MENTORING AS PROFESSIONAL DEVELOPMENT: A CASE FROM SECONDARY LEVEL MATHEMATICS

Ginger Rhodes, University of Georgia, USA
Patricia S. Wilson, University of Georgia, USA

Abstract

Professional development, set in the context of mentoring a student teacher, helped inservice teachers think about their own teaching in a new way. The program was based on the theory that effective professional development includes learning within practice. The following three, research-based characteristics were seen as critical in creating opportunities for mentor learning: learning within the context of practice, learning from students' mathematical thinking, and learning from collaboration. Each characteristic is discussed and illustrated. Challenges that teacher educators must consider when using the context of mentoring as professional development are discussed.

Learning a profession requires formal study and practical experiences, and teaching is no exception. In the United States, field experiences have become an integral part of teacher preparation programs and university students eagerly embrace the opportunity to work in schools and learn from veteran teachers. Practicing teachers may be involved in formal study at a university or a school district program, but we often overlook their need for practical experiences believing that their daily teaching fills this role. Inservice teachers can learn from their daily practice, but we argue that professional development that intentionally uses their practice to stimulate reflection provides more opportunities for substantial learning. Teachers need structured opportunities for reflecting on their practice, focusing on student learning, and discussing their insights with colleagues. We have found that professional development that is set in the context of mentoring a student teacher or a novice teacher can help practicing teachers think about their own teaching in a new way.

In the United States, teachers are rarely provided time during the day to intentionally reflect on their practice, but it is a common practice for experienced teachers to mentor a student teacher or a novice teacher. Traditionally, the mentor is expected to dedicate a significant amount of time and effort, and the novice teacher is considered to be the learner. We want to challenge that notion and argue that the opportunity for mentor learning can be increased by shifting the responsibility of the mentor from providing advice to a more collaborative responsibility of *working with a protégé in order to learn.*

Mentoring a student teacher or a colleague is difficult to do well (Sudinza, 1997) and often the responsibilities are not well defined (Carver & Katz, 2004). Some mentor teachers seek to model good teaching and others prefer to guide the practice of their protégé by posing challenging questions (Wilson, Anderson, Leatham, Lovin, & Sanchez, 1999), but few think of their mentoring as an opportunity for their own learning. Although teachers claim to learn how to teach from experimenting with their practice and talking with colleagues (Wilson, Cooney, & Stinson, 2005), the structure of most mentoring programs is not built on collaboration. By definition, the mentor has experiences that the protégé lacks. We found that we could alter the structure and responsibilities of traditional field experiences for student teachers and create professional growth experiences for all participants—student teachers, mentor teachers, and university teachers.

In the following sections we share our efforts to use mentoring experiences as professional development for inservice teachers. We have built our program on the theory that learning from practice while engaged in practice is extremely beneficial for practice (Stein, Smith, & Silver, 1999). Based on our experiences with mentors of students preparing to be secondary mathematics teachers, we describe opportunities for mentors to learn from their practice and mentoring. We identify three characteristics of our program that encouraged and supported professional growth.

Professional Growth as Part of Mentoring

Partnerships in Reform in Mathematics Education (PRIME) is a multi-level professional development project for three groups of teachers – student teachers preparing to be high school mathematics teachers, practicing teachers who served as mentors, and university teachers who teach courses for the student teachers. The goal of PRIME is to improve the teaching of mathematics at the secondary level by providing opportunities for preservice teachers, inservice teachers and university teachers, as a collective, to examine the practice of teaching mathematics and to discuss the mathematical knowledge and skills needed for teaching. PRIME has been part of the mathematics teacher education program at the University of Georgia since 1998, and was founded on the idea that the context of student teaching could provide meaningful learning opportunities not only for student teachers, but also for university teachers and mentor teachers. Student teachers were placed in groups of two to five at each participating school. In most cases

one student teacher was paired with one mentor teacher, but in some cases there were two mentor teachers for one student teacher or two student teachers with one mentor. The community of learners, which we denoted as a *cluster,* included the mentor teachers, student teachers, and the university teacher at each school site. The cluster met as a collective for 30 to 45 minutes once a week to discuss and examine *the work of mathematics teaching*. We used this phrase to emphasize a focus on mathematics. All members of the community were encouraged to actively participate in the cluster meetings. The content of the cluster meetings depended on events in the mathematics classes and the leadership of the university teacher who served as a facilitator for the group by sharing interesting mathematical and pedagogical questions that occurred in various classrooms.

The weekly cluster meeting offered a rare opportunity for mentor teachers to discuss their practice with a group of knowledgeable colleagues. We encouraged members of the cluster to move beyond the traditional mentor/student teacher dyad and begin to work as a collaborative group to enhance their teaching of mathematics. University teachers helped to focus the group on issues related specifically to teaching mathematics rather than general issues of teaching. The cluster discussions were most valuable when the discussion centered on events from the teachers' mathematics classrooms and specifically on the mathematics in the lesson. Some examples of activities included: examining student work, discussing a student's mathematical question, and solving a mathematics task. The separate school clusters came together four times during the year to share ideas. These meetings included mathematical activities (e.g., analyzing student work, discussing a videotaped lesson) and opportunities for the teachers to discuss their teaching and mentoring practices with colleagues from other schools.

Characteristics of Learning Opportunities

After studying PRIME at work in 13 schools, we offer an example of a situation where we observed great mentor participation and enthusiasm and then discuss three characteristics that promoted reflection, by mentors, on their practice. During a cluster meeting, a group of three mentor teachers, three student teachers, and the university teacher watched a ten-minute videotaped lesson on synthetic division from one of the student teacher's classes. The university teacher encouraged the student teacher to share a video episode from her class, and the student teacher took the leadership role by selecting a class episode and bravely sharing her teaching.

Before sharing the video, the student teacher described her concern that she had not let the students become involved in thinking about the mathematics, but instead she had led them through a step-by-step process of synthetic division without allowing them to develop it or question it. Her stated concern focused the group's observation, so everyone watched the video with a purpose.

After watching the video clip the teachers immediately began discussing what they had observed. The experienced teachers were able to recognize subtle student questions that had not seemed significant to the student teacher. The group was attracted to one student's question that indicated that he was looking at a relationship between two numbers in the algorithm. One mentor called the student comment insightful claiming it was very difficult for students to make such connections. As a group, the teachers focused on this high school students' mathematical thinking and recognized that the student's observation provided an opportunity to teach mathematical connections even when the lesson was about a procedural task. Another student teacher asked, "Why do we teach synthetic division?" Various responses to this question led to a discussion of the use of synthetic division in factoring polynomials of degrees greater than two, and then jumped to the relationship between synthetic division and long division. The group began to focus on connections among mathematical topics such as critical points of a function and derivatives. The conversation shifted from the mathematics of high school students to the mathematics of the teachers, and they began to see implications for the curriculum.

This example of a cluster meeting discussion illustrated the excitement that can be generated by using actual episodes from practice and focusing on the mathematical thinking of students. The discussion jumped around because of the spontaneous interest and participation of teachers who taught a variety of classes. A discussion that began with a procedural task developed into a collection of mathematical insights. Each cluster member participated in the analysis of the video, learning mathematics, seeing new ideas for teaching mathematics, and contributing to the conversation. This kind of collaboration fostered insights and led to reflection on each teacher's practice.

Characteristics of good professional development include working within the context of practice, focusing on students' mathematical thinking, and collaborating with colleagues (Garet, Porter, Desimone, Birman, & Yoon, 2001; Hiebert, Gallimore, & Stigler, 2002; Loucks-Horsley,

Love, Stiles, Mundry, & Hewson, 2003; Stein, Smith, & Silver, 1999). These characteristics were intentionally designed into the PRIME format. We chose to discuss these three characteristics because they were prevalent in successful cluster meetings and they suggest ways that professional development can be a product of mentoring.

Learning within the Context of Practice

Mentors and student teachers were enthusiastic about the discussion of synthetic division because it was related to their practice as mathematics teachers. By structuring events within the context of practice we were assured that the work reflected the excitement, the constraints, and the reality of teaching mathematics. Learning from practice can take place within a mathematics classroom, but there are additional venues that tap into practice. Studying authentic student work, watching videotapes of a mathematics lesson, creating or selecting a mathematics problem, or designing a lesson and assessment are all examples of activities that have the potential of allowing the participants to study teaching within the context of practice. Learning within the context of practice involves identifying key issues, problem solving, connecting ideas, and reflecting on experiences. We know teaching is complex and learning within practice acknowledges this complexity. The goal of learning within a context is not to emulate a master teacher or to replicate a successful lesson. The point is to study the teaching and its influence on student learning so that we understand why it was successful. Rather than a mentor modeling good practice for a student teacher, all cluster members reflected on the teaching episode.

Learning from Students' Mathematical Thinking

The participants in the example were discussing a students' mathematical thinking, which prompted them to share their own mathematical thinking. They had made strides in the difficult task of switching the focus of their study from "What should I do as a teacher?" to "What are my students thinking and how can I build on their thinking?" If someone is working to improve his or her teaching of mathematics, a naive approach might be to try to identify good teaching skills and learn to execute those skills smoothly and even creatively. This mastery of skills is appropriate for some tasks, but it is not sufficient for the complex task of teaching. It is not possible for teachers to help students learn mathematics if they don't understand the mathematical thinking of their students. Many teachers value getting to know their students, their interests in and out of school, their family backgrounds, and their aspirations (Wilson, Cooney,

and Stinson, 2005). Although this kind of knowledge can be a valuable asset to teaching, it is not synonymous with understanding students' *mathematical* thinking. Good teaching is dependent on the ability to assess, understand, and influence students' mathematical thinking. In other words, teachers need to know how to elicit students' mathematical thinking through clever assessment items, class discussions, and insightful questioning. Teachers need a deep understanding of mathematics in order to interpret what students are revealing about their mathematical thinking. Rather than a mentor and a protégé focusing exclusively on what a teacher should do, a collegial investigation into what students are thinking facilitated reflection on mathematics, curriculum, and mathematical connections.

Learning from Collaboration

The cluster meeting began with a concern from one student teacher, which quickly became the concern and focus of the entire group. We have found that collaboration is a key characteristic that distinguishes a mentor who is learning from a mentor who is advising. The collaborative process is about creating something new and a group that truly collaborates can attest to the non-mathematical statement that the whole is greater than the sum of its parts! Teachers frequently work together to produce a product, such as curriculum for a common class or a departmental exam, but we found productive collaboration to be joint work that encouraged teachers to reconsider their thinking and practice. As mentors began to discuss students' mathematical thinking and to address complex issues that came from their daily practice of teaching mathematics, they began to value and learn from collaboration. Rather than working independently, mentors and protégés were contributing their expertise to analyzing a situation that had been posed to the group, and they were thinking about how the shared ideas could play out in their own practice. In collaborative work, each person not only contributes but also walks away with valuable insights. Collaboration is difficult to achieve because it is not just a characteristic of a program, but also a disposition of the participants. Professional development that encourages collaboration within the group can promote mentor reflection and learning.

Improving Opportunities for Mentor Learning

PRIME encouraged student/mentor dyads to collaborate and to examine the work of teaching with a focus on students' mathematical thinking. The dyads planned lessons together, taught lessons together, and examined quizzes and tests together. While we believe all of these

activities were valuable for both the mentors and student teachers, we claim that professional growth of the mentors depended on the extent to which these activities incorporated the three characteristics—learning from the context of practice, learning from students' mathematical thinking, and learning from collaboration.

In order to highlight our claim we share a scenario that is frequently observed in student teaching, and contrast it with a scenario that incorporated the three characteristics to a greater extent. We argue that the second scenario provided more opportunities for mentor reflection and ultimately provided more opportunities for teacher learning.

We often saw mentor teachers sharing knowledge about student difficulties, mathematical connections, and teaching strategies with their student teachers. Although the mentor teacher's advice may be helpful to the student teacher, the opportunity for mentor learning was limited by the kind of interaction between the two teachers. In sharp contrast, we observed a mentor teacher who wanted to use a mathematics task in class that she had never used before. The mentor teacher and student teacher did the task together before they created their lesson plan. While completing the task both teachers commented on aspects of the activity that were difficult for them and thought about aspects that might be difficult for students. The teachers made reference to what students already knew about the underlying mathematics of the task. After the teachers completed the activity they went back to consider how to introduce the activity. On the surface, both examples include the three characteristics that promote learning, but we claim that the second example is considerably different from the first. The teachers were collaboratively considering the ways that their actions as teachers might affect student learning during the task. The teachers completed the activity themselves and made connections between the students' starting points, potential student solution paths, and possible student struggles. The mentor and student teacher were both taking an active role in planning a lesson; both teachers shared their ideas, listened and critiqued each other's ideas, and created the lesson jointly. Furthermore, both teachers approached the activity with an investigative stance.

Facilitating Mentor Reflection

Mentoring can provide a unique opportunity for teachers to collaborate and discuss the work of mathematics teaching. One PRIME mentor teacher made the following comment about her experience:

> Sometimes I just need a jumpstart to be more reflective about my teaching and to take more risks. It's very easy to get into a comfortable mode of doing the same things each year. This year has challenged me to re-think what I am teaching, why I am teaching it and if there are better ways to get my students to learn the things I want them to learn.

As the mathematics education community explores new ways to provide professional development for inservice teachers, we need to consider learning opportunities that exist within current structures. PRIME is an example in which hosting a preservice teacher provided a context for mentor teachers to investigate their own teaching practices. We have offered examples of how mentoring activities can provide valuable reflection opportunities for both the novice and the mentor teacher. In our concluding remarks we want to emphasize that teachers need support in order to carry out this mentoring work. Co-planning, co-teaching, and jointly analyzing and creating mathematical tasks are not common activities among teachers. The three characteristics that we have highlighted in our example present challenges for both the mentor and student teacher. First and foremost, both the mentor and student teacher must approach their joint work as learners. They must be willing to investigate their practice, contribute and share ideas, and consider each other's ideas. Second, limited time is a constraint that many teachers deal with daily. Together the mentor and student teacher must carve out time to dedicate to their joint work. Both of these challenges need careful attention when organizing and planning mentoring activities. We found that the university teacher's role was instrumental in this work. For example, facilitating meetings, encouraging inquiry, participating in discussions, and designing student teacher assignments were vital contributions in the process of transforming field experiences into professional development opportunities. As teacher educators we need to consider our role within mentoring structures and ways that we can work with and support teachers as they learn with novices about their teaching practices.

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