A Methodology to Explain Teachers' Emerging Roles As K-5 Mathematics Specialists

Joy W. Whitenack & Aimee J. Ellington
Virginia Commonwealth University

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Introduction

In this paper we outline the emerging roles of two K-5 mathematics specialists who are or who will be serving in leadership roles at their respective school buildings. One of the two teachers is a regular elementary classroom whereas the other teacher serves in a designated leadership role. Both of these individuals is a participant of an ongoing case study research project funded by the National Science Foundation. The aim of this research project is to understand the participants' induction processes in different settings as they become and/or continue to serve as mathematics specialists.

Both participants as well as the four other participants that comprise the case studies are currently enrolled in a K-5 mathematics specialist program. At the completion of this program teachers will earn a Master's degree from one of three state universities in Virginia that offers this degree program. They will also be eligible for a state licensure endorsement once the endorsement credentialing process is codified. In 2006 the General Assembly commended Virginia school boards for employing mathematics specialists in order to increase student mathematics achievement by increasing the quality of mathematics instruction. Currently, in the *Standards of Quality*, the State School Board of Education has recommended that 1 mathematics specialist be placed in Virginia's K-8 schools for every 1000 students (V. Inge, personal communication, March 16, 2007). (This initiative is currently an unfunded recommendation.) This move towards a K-8 mathematics specialist program is long awaited and is a result of over two decades of state-wide efforts spearheaded by the Virginia Mathematics and Science Coalition, a collaborative venture among district, university and K-16 education stakeholders.

The purpose of this paper is to provide a preliminary report of our case study project. The focus of our discussion is on the activities of two math specialists, Teacher 1 and Teacher 3. (For convenience, we will refer to both project participants as teachers although Teacher 3 is the only participant that is a currently a regular classroom teacher.) Each Teacher is housed in a only one elementary school is different school districts. All school building activities are related to the work in their respective school buildings, School Building 1 and School Building 3.

Theoretical Considerations

Our interest is two-fold. More generally, we wish to understand math specialists' daily work. How do they engage in these roles? What are the defining features of their roles? What activities do they engage in to support the work of teaching? Which activities do they engage in more frequently, for more sustained periods of time? The list of questions is endless. More generally, we hope to understand the professional terrain that the math specialist traverses? To accomplish this task, we develop a descriptive account of what might be possible if mathematics specialists can do the work of supporting teachers to facilitate student learning. Our second interest is theoretical. Theoretically, we attempt to align two different methods of documenting the math specialist's daily work in order to understand their evolving roles. We use PDA technology to document the types of and with what frequency these Teachers engage in their work. This information, self-reported by each participant, then is coordinated with our observations, interviews and other qualitative methods we employed to document the range of and the qualitatively different ways the participants engaged in these school-based leadership activities. By coordinating these two data sets, we hope to begin to understand the work of math teacher leadership against the backdrop of their unfolding stories.

Using the PDA, we attempt to answer questions about the math specialists' activities such as, With whom do they work?, How often do they work with certain teachers?, When do they work with others?, When do they work independently?, When do they engage in professional development?, How often do they engage in non-leadership activities?, How often do they engage in activities that address state-mandated assessment?, and so on.

We use information gleaned from our school building observations and interviews to answer questions such as, When the participants work with teachers, what is the nature of those discussions?, How do they address the range of pedagogical and content issues that encompass the teacher's mathematics instruction?, What is the nature of their interactions with teachers during planning sessions?, What strategies do they use while they support student learning? How do the participants interact with teachers during coaching sessions?, and so on.

We refer to and use this information to better understand the events and activities that we observed as we visited the school sites. We may be able to actually give further support for what these types of activities truly entail. For instance, if Teacher 3 reports that she collaborates regularly with another teacher, we can attempt to unpack this information when we visit Teacher 3's school building. Why does she work with a particular teacher? Can we characterize the nature of this collaboration as we make observations and interview each of these individuals? It is in this vein that we coordinate these two methods. By doing so, we like others (e.g., Simon, 2000), address the research problematic of teacher self-reporting. Simon, for instance, coordinates case study methods with classroom teaching experiments to corroborate teachers' professional development. The role that the researcher plays in Simon's model is much like the role we played as we engage in discussions with the math specialists. As we debriefed with Teachers, it became necessary to address a range of issues related to instructional strategies, mathematical content, the use of certain tasks to elicit student thinking, to name a few. Our roles were much like that of a coach or what West and Staub (2003) refer to as content-focused coach. We found that if we did not get inside of the participant's "practice" per se, we were unable to adequately address the issues the surfaced during our observations. In retrospect, Simon's and West et al's (2003) contributions have afforded us the opportunity to understand why our role has and necessarily needed to transform into that of participant observers inside of the data collection process. In fact, we might loosely describe our roles as that of coaching math coaches.

Our point of departure from Simon (2000) and possibly West et al. (2003) is that we do not attempt to support learning per se. During interview sessions, for instance, we did not focus discussions on issues in order to support teachers' learning of new ideas. Nor do we apprentice the teachers so that they might participate differently or more fully in a particular practice. However, we suspect that in some instances, because the participants had opportunities to revisit the activities in which they had just engaged in, they might have developed new or refined existing ideas. Because we do not take an individualistic account of learning (i.e., psychological constructivist), these types of claims are beyond the scope of our discussion.

We have taken a different approach towards learning, one that aligns more closely with situative learning (Lave & Wenger, 1998; Wenger, 1998). From this perspective our aim is to understand the ways in which Teachers participate in these leadership practices (Lave & Wenger, 1997). We hope to capture the ways in which individuals participate in various activities to understand the product or what Wenger (1998) refers to as *objects* of their activity. More generally we hope to sketch what particular practices form and transform the community in which the Teachers carry out their work.

The extent to which the participants might engage in or engage in these practices differently over time might help us understand the process by which they participate in and negotiate their identities, meanings and the communities.

To accomplish our task, we observed the participants in school-based and university settings. At the school sites we documented their daily activities as they worked with other teachers. At the university sites we documented the types of educative activities that participants engage in that might have supported their school-based activities. To collect this information, we made observations, took field-note and made voice recordings of interviews. In addition, we recorded portions of the class discussions and made recordings of interview sessions. Recordings were later transcribed so that we might conduct further, more detailed analyses.

Methodological Considerations

Participant Background Information

Each of the participants has participated for the first two years of the three-year mathematics specialist program. Each is from a different school district located near or in a large urban area. Teacher 1 is currently in a leadership role; Teacher 3 is currently a regular classroom upper elementary school teacher. Both teachers are housed in K-5 elementary school buildings.

Data Collection and Analyses

We employed two different methods to document the participants' roles in their daily work. As we stated earlier, one of the aims of this reports is to explore the possibility of coordinating findings using two different data collection approaches to develop a better understanding of the math specialists' evolving roles. One of the approaches we use is case study to develop narrative accounts of each of the project participants' experiences as they progress through the Masters' program. Because we are still in the process of collecting raw case data (Patton, 2002), our findings at this stage in the project are preliminary. So one of the aims of our discussion is to develop a better understanding of the raw data that we are in the process of organizing. We also hope to develop some initial hypotheses that are grounded in our case methods. As Patton suggests, the case study method is both a process and when completed, produces the product, or a ground account of the thing being studied.

Our second methodological approach aligns with descriptive quantitative methods. We are also collecting information to make frequency counts of the participants' school-based activities. By doing so, we document the types of and the frequency with which they engage in specific activities that comprise their daily work. To accomplish this task, we use a web-based PDA technology program (Campbell, 2006) as the means of recording and organizing this information. We describe the PDA in the next section so we will not elaborate the details of the program here. It is important, however, to mention that the participants self-reported this information. We use this descriptive data as one of the ways to coordinate and organize information to develop the case studies.

The PDA

The PDA program, Intelligent Specialist Activity Manager [ISAM][i] allows teachers to record their activities during the regular school day. This menu-driven program has 8 different areas or branches that the teachers can traverse to record information about daily activities. Teachers are prompted to

select time segments throughout the 8-hour day, traverse through the appropriate branch and select those specific activities that best describe their work during those time intervals. After the teachers have entered information about their daily activities, they have the option to edit, add comments or simply save the information they have entered. Weekly, teachers sync the PDA and send the current data to a remote server where the information is stored.

An example might help.

To better understand this process, consider Figure 1. In this figure we use the arrows to trace how a participant might record information for a coaching session. To read the figure, proceed from left to right in the first row of text boxes and then continue moving from left to right on the second row of text boxes. Each box represents different levels of a particular branch of the program. In our example, the participant has selected the main branch, *Coach,* and then proceeds to the next level, level 2 where she selects a coaching service, *coach individual teacher*. She then selects both options, *Goal* and *Coach Service* at the next level, level 3. After entering information about the goals for the coaching session (math content/curriculum; instructional issues or no stated goal) she proceeds to level 5. Note that in our example, the participant has selected instructional issue(s) for her goal. Once at level 5, she is prompted to selection one of the specific types of tasks. Let's assume that the participant selects *questioning* as the specific focus of her goal related to instructional issues. At this point she is moves back to level 4 of the branch and is prompted to proceed to the coaching services sub-menu. Note that the participant has selected *teacher a class*. She proceeds again to level 5 where she selects *co-teach the lesson* and moves to the final level of this branch, level 6, where she selects *instructional materials/technology*. Once this information is stored we have information about what the goals and focus were for the coaching session. In our example, the participant worked with an individual teacher about asking questions while implementing instructional materials/technology.

This information is stored in a file that can be transmitted later to a remote server by way of a web browser. All the information that the participants record and transmit is compiled and then organized according to the number of times they engaged in each activity, the percentages for each activity, the total number of minutes and hours they engaged in these activities as well as the percentage of time they did so. For instance, Teacher 1 reported that she engaged in 190 coaching related activities during the 2006-07 school year (through February 23, 2007). This quantity accounts for approximately 28% of the 664 activities she engaged in during this time period. She has spent 187.75 hours of the total number of hours engaging in coaching activities or approximately 22% of the time.

In the next section we summarize the PDA information that has been compiled to date for the 2006-07 academic year. We will summarize both participant's information and draw parallels among these descriptive statistics when it seems appropriate.

Findings

Teachers' PDA Reports

To report the information, we compare information reported by Teacher 1 and Teacher 3. We also highlight trends across the two teachers for three of the eight branches (coaching; non-education activities, and independent work) of the PDA.

Coaching. As one might expect, Teachers 1 who served in math leadership role, spent 29% percent of her time engaged in coaching activities. When Teacher 1 served in this coaching role, she engaged in these tasks with an individual teacher 84 % of the time. (See Figure 2 and Figure 4.)

Teacher 3, who is currently a regular classroom teacher, not surprisingly, reported that she spent about 7% of her time engaged in coaching activities (See Figure 3 and Figure 5). When she engaged in these activities, she almost always worked with an individual teacher (98% of the time).

Teacher 1 and Teacher 3 spent their time differently. Note in Figure 3 that Teacher 1 reported that 85% of the coaching services that she provided were teaching related. When she taught, about 76% of these "lessons" were co-teaching experiences. When Teacher 3 coached, she more frequently worked with an individual teacher, about 69% of the time. When she engaged in coaching services she reported that 98% of these tasks were instances in which she worked with an individual teacher (See Figure 5).

There was also quite a range between the total number of tasks each engaged. Teacher 3 engaged in 1295 tasks, whereas Teacher 1 engaged in 664 tasks (See Figure 2 and Figure 4). There is also quite a range between the number of coaching services each engaged in. Teacher 3 engaged in 117 coaching service tasks, whereas Teacher 1 engaged in 606 tasks.

As an aside, to better understand the apparent discrepancies among totals and subtotals, we must first note that teachers often engaged in several different tasks when they completed different services. For instance it is certainly conceivable that if a teacher plans to co-teacher a lesson, she might review lesson plans, search for teacher ideas and develop materials during this co-planning session (all considered as types of independent work). It is for this reason that the total number of times that the teacher engages in this activity may not appear accurate the total count of independent work tasks. Teacher 1, for instance, reported that she engaged in independent work 281 times, and yet she also reported that she engaged in 1,234 independent tasks when she did independent work. By taking a simple average we might surmise that she performed approximately 4 tasks when engaged in independent work. Reasoning in this way, this information is particularly telling when one considers that 42% of the tasks she engaged in might deal with this level of complexity.

When co-teaching a class, Teacher 1 focused on *identifying/eliciting understanding* or *clarifying/questioning understanding* slightly more often than *conveying/monitoring expectations*, approximately 28%, 25% and 22%, respectively (see Figure 4).

Teacher 3 did not report any co-teaching or modeling instances.

When Teacher 3 worked with an individual teacher, she and the teacher addressed *pedagogy/planning* for 69 of the 115 tasks (or 60%). Most of these pedagogy/planning tasks fell into one of two categories: *co-planning/co-teaching a lesson* (67%) or *planning the teacher's independent instruction* (28%). Teacher 1 reported a lower percentage than Teacher 3—22 of 59 tasks (37%) for math content/curriculum and 31 of the 59 tasks (53%) for pedagogy/planning.

So with regard to coaching, Teacher 1 reported that she more often engaged in co-teaching experiences than modeling lessons (76% and 24%). Teacher 3 reported only two instances when she co-taught a class—about 2% of the coaching activities she engaged in. The most noticeable difference between the teachers was how they spent their time when they participated in coaching

activities. Teacher 1 often taught a class and when she did so she usually co-taught. Teacher 3 reported that she almost exclusively worked with an individual teacher when she engaged in coaching activities. When she worked with an individual teacher she typically addressed issues around pedagogy and planning.

Independent Work. Teacher 1 and Teacher 3 reported that they engaged in *independent work*, 42% and 26% of their time, respectively. In terms of the number of tasks that each reported, Teacher 1 engaged in slightly less independent work (281 tasks) than Teacher 3 (343 tasks).

When Teacher 1 and Teacher 3 engaged in independent work, over half of these types of tasks were administrative. They typically engaged in tasks to *support the use of materials* or to *communicate with others*.

Among the least reported independent tasks that that Teacher 1 engaged in were *personal professional development* and *writing notes or reflections* approximately 4% and 2%, respectively. For Teacher 3, these percentages were slightly lower, approximately 3% and 0%, respectively.

Non-Education Activities. Teacher 1 and Teacher 3 each engaged in non-education activities. Each reported that they spent about 13% of their time engaged in these types of activities. Teacher 1 engaged primarily in tasks involving lunch duty whereas Teacher 3 reported that about 58% of these tasks were related to lunch. Teacher 3 also reported that 16% of these types of tasks were breaks whereas Teacher 1 reported 4%.

Student Support. Teacher 1 reported that a low percentage of her time was spent providing student support, approximately 3%. By way of contrast, Teacher 3 reported that she spent about 23% of her time supporting students. Almost all of these instances were reported as solo grade-level teaching.

In the next section we use representative examples of the types of activities that the Teachers to documented their activities in their school buildings. Our goal is to begin to understand the various communities in which the teachers engaged in their activities. We know that teachers spent a portion of their time engaged in activities associated with coaching for instance. What do these coaching activities look like? How do they engage in those activities? To what extent do the Teachers begin to coordinate their different forms of practice to define their roles and, more generally, to sustain an evolving community of practice? If a community of practice is a system of interrelated forms of participation (Wenger, 1998, p. 90), our hope is to begin to understand how those communities evolve.

School Building Visits

Teacher 1's Geometry Lesson. Teacher 1 has been a teacher leader for 3 years in her school building. Prior to taking on this new role, Teacher 1 had taught elementary school for 19 years. Although she is not a regular classroom teacher, she currently teaches 5th grade for two periods, four days each week. She does not teacher on Wednesdays. On Wednesdays she attends different grade level meetings to plan, discuss materials, and to discuss other concerns or questions that the teachers might have. Wednesdays, students are dismissed early so that teachers can plan, collaborate and so on.

Her school district, District 1, has adopted *Investigations in Number, Data and Space* as their K-5 mathematics curriculum. Teacher 1 has taught from this curriculum, tested materials and provided

staff development for six years around this curriculum.

To better understand Teacher 1's role as a teacher leader in her school building, School 1, we needed to understand why she has continued to teach two 5th-grade mathematics classes as a teacher leader. During one our visits we gained insight into this issue. During an interview with her after observing one of her 5th-grade geometry lessons, Teacher 1 explained why she teaches the 5th math lessons. She also explained her professional relationship with the regular 5th-grade classroom teachers.

> The regular classroom teacher is watching because we are building this curriculum that is going to the whole county after we pilot it here…This [geometry] lesson will be written up and it will be a two-session lesson (instead of one-session). We just found that out today! But who knows, maybe for next group, it will fit all in one session.

Here she explained that the classroom teacher observed the lesson (as did we) that Teacher 1 taught because it was necessary for her to teach these lessons since she is developing the district 5th grade curriculum for accelerated students. She, along with other teachers in several other buildings, is testing these materials during the 2006-07 school year. She also mentioned that the regular classroom teacher would teach a similar lesson with another group of 5th graders:

> The next hour, Regular Classroom Teacher is on her own. So she learns the content and she delivers the instruction on her own. And she tweaks it like she wants to.

As her comments indicate, Teacher 1 is not only testing these materials but also modeling the "revised" lesson so that the regular classroom teacher could teach a similar lesson during the next hour. From Teacher 1's comments we also understand that this teacher will likely make whatever changes to make the lesson her own.

When asked to elaborate the regular 5th-grade classroom teacher's role when she planned this lesson, Teacher 1 explained that she had sketched out the idea and had a 15-minute conversation with the regular classroom teacher about the goals and activities of the lesson. She also mentioned that they had outlined the entire unit for geometry several weeks earlier. (She later even bemoaned the fact that after this school year, this teacher would be moving.)

When we observed the lesson, we gathered additional information regarding the nature of her professional relationship with the 5th grade teachers. During the lesson, at times the regular classroom teacher might interject a comment (feigned disbelief) or express her excitement about the ideas the students were considering. At one point she even offered a geometric term when Teacher 1 asked for her assistance. And as the students worked in small groups to create rules for sorting geometric solids, she observed groups and conversed with the students. So although the regular classroom teacher primarily observed Teacher 1, she also provided additional support at different points during the lesson.

Teacher 1 also indicated that she would teach this same lesson to a second group of 5th graders during the next hour. Another regular classroom teacher would observe her as she modeled the lesson.

As we continued to discuss the issue about developing the 5th lessons, Teacher 1 also mentioned that although these lessons would be used by those 5th grade teachers teaching accelerated mathematics,

eventually she hoped that these types of lessons could be integrated into the regular 5th grade pacing guide so that teachers could provide differentiated instruction for their students.

So it was important for Teacher 1 to teach these two 5th grade classes. She taught these lessons to make additional revisions if necessary. She and several other teacher leaders would meet during the summer to further develop and revise these lessons to complete the district-wide curriculum for the accelerated program. As her comment suggests above, by teaching this geometry lesson, she determined that this particular lesson would need to be expanded into a two-part lesson when it was included in the District 1 curriculum guide.

As we continued to discuss the lesson, Teacher 1 also explained how she developed and expanded the lesson ideas in relation to the State Standards:

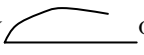
> This lesson is not from any *Investigations in Number, Data and Space* book or binder…Here is the State Standards objectives that we need to cover—the blueprint. So you work backwards. What do we want to bring out?...The *Investigation* units do not necessarily meet the State Standards objectives so you have to pull from other places.

Above, she indicated that the State Standards might be a blueprint for the content that needed to be covered. Her subsequent comment about "working backwards" is curious. This approach appeared to be a strategy that she used to further develop this and possibly other lessons.

As she continued to explain the content of the lesson she again mentioned the State Standards:

> We want to bring out this vocabulary (points to the lesson plan terms: *face*, *edge*, *base*, *vertex*) without telling them, which is how geometry [instruction] usually works. "Here's a list of words. Here's a picture of the word. And it will have the word and an arrow pointing out to the 'edge' of something." This [lesson] is so much cooler, more fun for them…On the State Standards test, students might have to answer the question, "How many faces are on a rectangular prism? Two? Four? Six? Eight?" Who knows? I don't know what is going to be on [the standardized test].

Note that Teacher 1 explained that the geometry lesson that she taught had elements that went beyond "usual." She then describe what a usual lesson might entail—connecting terms with pictures that represented the terms. In her view, this type of lesson did not characterize the lesson she taught. She intended for students to develop geometry definitions for various geometric solids. She did not intend them to simply memorize terms.

The lesson that we observed was not of the "usual" type. As we sat in the back of the room along with the regular classroom teacher, Teacher 1 began the lesson with a question about angles. As they reviewed ideas that surfaced during the previous lesson, she posed a question that presented the students with a counter example of their definition of angle. She drew  on the whiteboard and asked the students if this figure was an angle.

To illustrate part of the lesson, we use excerpts of an interview we conducted with Teacher 1 following the lesson. As Teacher 1 talked about the lesson she first discussed one student's argument for why  was an angle. She then indicated that this situation presented a teaching dilemma for her:

> (Restating a student's ideas) And if you are in a microscope and you go all the way down into the microscope and you look at where they (points) are touching (at the vertex), is that an angle or not?…[I can get to the next point by following a straight path…there is no such thing as curve.] So what is the classroom teacher going to do? So you just leave that.

The student had given an interesting argument that involved seeing pixels (like one would see using a drawing program for a computer) through a microscope. As she continued to discuss this situation, she explained how she decided to deal with her dilemma:

> So then we talk about how do WE agree that angles are created. So forget about that crazy far out idea. That's for trigonometry; that's for calculus. Right now let's think angles are intersecting straight paths (draws ). (Points to her picture) Those are angles. An angle is also defined as rotation around a "vertex" (draws a ray and part of a circle). That forms angles. And then [we can define an angle as] changing directions.

As her comments suggest, she chose to highlight angle definitions that the students had developed. She then spoke again about the third definition for an angle:

> And I never included [the third definition] in my explanation before. And that's an angle! Straight paths. Moving on a straight path and changing direction and continuing in a straight path, that makes an angle (draws). So that came up in the 5th grade class. Sometimes ideas get beyond me as well.

Her comment is illustrative of her teaching style and her willingness to learn with her students about mathematical ideas—even when students, not the teacher, introduce those ideas. She then returned to the dilemma she faced about highlighting the student's pixel argument:

> The student wanted to tell me that there was an angle there and got really, really small and where they touched that would have to be an angle. I am just going to say, does it fit one of the three things that we already come to know through our experience because we can't go into a microscope down there and see. So I am not going to tell the student "no" or "yes"… "Let's just leave it there."

Again, Teacher 1 explained how she decided to handle the student's explanation. She neither accepted nor rejected the student's ideas. Instead she treated the student's ideas like an open question.

We offer this example because it captures the careful attention Teacher 1 gave to highlighting and supporting students' ideas. This type of lesson was representative of the types of lessons that she and the 5th grade teachers were testing and refining.

Summary and Analysis. Teacher 1's role as a leader in her school district is uniquely defined by the various types of responsibilities that she has. She plans and co-teaches with other classroom teachers on a regular basis. This year she and other teacher leaders must further develop, test and refine the accelerated 5th-grade curriculum for District 1. To accomplish this task, Teacher1 works collaboratively with one or both of the regular 5th-classroom teachers. She co-teaches the lessons,

but the regular classroom teachers offer instructional support. Their roles are important because Teacher 1 draws on their expertise about planning, teaching, the students, and so on.

As we consider the professional setting in which Teacher 1 engages in her role, we note that one of the unique routines in this school building is that there is a weekly, allotted time for teachers to collaborate together. Teacher 1 has opportunities during these afternoon work sessions to work with others. In fact, it is assumed that she will meet with grade-level teachers during this time.

In both types of activities, Teacher 1 and the building teachers with whom she works appear to have mutual goals for their meetings. The 5th-grade teachers and Teacher 1, for example, have developed ways to jointly participate as they develop lessons that will serve as the district-wide lessons for the accelerated program. At the local level, they too are vested in these lessons because they will teach a similar lesson to a different group of 5th grades in their school building. How might they be accountable in these roles? Certainly they are obliged to teach a similar lesson to another 5th grade. As they do so, they may provide additional feedback to Teacher 1 about what did and did not work as they delivered the lesson. They might also provide additional insight about different entry points into students' understanding. During the grade-level meetings, teachers are also vested in understanding how the lessons in an *Investigations* unit might be developed, capitalized on and so on. As these examples are thought to illustrate, Teacher 1 and the building teachers have established a *joint enterprise* (Wenger, 1998) around delivering instruction as they employ innovations that, in this case, align closely with reform initiatives promoted by the National Council of Teachers of Mathematics (2000).

Teacher 1 and building teachers have also developed certain routines for engaging in this joint enterprise. During planning meetings that take place on Wednesday afternoons, Teacher 1 regularly visits different grade-level groups to address the curricular goals for the *Investigations* lessons that they will teach. Teachers ask Teacher 1 questions, they together discuss content that might surface, consider how the students might engage in the activities, and so on. Teacher 1 has also established routines with the two 5th-grade teachers that observe her teaching. This particular routine is a site for Teacher 1 and each of these 5th-grade teachers to collaborate about teaching and revising the 5th-grade accelerated curriculum. As they develop these routines, they too are contributing to the ongoing negotiation of what constitutes this particular joint enterprise.

In sum, Teacher 1 contributes to and participates in these practices that sustain and transform this community. In fact we suggest that she is one of the central participants of this (mathematics) community. During this school year, for instance, by modeling lessons for the 5th-grade teachers, she has engaged in professional dialogue with them about details of teaching that might otherwise not have been possible. We suspect that this dynamic, although temporary, may reshape aspects of her practice during this year as well as the next school year. In this regard, we begin to develop a better understanding of Wenger's (1998) notions about the evolving qualities of communities of practice. We also understand how certain practices might sustain and enable changes in what constitutes participation.

Coordinating PDA Reports and School Building Observations: Teacher 1. Recall that Teacher 1 reported that that she engaged in coaching sessions 29% of the time and usually coached individual teachers when she does so. When she engaged in these coaching services, she typically taught a class. When she modeled or co-taught a lesson, we know that one of the reasons she did so was to develop the 5th-grade accelerated curriculum. Further, one 5th-grade teacher observed her teach each of these

lessons. One of these two teachers also taught a similar lesson to two other 5th-grade classes. We also know that although Teacher 1 assumed full responsibility for teaching the model lessons, she collaborated with these two 5th-grade teachers as she continued to revise these lessons. She assumed this responsibility because these lessons were to be distributed throughout the district. She also hoped that other teachers not teaching in the accelerated program might use these teaching ideas to differentiate instruction. In these instances, her role as coach was much like that of a regular classroom teacher or co-teacher.

By way of contrast, when Teacher 1 engaged in other coaching services, she seemed to participate in more conventional coaching activities (planning, working with students, observing lessons, debriefing about lesson, etc.). For instance, when working with grade-level teachers, she addressed instructional goals, helped teachers plan, discussed math ideas in the lesson, and so forth. Even in these situations, what motivated these discussions was how to effectively use innovative instructional materials (*Investigations*). These discussions were rich. Teacher 1 and fellow teachers seemed to be in complete agreement during these discussions. Interestingly, we rarely observed discussions about how these lessons met State Standards. Neither at any time did we observe Teacher 1 or other teachers voice concerns about the upcoming state tests.

Teacher 3: Teaching as Leading in a New School

Background. By working with Teacher 3 we have had the unique opportunity to observe a regular classroom teacher as she begins to transition into a math specialist. Teacher 3 currently teaches 4th grade and is responsible for all instruction in all subject areas. Prior to the 2006-07 school year, Teacher 3 taught at a different school, School C, where she had been a primary grade teacher for 6 years. At School C, Teacher 3 was one of the lead teachers in her building for mathematics and science instruction. She also worked closely with the building math coach. She, in fact, hoped to serve in a similar role as a math coach once she completed the math specialist program. However, Teacher 3 was reassigned to a different school building, School 3 for the 2006-07 school year. In addition to teaching in a different school building, Teacher 3 is teaching 4th grade for the first during this school year.

Teacher 3's district mathematics supervisor and Teacher 3 believed that moving to 4th grade would be an important move for her so that she might be better prepared to serve as a K-5 mathematics specialists at the completion of her degree program.

The environment in which Teacher 3 had previously worked was a very positive one in which she collaborated extensively with the math coach. They discussed lessons that they had co-taught, discussed what did and did not work, addressed the needs of individual students as they planned upcoming lessons, and so on. During one of our earlier conversations, Teacher 3 addressed her math coach's influence in School C.

> The high level thinking that she asks the kids to use…is incredible. And a lot of teachers don't have much experience with [teaching inquiry mathematics]...And all of the sudden you start hearing them say, "I just cant' believe what kind of thinking math coach gets out of my kids." So you start hearing that dialogue from the teachers. Teachers are becoming excited about math and the kids are becoming excited about math. It just snowballs.

As Teacher 3's comments suggest, before coming to School 3, she had opportunities to work in a school building, School C, where a math coach's influence had begun to have a very positive effect

on teachers' and their students. One of the noticeable changes that Teacher 3 observed was with regard to teachers' and students new excitement about mathematics. This excitement carried over into other professional development activities. The math coach's effect also inspired Teacher 3. She hoped to have a similar impact as she worked with classroom teachers. In fact Teacher 3 considered math coach to be her role model. As she said during one of the interviews, "I keep telling the math coach, 'I'm watching you, because I want to do what you do, and make sure that I make that kind of impact'."

When Teacher 3 was transferred to School 3, she not only moved to a new grade, but also she left many of her colleagues. She would no longer work with math coach. In fact, in her new building she and two other seasoned teachers would share these leadership responsibilities per se. Teacher 3 chose to serve as the building science lead teacher since she had previous experience with these professional activities. She also hoped to develop collegial relationships with the two other teachers in School 3 who were designated as the upper and lower elementary grade level math teacher leaders (We will refer to the lower elementary building math leaders as Teacher L and the upper elementary lead teacher as Teacher U, respectively.) So although Teacher 3 moved to a new elementary school building, she had already begun to align herself with these two teacher leaders in her building. Additionally, Teacher 3 worked daily with a two special education teachers, Teacher A and Teacher B. We will focus our discussion on the unfolding professional relationship Teacher 3 was developing with one of these new colleagues, Teacher A.

We recount two activities that we have observed during our visits to Teacher 3's school building. The first of these activities is a planning session between Teacher 3 and Teacher A. The second example is taken from an introductory lesson about adding fractions. We use these two examples to illustrate the different but important roles that Teacher 3 and Teacher A were establishing to support their ongoing efforts in School 3. We begin with their planning discussion.

Teacher 3's Planning Session. How might she develop her role as a math specialist (or math coach) as she continued to teach at a new grade level? Would teaching 4th grade better prepare her to work with K-5 teachers when she became a math specialist? What opportunities would she have during this current calendar year to support teachers in her building? How would she begin to build professional relationships in this new setting?

As we visited Teacher 3's classroom, we began to try to answer some of these questions. During our first visit, it became immediately apparent that Teacher 3 had already begun to have some impact on a few of the teachers in her school building. Her influence was the result of working almost exclusively with the special education teacher, Teacher A, assigned to collaborate with her all year. This professional relationship began fortuitously as Teacher 3 and Teacher A began the new school year. Neither had formally met before. Teacher 3 once even stated that they "did not know each other from a hill of beans." They had been randomly assigned to work together by Principal 3, Teacher 3's building principal. Neither teacher could have anticipated that their collaborations would affect their practice as well as begin to have some effect on other teachers in their school building. As the school year progressed so did their professional relationship. As such their collaborative relationship began to take on a life of its own as they continued to work together.

During this first visit, we observed a planning session for a lesson that they would teach during the first hour of the school day. It was during this session that we became aware of the collaborative nature of their work.

For this particular planning session, they discussed how they would help students use information about 3 x 3 to solve 6 x 3 and 12 x 3. The dialogue below is part of a conversation between Teacher A and Teacher 3 during this planning session. (This conversation was paraphrased from our field notes taken during the planning session.) Note how the two discuss the content as well as how they would pair up the students:

Teacher A:	If we lose the students when they are asked to solve 6 x 3 using multilink cubes, we need to find a way to bring them back into the discussion. We might ask, "Let's make one more group of 3. As they make several more groups of 3 (for a total of 6 groups), we might say, "So you have 3 + 3 + 3 + 3 + 3 + 3. Isn't that the same as 6 x 3?"
Teacher 3:	Right. We might ask Student 1 and Student 2 to explain their ideas for the whole class.
Teacher A:	It worries me that these students might not share their ideas.
Teacher 3:	Then we will ask Student 3, Student 4, Student 5 or Student 6 to explain and then re-explain one of these students' ideas.
Teacher A:	Oh, okay.
Teacher 3:	How do we want to pair the students?...
Teacher A:	Student 7 with Student 8?
Teacher 3:	Student 7 has some difficulties with reading so let's pair Student 7 with Student 5.

The discussion flowed seamlessly as they discussed how they might address the content, how they might orchestrate discussions and how they might pair students. Note for instance that Teacher A role played how she might help students make connections between the two multiplicative relationships, 3 x 3 and 6 x 3. If students were confused, she could prompt the student to join one and then two other groups of three cubes to calculate the product for 6 x 3.

The next issue the surfaced was how they might highlight these ideas during the discussion. Which students might they ask to explain their ideas. In this part of the discussion, Teacher 3 initiated how they might facilitate the discussion. She then shifted their discussion to that of choosing partners for each of the students.

Even in this short excerpt one gets the sense that as they planned, they initiated and built on each other's ideas. We use this example to illustrate that their roles were more in concert as they planned. However from the lessons we have observed during our visits, Teacher 3 took primary responsibility for introducing ideas and orchestrating whole class discussions.

The Pizza Lesson. The above example was the first planning session first that we observed during the school year. Since that first visit, Teacher 3 and Teacher A have continued to work together throughout the school year. During a subsequent visit, we observed a beginning lesson about adding fractions. For this lesson, students solved the following problem independently: Patrick had 1/8 of a slice of pepperoni pizza and 3/8 of a cheese pizza. How much pizza did he eat?

After the students solved this and several other problems, Teacher 3 led a whole class discussion about the first problem. She began the discussion by asking the students what equation they had written to represent this problem. She then asked the students why they decided to add the two fractional parts. After students agreed that Patrick had eaten 4/8 of a pizza, the discussion shifted.

This shift in the lesson was first initiated by a question asked by Teacher A. Teacher A asked the students why answer was not 4/16 instead of 4/8 pizza.

We suggest that there was a shift because the question seemed to change the direction of the subsequent discussion. Previously the students discussed the value of the fractional parts of the pizzas and explained why the answer was 4/8. When Teacher A asked her question, we suspect that she hoped that the students might explore what constituted the unit in this problem. However, the students did not respond to her question. When the students did not respond, Teacher 3 then asked a different question. She asked the students if they could make a whole pizza with what was left of the pepperoni and cheese slices that were left. Teacher 3 and the students then engaged in an informal discussion about whole pizzas (i.e., the unit) as they combined the remaining slices.

Teacher 3's teacher move at this point during the discussion seemed important. Pragmatically, she was able to judge the students' potential confusion and seamlessly redirect the discussion.

Both teachers played critical parts in this discussion. Because Teacher A asked her question, Teacher 3 could judge what students may or may not yet be ready to grapple with about renaming the unit. We also suspect that situations like the one we observed may have been an opportunity for Teacher A to observe Teacher 3's teacher moves. In this case, Teacher A observed how Teacher 3 redirected the discussion to address some of the students' beginning understandings about units using this pizza problem.

So as Teacher A and Teacher 3 worked together during these lessons, Teacher 3 and Teacher A co-taught lessons, each sometimes posed questions different points during the whole class discussions. Each talked with and observed students as students completed problems.

When we spoke with both Teacher 3 and Teacher A about their collaborations, they each spoke of the other's role as crucial to making this professional relationship work. Given that these two individuals were randomly selected to work together, it is quite extraordinary that they valued their professional relationship.

During the interview sessions, for instance, Teacher 3 share several ways that Teacher A supported her teaching, her transition as a 4th grade teacher and more generally in her role as a teacher leader.

With regard to Teacher 3's transition as a new 4th grade teacher, she mentioned that because Teacher A had worked with upper elementary students before and had a good understanding of the 4th grade curriculum, Teacher 3 could draw on Teacher A's expertise as they planned lessons, developed pretest assessments, etc. We have evidenced this fact during our visits as well.

Teacher A helped Teacher 3 as they co-taught the lessons. When we asked Teacher 3 about which students Teacher A worked closely with during the lessons, Teacher 3 indicated that Teacher A helped all of her students:

> All of my students [get support]. It is just the nature of collaboration—the way Teacher A and I view collaboration. Technically, I have five students who are IEP special education students. Four of the students have math goals…One has behavioral goals…We all work with all of the students at all times. When we pull kids, we mix them up. So…the students don't know…who is having trouble.

As Teacher 3's comments suggest, Teacher A supported all of the 4th graders in her classroom. This view of collaboration, one in which she co-planned and co-taught with Teacher A, was a different approach than one that she had participated in previously at School C. One of the reasons that this relationship was more collaborative seemed related to Teacher 3's view of her role in this collaborative effort:

> As a co-teacher, I am not the specialist; I am not the know-it-all, the guru. I am a teacher working with a teacher to teach all of the kids present all the material…to help all of the kids. This is how I view my role in the classroom. We are sounding boards for each other and role models for each other.

Teacher 3 seemed to view her role as a teacher working with a fellow teacher. As co-teachers, they had similar goals for all of her students.

Additionally, Teacher A's willingness to work with Teacher 3 has made it possible for them to have open dialogue about teaching. As a result, Teacher 3 has opportunities consider the mathematics that she is teaching:

> Having the dialogues with Teacher A is so powerful because it makes me think about the mathematics more than if I were to sit down and look at students' work and/or do my own work. Having that dialogue sometimes helps me see it in another light.

More generally, Teacher A has begun to support Teacher 3 in her role as a teacher leader. When asked about the impact that Teacher A had on Teacher 3, Teacher 3 first stated, "Let me count the ways…" She then began to share about Teacher A's excitement about teaching mathematics and how this excitement was possibly influencing others:

> Teacher A will say…"I think I am going to try [this activity] with my little resource group. It worked really well. I tried it. It was great." So now Teacher A is talking to other teachers and mentioning it. Teacher B came up to me and said, "Teacher A keeps telling me about this and we really have to set a time…This was last Wednesday that she [approached me]. I said, okay, but unfortunately, this week didn't work.

Because Teacher A has shared her experiences with Teacher 3 with other teachers, another special education teacher has approached Teacher 3 about working with her. As in the above example, Teacher B has already approached Teacher 3. As such, Teacher 3 is beginning to make contacts with other teachers in her building.

We can also make arguments for how Teacher A has benefited from working with Teacher 3. We have already suggested that by observing Teacher 3's instructional strategies as she teaches, what Teacher A refers to as "new math," she is developing new ideas and applying those ideas in other instructional settings outside of Teacher 3's classroom.

Summary and Analysis. How might we define the community of practice that is unfolding in Teacher 3's school building? We again consider three constructs (mutual engagement, joint enterprise and shared repertoire) that define a community of practice. Let's begin with mutual engagement. The roles that Teacher 3 and Teacher A have established as they co-teach continues to unfold during this school year. They draw on one another's different expertise to support the 4th students'

mathematical learning. They have chosen to co-plan and at times co-teach lessons. In some instances it appears that one or the other takes the lead when necessary. Each seems to benefit in different ways from this collaboration. During the school year, they sustain this working relationship by confiding and exploring ideas as they work together. As they do so, they also work towards their common goals (i.e., joint enterprise) of supporting students' learning. They engage in this joint venture in very practical ways. They plan lessons, discuss the content that will be addressed in the lesson, decide which students might work better together, and so on. And they sustain this unfolding enterprise by supporting each other's work. They appear to have a mutual understanding that their ultimate goal is for students to develop deep understanding of the mathematical ideas. Although they are charged to ready the students for the state tests, preparing the students for these tests does not seem to be the only goal. A more global goal that they seem to strive for is teaching mathematics for understanding.

Still at another level, Teacher 3 and Teacher A are contributing to the more global joint enterprise of supporting Teacher 3's evolving role as a math specialist. In some instances this goal is clearly articulated by Teacher 3. She realizes that her experiences will help her transition into her role as a math specialist. At the same time, she recognizes that she is presently a regular classroom teacher. Teacher A, on the other hand is contributing in part to defining Teacher 3's leadership role. She has begun to communicate with other teachers about Teacher 3's practice. (Teaching 3's instructional approach works!) As she continues to communicate with her colleagues, she along with other participants may help to reshape Teacher 3's role. They may also begin to contribute to a more global goal of supporting other students' mathematical learning. As such, as Teacher 3 and Teacher A contribute to their ongoing working relationship and shape their goals at the classroom level, they are also creating the potential for these local classroom practices to transform into more global goals in the building. As they develop routines for supporting students at the classroom level, they also begin to contribute to the potential for more global routines, etc. The extent to which Teacher 3 will be able to capitalize on opportunities to work with other interested teachers is perhaps a glimpse of how these local practices might support the further development of the community of practice. What new routines that might grow out of these more local practices remains open for negotiation among the participants in this evolving community.

Coordinating PDA Reports and School Building Observations: Teacher 3.
When we consider how Teacher 3 spends her school day, we begin to understand what her coaching work might entail. Although she is a regular classroom 4th-grade teacher, she engaged in coaching services 7% of the time. When she provided coaching services, she almost always worked with an individual teacher, Teacher A. Although she took on this collaboration as part of her regular classroom teaching responsibilities, she and Teacher A have begun to develop a collaborative relationship that has the potential to span beyond her assigned teaching responsibilities.

As we look across the data sets, we also begin to understand some potential ways in which these coaching activities might provide new opportunities for Teacher 3 to support other teachers' work in her school building. For instance, another teacher in her school building recently approached Teacher 3 about teaching mathematics. It will be important to trace this and possibly other new professional working relationships that are underway in her school building. As we do so, we may begin to understand how her leadership work is beginning to take form in this school building. Teacher A's important role in this process cannot be underscored enough. Because she and Teacher 3 have developed a professional relationship in which they have common goals for their students, Teacher A has had opportunities to consider how she might incorporate new ideas in her daily work.

She has seen firsthand how students who have special needs might benefit from Teacher 3's (this new) instructional approach.

Final Comments

When we consider the evolving communities of practices in which Teacher 1 and Teacher 3's participate, we begin to understand how such a community might unfold in very different school settings. Teacher 1's practice seems to mirror that of working exclusively with *full participants* as they meet their common goals for student learning. Some of these goals are couched in the new curricular materials that she and her 5th grade teachers are testing and refining. This community of practice works seamlessly to accomplish these and other goals both at the school and district level. On the face of it, Teacher 3's work seems quite different. She works almost exclusively in one classroom with one teacher to support student learning. Because Teacher 3 teaches in a new school building, her role in this school seems an important one as she and her colleagues develop common goals around supporting students' mathematical learning.

As we look across these two sites, School 1 and School 3, we might consider how one site could help us understand how the other site might evolve as a community of practice. We could, for instance, use School 1 as a backdrop to construct a possible trajectory for how Teacher 3's role as a math leader might develop in School 3. This trajectory is hypothetical in nature. It cannot be used to determine how a community might actually evolve. As Wenger (1998) suggests, communities of practice are social accomplishments that are established by those who participate in and sustain those communities. Our point here is that by understanding the practices of one community, we might trace how another community could evolve or how it might have evolved. At best we might understand how certain dimensions (mutual engagement, joint enterprise, shared repertoire) support different communities in unique ways. By defining potential trajectories we might understand which practices support Teacher 3's induction and transition into her math specialist role. We might also develop a better understanding of how those practices that constitute Teacher 1's community may have evolved over time. These two school buildings are situated in very different settings and yet each may help us identify those practices that support math specialists as they engage successfully in their daily work.

Following Wenger, we agree that it is not necessary for these sites to evolve without certain challenges. It is not necessary for individuals to work seamlessly together to accomplish goals. Our hope is to uncover both continuities and discontinuities that contribute to and sustain those practices of a particular community. What role if any do district-wide assessments play in these evolving practices? How is professional development supported? Are participants met with resistance in their respective school buildings? In what ways do practices meet the challenges that teachers face regarding high-stakes testing? As we continue to follow these and the other case participants as they transition or continue to work in the current leadership roles, we hope to identify the overarching issues that they face in their daily work.

References

Campbell, P. F., & Inge, V. (April, 2006). *Coaches Providing On-Site Elementary Mathematics Professional Development: Growth, Support, and Evaluation.* Presentation made at the annual meeting at the Association of State Supervisors of Mathematics, St. Louis, MO.

Simon, M. A. Research on the development of mathematics teachers: The teacher development experiment. In A. E. Kelly & R. A. Lesh (Eds.), *Handbook of research design in mathematics and science education* (pp. 335-359). Mahwah, NJ: Lawrence Erlbaum.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. New York, NY: Cambridge University Press.

West, L., Staub, F. C. (2003). *Content-focused coaching: Transforming mathematics lessons*. Portsmouth, NH: Heinemann.

Figure 2: Teacher 1's reported PDA information.

	Teacher 1			
Level 1	**Count**	**Percent**	**Hrs**	**Percent**
Coach	190	28.61	187.75	22.68
Student Support	17	2.56	18.00	2.17
Deliver Prof Dev/Workshop	18	2.71	48.25	5.83
Assessment and Data Analysis	16	2.41	18.25	2.20
Duties	27	4.07	28.50	3.44
Meetings	31	4.67	68.00	8.22
Independent Work	281	42.32	375.00	45.30
Non-Ed Activities	84	12.65	84.00	10.15
	664	**100.00**	**827.75**	**100.00**
Coach				
Coach Individual Teacher	160	84.21	136.25	84.76
Grade-level meeting	30	15.79	24.50	15.24
	190	**100.00**	**160.75**	**100.00**

Figure 3. Teacher 3's reported PDA information for the 8 branches (level 1).

	Teacher 3			
Level 1	**Count**	**Percent**	**Hrs**	**Percent**
Coach	93	7.18	75.00	6.68
Student Support	293	22.63	383.00	34.11
Deliver Prof Dev/Workshop	13	1.00	29.50	2.63
Assessment and Data Analysis	98	7.57	106.50	9.49
Duties	250	19.31	110.00	9.80
Meetings	39	3.01	46.50	4.14
Independent Work	343	26.49	258.50	23.02
Non-Ed Activities	166	12.82	113.75	10.13
	1295	**100.00**	**1122.75**	**100.00**
Coach				
Coach Individual Teacher	65	69.89	24.75	63.87
Grade-level meeting	28	30.11	14.00	36.13
	93	**100.00**	**38.75**	**100.00**

Figure 4. Teacher 1's PDA information about coaching services.

	Teacher 1					
Coaching Service	**Count**	**Percent**				
Observe Instruction	30	4.95				
Teach a Class	517	85.31				
Work with individual teacher	59	9.74				
	606	**100.00**				
Observe Instruction	**Count**	**Percent**				
Ascertain need for future	1	3.33				
Classroom management	2	6.67				
Use of materials/technology	2	6.67				
Questioning	5	16.67				
Lesson pacing/flow	2	6.67				
Monitor/manage small groups	4	13.33				
Student math expectations	3	10.00				
Get at student understanding	4	13.33				
Lesson's meaning/emphasis	3	10.00				
Observe students	4	13.33				
	30	**100.00**				
Teach a Class	**Count**	**Percent**		**Model a lesson**	**Count**	**Percent**
Model a lesson	124	23.98		Classroom management	6	4.84
Co-teach a lesson	393	76.02		Use of materials/technology	0	0.00
	517	**100.00**		Questioning	19	15.32
				Lesson pacing/flow	11	8.87
				Monitor/manage small groups	12	9.68
				Convey/monitor expectations	17	13.71
				Elicit math understanding	34	27.42
				Clarify/question understanding	17	13.71
				Differentiating instruction	8	6.45
					124	**100.00**
				Co-teach a lesson	**Count**	**Percent**
				Classroom management	7	1.78
				Use of materials/technology	42	10.69
				Shorten teacher's inst. Time	3	0.76
				Convey/monitor expectations	85	21.63
				Identify/elicit understanding	110	27.99
				Clarify/question understanding	100	25.45
				Differentiating instruction	46	11.70
					393	**100.00**

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Table 5. Teacher 3's PDA information related to coaching services.

	Teacher 3					
Coaching Service	**Count**	**Percent**				
Observe Instruction	0	0.00				
Teach a Class	2	1.71				
Work with individual teacher	115	98.29				
	117	**100.00**				
Work with individual teacher	**Count**	**Percent**				
Address math content/curr	10	8.70				
Address pedagogy/planning	69	60.00				
Debrief	13	11.30				
Address student performance	18	15.65				
Encourage; Address concerns	5	4.35				
	115	**100.00**				
Address math content/curr	**Count**	**Percent**				
Focus of unit/objective(s)	2	20.00				
Teacher's math understanding	3	30.00				
Select math objectives	0	0.00				
Use of pacing guide	2	20.00				
Relate lesson to big ideas	1	10.00				
Math trajectory	2	20.00				
	10	**100.00**				
Address pedagogy/planning	**Count**	**Percent**		**Plan teacher's indep. Inst**	**Count**	**Percent**
Walk through/clarify lesson	3	4.35		Classroom management	0	0.00
Clarify use of materials	1	1.45		Use of materials/technology	2	10.53
Co-plan a modeling lesson	0	0.00		Questioning	2	10.53
Co-plan co-teaching lesson	46	66.67		Lesson pacing/flow	2	10.53
Plan teacher's indep. Inst.	19	27.54		Monitor/manage small groups	1	5.26
	69	**100.00**		Convey/monitor expectations	0	0.00
				Elicit math understanding	4	21.05
				Clarify/question understanding	0	0.00
				Differentiating instruction	8	42.11
					19	**100.00**
Debrief	**Count**	**Percent**				
After modeling lesson	0	0.00				
After co-teaching lesson	12	92.31				
After observing teacher	1	7.69				
	13	**100.00**				
Address student performance	**Count**	**Percent**				
Analyze test performance	1	5.56				
Analyze student work	5	27.78				
Develop plan based on data	0	0.00				
Plan for differentiation	7	38.89				
Documenting student perform	1	5.56				
Math trajectory	4	22.22				
	18	**100.00**				

[i] See Campbel (2006) for more information on this technology.