vary. Almost all enactments engage participants in multiple tasks of teaching simultaneously, such as choosing representations, asking questions, and selecting student strategies for class discussion. However, some may seek to lessen the complexity, for example, by focusing in on eliciting ideas from a single student rather than an entire class. Role-plays, micro-teaching, rehearsals, practice interviews, and lesson studies are all examples of enactments used in PD. This list illustrates the diversity of activities we classify as enactments.

While primary artifacts and depictions of practice can also support collective inquiry, enactments offer an opportunity to "try out" ideas that surface through this collective reflection. As mentioned above, enactments allow for tightly coupled experimentation and feedback. I propose a particular kind of enactment, of *routine activities*, as a productive avenue for future research. My ideas about this are informed by recent work by Lampert (2005) and Graziani (2005) studying professional education in a school of Italian language development in Rome. The Italian language school has a sophisticated framework for understanding linguistic

competency. Within this framework, key instructional activities or routines of practice have been identified and in fact extensively specified. These routines have been carefully selected to link to different aspects of the framework for developing the skills and understanding necessary to become proficient in Italian. As teachers learn these routines of practice, they engage simultaneously in understanding teachers' instructional moves and students' contributions and understandings. The set of routines also enables teachers to develop their practices around common objects of study. In the program Lampert observed, teachers collaboratively plan, enact, and subsequently analyze video of their practice.

Building on Lampert (2005) and Graziani's (2005) analysis, we propose that a routine activity is one that can and should occur regularly in the classroom and is situated within a frame for understanding the development of some disciplinary competence. It is a way of slicing up work of teaching into a manageable piece so that teachers can learn how to lead or facilitate a particular activity with students. Many current curricula advocate the use of classroom routines, and so they may already be a part of many teachers' instructional practice. A routine activity provides a common focus for a group of teachers, and ensures there will be opportunities for multiple enactments, which is often not the case when teachers choose to enact particular lessons that may occur only once a year, and fall in a particular place within their curriculum or pacing guide. Trying to determine: "what is routine about this activity?" is important intellectual work for teachers to engage in as they analyze depictions and artifacts related to a given routine. The fact that there are some predictable features of the activity helps to limit improvisation involved in each enactment of the routine. Although routines have a somewhat consistent structure, by no means is the need for professional judgment and decision-making eliminated. There are many junctures at which a teacher must ask themselves whether a particular students' response is acceptable, and if not, who and how should they push for further justification? Whether a representation or model is appropriate, and if so, which representation and who should create it? Schoenfeld (1998) offers a useful analogy, suggesting that the recipe you must at first rely heavily on is what later allows you to experiment and respond to the specific conditions of your creation.

Focusing research and development on routine activities has many advantages. We are interested in how routines can serve as a tool to connect teachers' work across the contexts of PD and their classrooms, as a collective object of inquiry around which they can develop new knowledge and ways of knowing. We believe routines are a potentially generative structure because they lend themselves to both investigation and enactment. Lampert and Graziani's work leaves us with many questions and challenges. What collection of activities might we choose as the focus of our work with elementary mathematics teachers? What grain size should we use to decompose teaching into constituent routines, or in other words, on what timescales and with what level of detail should routines be specified? And finally, it challenges us to think about the ways enactments of these routines activities can be coupled with investigations of practice, including the analysis of depictions and artifacts of the enactments.

By recommending that teachers engage in enactments of routine activities, we are not advocating a simplistic "learn from experience" or "practice makes perfect" point of view. Much like Ball & Cohen (1999) we would argue that practice has long been "the principal site for [teachers'] individual and idiosyncratic development" (p. 5). Rather we hope that through ongoing cycles of enactment and analysis, teachers will develop new knowledge and ways of knowing that support the "disciplined improvisation" Sawyer (2004) describes.

Acknowledgements

I am indebted to my work with Megan Franke and Amanda Hubbard for the development of the ideas in this paper. Recent conversations with Magdalene Lampert and Filippo Graziani about their work studying Italian language instruction have contributed significantly to the argument presented in this paper.

References

- Ball, D.L., & Cohen, D.K. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional education. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as a learning profession: Handbook for policy and practice* (pp. 3-31). San Francisco: Jossey-Bass.
- Cook, S. D. N., & Brown, J. S. (1999). Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing. *Organization Science*, 10, 381-400.
- Graziani, F. (2005, April). The pedagogical practice of the authoritative professional in professional education. In P. Grossman (Chair), *Unpacking practice: Decompositions and approximations of practice in professional education*. Symposium conducted at the annual meeting of the American Educational Research Association, Montreal, Canada.
- Grossman, P. & Shahan, E. (2005, April). The anatomy of practice: The use of decomposition. In P. Grossman (Chair), *Unpacking practice: Decompositions and approximations of practice in professional education*. Symposium conducted at the annual meeting of the American Educational Research Association, Montreal, Canada.
- Horn, I.S. (2005). Learning on the job: A situated account of teacher learning in high school mathematics departments. *Cognition and Instruction*, 23, 207-236.
- Lampert, M., & Ball, D.L. (1998). *Teaching, multimedia, and mathematics: Investigations of real practice*. New York: Teachers College Press.
- Lampert, M. (2005, April). Training in instructional routines: Learning to “listen” and constructing responses. In P. Grossman (Chair), *Unpacking practice: Decompositions and approximations of practice in professional education*. Symposium conducted at the annual meeting of the American Educational Research Association, Montreal, Canada.
- Little, J.W. (2002). Locating learning in teachers' communities of practice: Opening up problems of analysis in records of everyday work. *Teaching and Teacher Education*, 18(8), 345-354.
- Little, J.W. (2004). "Looking at student work" in the United States: Countervailing impulses in professional development. In C. Day & J. Sachs (Eds.), *International handbook on the continuing professional development of teachers* (pp. 94-118). Buckingham, UK: Open University Press.
- Sawyer, R.K. (2004). Creative teaching: Collaborative discussion as disciplined improvisation. *Educational Researcher*, 33(2), 12-20.
- Schoenfeld, A. (1998) Making mathematics and making pasta: From cookbook procedures to really cooking. In J. G. Greeno & S. V. Goldman (Eds.), *Thinking practices in mathematics and science learning* (pp. 299-319). Mahwah, NJ: Erlbaum.
- Sherin, M.G. (2004). New perspectives on the role of video in teacher education. In J. Brophy (Ed.), *Using Video in Teacher Education* (pp. 1-27). New York: Elsevier Science.
- Shulman, L.S. (1986). Those who understand teach: Knowledge growth in teaching. *Educational Researcher*, 57(1), 1-22.