Preparing Future Teachers to Collaborate

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Introduction

Traditionally, classroom teaching in the United States has been viewed as a profession to be exercised in privacy behind classroom doors. Recently, efforts have called for teachers to share their experiences and learn from each other, and various forms of professional development centered on collaboration have become popular. Lesson study groups (Lewis, 2009) and professional learning communities (Hord, 1997) are two examples. Notably, the field of education has begun to valorize those teachers who have the "courage" to make their teaching visible. New heroes of teaching are replacing those teachers of the year who only a few can emulate. These new heroes are teachers who "open their classroom doors and, rather than evaluating each other, begin studying their practices as a professional responsibility common to all" (Hiebert, Gallimore, & Stigler, 2003, p. 56).

This shift in culture requires that teachers learn new skills. A review of the literature on professional learning communities identified the ability to analyze and reflect on practice and to engage in productive discussions of teaching and learning as crucial to the effectiveness of teacher groups (Vescio, Ross, & Adams, 2008). In a quasi-experimental

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study that demonstrated the positive impact of teacher grade-level groups on student achievement, Saunders, Goldenberg, and Gallimore (2009) found that one of the features that made teacher discussions effective was a focus on cause-effect connections between specific instructional strategies and student learning.

At the same time that these skills have come into focus, researchers have documented the lack of opportunities for U.S. teachers to develop and practice the knowledge and skills necessary to engage in these kinds of productive discussions on teaching (Chokshi & Fernandez, 2004; Hiebert, Gallimore, & Stigler, 2002). Exceptions to this are co-teaching experiences between general education and special education teachers. Studies of such collaborations have highlighted important outcomes. Teachers engaged in co-teaching have reported greater flexibility in their teaching; improvements in their instructional responsiveness, with better attention to individual students' needs; and more opportunities to implement differentiated instruction. Yet, these studies also conclude that there is a need for more specific preparation so that teachers can take full advantage of co-teaching opportunities (Cramer, Liston, Thousand, & Nevin, 2010).

New teachers are in a position to play a fundamental role in changing teaching from a solitary to a collaborative profession. In any community of practice, newcomers start by observing at the periphery and gradually assume a more participatory and active role. As their role becomes more central to the community, they can bring in new ideas and challenge the status quo (Lave & Wenger, 1991). If new teachers entered the teaching profession with knowledge and skills for systematically analyzing teaching, they would be on the right trajectory for playing an active role in this cultural shift. The ability to engage in discussions of teaching and a positive disposition toward making their practice visible would prepare these teachers to be effective collaborators.

Collaboration skills and dispositions have been identified as important elements of teacher preparation (Cochran-Smith & Zeichner, 2005; Darling-Hammond, 1996, 2005). Research on professional development (McLaughlin, 1997; Wilson & Berne, 1999), team teaching (Anderson & Speck, 1998), and teacher learning and preparation (Beck & Kosnik, 2002; Bransford, Brown, & Cocking, 2000) supports the value of paired student-teacher placements.

Lacking, however, is research that investigates the development of collaboration skills (Westhmeier, 2008). This paper addresses this research gap by providing a description of pre-service teachers' collaboration across university and school settings.

Study Context and Research Questions

The teacher preparation program that provided the context for this study is a 5th-year post-bachelor program at a public U.S. university. Every year, the program enrolls approximately 90 students who seek an elementary-school credential. Students take a variety of courses targeted at developing their knowledge of children and how they learn and of methods for teaching all elementary-school subjects. In addition, students enroll in a course called "Learning to Learn from Mathematics Teaching." This course, structured into 12 meetings of approximately two hours each during a three-month period, aims at developing knowledge, skills, and dispositions for systemically analyzing teaching and improving practice overtime (Santagata & Guarino, 2011; Santagata & van Es, 2010). Among other things, this course develops pre-service teachers' abilities to discuss student learning and problems of practice. Pre-service teachers are provided with multiple opportunities for collaboration. They jointly analyze artifacts of practice, which include transcripts of teacher-student interactions, samples of student work, and videotaped classroom lessons.

Although this course develops skills useful for the analysis of teaching of all subject matters, the focus so far has been on mathematics teaching due to the need in this particular program to improve pre-service teachers' ability to teach mathematics. Collaboration skills are also developed in the context of fieldwork experiences as follows. A sub-sample of pre-service teachers participates in a paired-fieldwork model, whereby two pre-service teachers are placed in the same classroom with one cooperating teacher. The program includes two fieldwork experiences. The first experience involves observing a classroom one day a week for three months, followed by student teaching in the same classroom for ten weeks, four days per week. The second fieldwork experience places pre-service teachers in a second classroom five days per week for ten weeks. These paired placements serve as the context for the study presented here.

The following research questions are addressed:

1. In what ways do pre-service teachers conceive of collaboration? What mental schema do they bring to the idea of collaboration in teaching?

2. In what collaborative processes do pre-service teachers engage when asked to analyze others' teaching performances?

3. What forms does collaboration take? How often do pre-service teachers collaborate, and in what ways does this collaboration shape their fieldwork and student teaching experiences?

Method

Participants

Pre-service teachers' development of collaborative skills was studied in two contexts: (a) the "Learning to Learn from Mathematics Teaching" course, and (b) the paired-fieldwork experiences. Although all pre-service teachers who enrolled in the program attended the course, only some were paired for their fieldwork experiences. Data for this study were collected from 10 pre-service teachers enrolled in the course and from 15 pre-service teachers for the fieldwork experiences. Of these, 8 participants were paired for their first fieldwork experience, and 7 were paired for their second. Students were paired at all elementary grade levels, from kindergarten through sixth grade.

Data Sources and Analysis

The Learning to Learn from Mathematics Teaching course. Data were collected in the context of a section of the course that enrolled 40 pre-service teachers. These teachers were divided into eight groups of five pre-service teachers each, based on their entering analysis abilities, as measured by a video-based assessment administered at the beginning of the program. Each group was heterogeneous in terms of the range of skills represented. Two of these groups (for a total of 10 pre-service teachers) were videotaped every time they completed a task that required them to collaboratively analyze an artifact of practice. Pre-service teachers engaged in these activities multiple times during each course meeting.

A total of 40 video segments in which these two groups engaged in collaborative analysis and reflection on teaching were identified. These segments were transcribed and analyzed thematically to identify processes in which pre-service teachers engaged to collaboratively analyze teaching. Using inductive analysis (Patton, 2002), the researchers developed thematic codes as information emerged, and new codes were added when information did not fit with existing codes. Themes that emerged through coding were analyzed and interpreted.

Fieldwork experiences. Data included two individual semi-structured interviews. A total of 15 pre-service teachers were interviewed and asked to characterize collaboration within their paired-fieldwork experience, describe how often they collaborated, what they collaborated about, and how the paired-fieldwork experience contributed to their ability to analyze and reflect on teaching and learning. Interviews were recorded and transcribed. Interview data were examined to identify themes, patterns, similarities, and differences. As with the course data, inductive analysis (Patton, 2002) was used to identify themes. Finally, analyses of course

and interview transcripts were compared to identify themes that emerged from both as well as themes that were unique to a data set.

Findings

Developing Schema for Collaboration

Pre-service teachers entered paired-fieldwork placements with varying schemas for collaboration. Many pre-service teachers shared experiences of collaborating prior to the teacher preparation program, such as completing group projects in undergraduate coursework with a "divide and conquer" approach, with one member doing all of the work and other having a "free pass." It was evident, through their responses, that participants relied on support from the teacher preparation program and cooperating teachers to engage in effective collaboration. One participant stated:

> With the experience they (cooperating teachers) have on reflecting, it would be best for them (cooperating teachers) to force us to achieve collaboration by stopping and providing us with, "How did it go?" "You two talk about it." We kind of needed a training to collaborate with each other. I don't think we knew how to collaborate . . . once my partner and I got past that wall of "this is my half, this is your half," we realized we could probably reach this with a higher success rate than we would have on our own. You kind of need that modeling.

Although there were no specific interview questions that addressed the need for support to collaborate, this was a common theme identified by all participants.

Frequency of Collaboration

Despite these initial challenges, pre-service teachers reported many instances of collaboration, moving from discussion and analysis of others' teaching, as experienced within the university setting, to discussion and analysis of their own teaching within the paired-fieldwork experience. Collaboration occurred before, during, and after the school day, with pre-service teachers' collaboratively planning lessons, teaching, giving and receiving peer feedback, analyzing, and reflecting on teaching and learning. Pre-service teachers engaged in collaborative discourse as they made sense of student thinking and proposed alternatives for instruction.

Collaboration Processes

Across course and interview transcripts, two themes that characterized initial pre-service teachers' conversations emerged. These were (a) the co-construction of analysis of student thinking and learning and (b)

the co-construction of instructional improvements. Pre-service teachers were given a transcript of an exchange between a teacher and a student concerning the solution to a math problem, and they were asked to discuss the teacher questioning strategies. Below is a short segment of the discussion in which pre-service teachers co-construct an interpretation of the student mathematical reasoning:

> *Angela*: [reading transcript of teacher-student conversation] Six and got two more for his birthday.
>
> *Jennifer*: Student pulls out eight cubes one at a time . . . Pulled out cube one, at a time and counts a set of six. Two, three, four, five, six . . . and then a set of two and makes a row of cubes underneath. Eight cubes in each line solution and puts them all together. Okay. Six and then two and then put the answer down here which is eight. What's six, seven, eight?
>
> *Angela*: He's [counting to]
>
> *Mark*: [counting]
>
> *Angela*: Six and then [adding seven]
>
> *Jennifer*: [Oh, seven] and then eight. Oh, I see. So he's counting on.
>
> *Angela*: Yeah.
>
> *Mark*: Yeah.
>
> *Jennifer*: [reading the transcript] So did you count each cube individually? Two and six is eight . . .
>
> *Mark*: Count by one.
>
> *Connie*: Although, it seemed like they kind of did this one quickly, so I think it would be interesting to change the numbers to one or two and then have them try to do it without cubes.
>
> *Jennifer*: Yeah.
>
> *Connie*: . . . because did they use the cubes just because they were sitting there or did they actually know if they counted on . . . or [inaudible] visualized it.

The group continues to discuss alternative strategies for making the student thinking more visible and clear to the teacher. Learning to analyze student thinking collaboratively and to co-construct inferences about student mathematical understanding is an important first step in developing the skills necessary to engage in productive discussions of teaching (Santagata & van Es, 2010; Saunders et al., 2009).

Discussions of student learning also were mentioned by all pre-ser-

vice teachers in the interviews. This indicates that pre-service teachers were able to move their focus beyond concerns of self, which are typical of reflections by novices (Ward & McCotter, 2004). Sometimes, the discussion focused on evidence of student learning that was present, other times on evidence that was missing and should be collected. One participant shared the typical conversation between herself and her partner: "What about this student, did he get it? Did he not get it? Two sets of eyes monitor students. One of us may catch one student not doing well; the other may catch another student not doing well." The reference to "two sets of eyes" was common among participants. By discussing student learning and often interpreting things differently, pre-service teachers come to appreciate the opportunity to dialogue as well as to value multiple perspectives.

In the interviews, all participants also reported that they discussed instructional improvements. One participant stated, "It was really neat to talk to someone about how it went and come up with ideas of what you would do differently next time, if there was a next time."

Pre-service teachers reported having discussed instructional improvements in two different ways: (a) as alternative instructional strategies that they later enacted, and (b) as instructional improvements that they enacted while teaching. In addition, three pairs of pre-service teachers reported that they discussed the reasons behind student understanding and/or the impact of instruction on student learning. These pairs reported having engaged in these conversations later in the year when they began to student teach. One of the participants recounted a lesson that she and her partner co-taught:

> The lesson crashed and burned. We went back, re-started the lesson, and found better resources. We took a week to really make it better. We were each teaching different groups and we each noticed different things. We revamped it and relied on each other to get things done.

This example was typical among pre-service teachers: As they discovered something that was not working as intended, they collaboratively found solutions by planning for future modifications of their instruction.

Five pairs made progress in their collaboration and reported having discussed instructional improvements and enacting them as they taught. This process is quite sophisticated for a novice in that it requires monitoring student progress and developing alternative strategies while providing instruction. One participant stated:

> Even in the middle of the lesson, if the students got stuck, we would talk to each other, stop them, and go back and re-teach if they were not understanding. We would collaborate and re-teach during the les-

> son. The efficiency of it allowed us to address things right on the spot because there were two of us.

In discussing instructional improvements, pre-service teachers acknowledged that lessons can and should be improved. This places them on the right trajectory for becoming lifelong learners.

Three of the pre-service teacher pairs, in addition to discussing student learning, proposing instructional strategies, and then acting upon them, also discussed how instructional decisions affected student understanding. One participant shared an example of how she and her partner made adjustments to their instruction and monitored student learning to determine whether the adjustments affected student progress,

> We'd try to notice commonalities among observations. For example, if I noticed student A didn't do XYZ on Monday and we made an adjustment on Tuesday, we'd look back at the same student and see his progress . . . did this strategy work for us, and then we'd adjust our lesson. We did that for all of the students.

The example above illustrates pre-service teacher engagement in a systematic and continuous approach of research and inquiry (Dewey, 1929, Hiebert, Morris, Berk and Jansen, 2007). It also provides evidence of engagement in discussions of cause-effect connections between teaching and learning. As noted above, these kinds of discussions have been found to be particularly effective in improving teacher practices and student learning (Saunders et al., 2009).

Another participant and her partner went through a similar process as they discussed student learning, trying different instructional strategies, determining whether those strategies were effective, and brainstorming additional strategies. A typical conversation between this participant and her paired partner was as follows: "If this tactic didn't work, why don't we think it worked? What can we try differently? What improvements did we see, if any? What's a third tactic we could use?" This provides additional evidence that pre-service teachers agree that student learning is a shared objective, understand that their instructional decisions have an impact on student learning, and express a desire to discover how and why.

Discussion and Conclusions

In this article, we argue that teacher education programs should equip future teachers with skills for engaging in productive collaboration focused on improving instruction. Because little is known about pre-service teachers' beginning conceptions of collaboration and the ways

in which collaboration skills can be developed, we conducted a study to investigate these issues. Our findings can be summarized as follows:

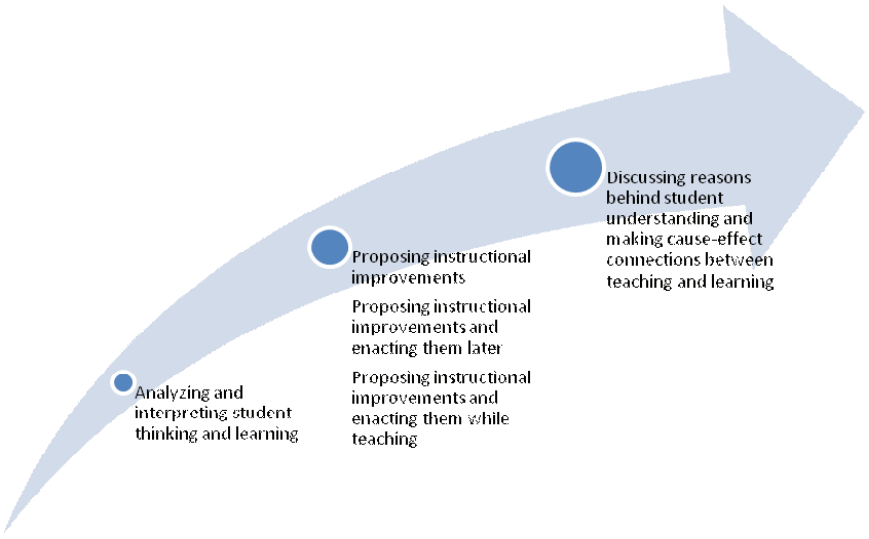
1. Pre-service teachers' initial conceptions of collaboration do not necessarily match with the kind of collaboration expected of them in professional development settings such as lesson study or professional learning communities.

2. With support, pre-service teachers can learn to collaborate and find collaboration useful. Guided analysis of artifacts of teaching, such as video of classroom lessons, student work, or transcripts of teacher-student interactions can assist pre-service teachers in learning to analyze and interpret student thinking and learning and to consider instructional improvements.

3. Collaboration in fieldwork settings can further develop collaboration skills. Pre-service teachers can begin to test out instructional improvements in their own teaching, first by revising lessons, then by incorporating improvements in the midst of teaching. In addition, pre-service teachers can begin to use evidence of student thinking and learning to reason about teaching in a cause-effect manner.

Figure 1 presents the processes of collaboration in which pre-service

Figure 1
Learning Trajectory for Collaborative Processes



teachers engaged. While all pre-service teachers were able to analyze student learning and propose instructional improvements, not all were able to test out these improvements in a later lesson or while teaching. Only a few were able to reason about teaching by considering the impact of instruction on student learning.

Thus, although study findings suggest that providing pre-service teachers with opportunities to engage in collaborative analysis of teaching across university and school settings contributes to the development of important collaboration dispositions and skills, the findings also highlight the need for a system of support that guides pre-service teachers' development. If pre-service teachers were to engage in productive collaboration early on, the most sophisticated levels of collaboration could perhaps be reached by the majority of them by the end of the teacher education program. In our future work, we will investigate specific factors that contribute to the development of the various collaboration skills or that hinder their development. The results of this analysis will guide the design of a system of support for the deliberate development of specific skills.

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