BUILDING A MATHEMATICS EDUCATION COMMUNITY THAT FACILITATES TEACHER SHARING IN AN URBAN ELEMENTARY SCHOOL

Dorothy Y. White
University of Georgia
dwhite@coe.uga.edu

Paola Sztajn
University of Georgia
psztajn@coe.uga.edu

Amy Hackenberg
University of Georgia
ahacken@coe.uga.edu

Martha Alexsaht-Snider
University of Georgia
maas@coe.uga.edu

This paper describes how teachers, as members of a mathematics education community, interpret their professional development experiences designed to facilitate teacher sharing. Project SIPS (Support and Ideas for Planning and Sharing in Mathematics Education) is a school-based professional development project designed to help teachers improve the quality of their mathematics instruction by establishing a mathematics education community within their school. Analysis of data from focus group interviews revealed that SIPS enabled teachers to learn from and support each other and helped them to collectively think about mathematics teaching and learning. Through their interpretations we learned that developing a community creates several possibilities and tensions.

Theoretical Framework

Since the early 1990s, educational researchers have highlighted the importance of working with schools as organizations (Fullan, 1990), considering schools as a unit of change (Wideen, 1992). Clarke (1994) suggest that professional development opportunities should "involve groups of teachers rather than individuals from a number of schools, and enlist the support of the school and district administration, students, parents, and the broader community" (p. 39). In mathematics education, researchers have reiterated the importance of teachers working with colleagues within their school in the implementation and development of reform efforts (e.g., Campbell & White, 1997; Franke & Kazemi, 2001; Stein & Brown, 1997; Stein, Silver, & Smith, 1998). As Loucks-Horsley, Hewson, Love and Stiles (1998) explain, "effective professional development experience builds a learning community" (p.37). But, we know very little about how these communities operate and the ways in which teachers participate in them (Gutierrez, 2000).

Research on professional learning communities suggests these communities provide teachers with opportunities to communicate with colleagues and encourages teachers to continuously learn together and share. Paramount to these communities is teacher's engagement in professional conversations. Professional conversations are "discussions among those who share a complex task or profession in order to improve their understanding of and efficacy in what they do" (Britt, Irwin & Ritchie, 2001, p.31). Britt et. al. (2001) found for many teachers "professional conversations provided an important vehicle for the examination of their beliefs and practices" (p. 50). Teachers working together and sharing their mathematics teaching experiences through professional conversations are the bedrock of Project SIPS.

Methods

SIPS is a school-based professional development project designed to help elementary teachers improve the quality of their mathematics instruction by building a mathematics education community within their school. Building a community meant that school staff and two

university-based mathematics educators met regularly during school hours to explore, discuss, and plan the direction of mathematics education in the school. With teachers' input, activities were designed to nurture professional conversations where teachers share and plan mathematics-teaching strategies for the school's diverse student body. While building a community, SIPS aimed to help teachers increase their mathematical content and pedagogical knowledge. SIPS is currently in its third year. However, this paper focuses on the activities during the first year that facilitated teacher sharing within professional conversations.

Adams Elementary (pseudonym) is a Prek- 5 urban school where 90% of the children qualify for free or reduced lunch. During 2001-2002 the school enrolled about 400 children: 57% African American, 29% Hispanic, and 14% White. During this year, SIPS worked with 27 teachers at the school: all 18 homeroom teachers and 9 Resource teachers.

Three assumptions guided our work: (1) A mathematics education community is anchored on the exchange of knowledge and ideas; (2) Teachers need opportunities to share their mathematics teaching experiences with colleagues, and (3) Teachers *want* to share and learn from their colleagues. Therefore, SIPS included several activities to facilitate teacher sharing and to help teachers collectively think about mathematics content and pedagogy. SIPS first began by establishing a *Mathematics Leadership Team (MLT)*. This team included a teacher from each grade level, the Special Education Teacher and the Gifted Education Teacher. In the Spring of 2001, the MLT conducted a mathematics needs assessment for every grade level to identify the topics teachers wanted to learn more about or needed help teaching. For example, fifth-grade teachers wanted to learn more about teaching fractions and decimals while second grade teachers needed help teaching place value. Teaching problem solving was mentioned as a need for all grade levels. Based on the needs assessment, the MLT met with the mathematics educators, the school administrators and the mathematics consultant to plan the professional development topics for the year.

In the Fall 2001, SIPS was inaugurated with a four-hour workshop for all the teachers, paraprofessionals, and school administrators at the school. The focus of this workshop was to introduce teachers to the ideas espoused in the *Principles and Standards for School Mathematics* (NCTM, 2000), to discuss children's mathematical learning, teaching mathematics via problem solving and teaching mathematics for understanding. Following this initial workshop, teachers met throughout the year in grade-specific worksessions and monthly faculty meetings.

Grade-specific worksessions were held during school hours at the school. Teachers worked in four grade groups: PreK-K, $1^{st} – 2^{nd}$, $3^{rd} – 4^{th}$, 5^{th} – /Gifted ed. Each grade group met for half a day every other month. Substitute teachers were hired to allow teachers to attend the worksessions. During the worksessions, mathematics educators presented the research on children's learning of specified mathematics topics and introduced activities and ideas for teaching the topic with a grade-level focus. These worksessions encouraged teachers to explore their knowledge of the topic, to share their classroom experiences and teaching strategies, and to collectively plan mathematics lessons. These lessons were to be taught and shared at the faculty meetings.

Monthly mathematics faculty meetings were held after school and attended by the entire school staff. These meetings enabled vertical integration across grades where teachers shared their classroom activities with colleagues and discussed the mathematics expectations for students across grades. The meetings also provided an opportunity for teachers to engage in mathematics problem solving. Teachers solved adult mathematics problems, shared their solutions and discussed how the problems and concepts could be adapted for their classrooms.

In addition to the aforementioned activities, a *SIPS web page* was also established to highlight mathematics topics, to post teachers' teaching ideas and student work, and to provide links for related math sites. All these activities were designed to create a mathematics education community within Adams Elementary. This paper describes how teachers, as members of the mathematics education community, interpret these professional development experiences.

Data Sources

SIPS' research is interested in unveiling teachers' perceptions about the development of the mathematics education community. Data were collected from videotapes of all monthly faculty meetings, teachers' written reflections after worksessions and faculty meetings, and the mathematics educator's field notes. Semi-structured interviews, conducted by an external evaluator at the end of the first year, provided another source of data. Interviews provided an opportunity for teachers to reflect on their experiences, freely voice their opinions, and make suggestions for changes in the project. The focus group approach allowed "participants to talk to one another, asking questions, exchanging anecdotes, and commenting on each others' experiences and points of view" (Kitzinger & Barbour, 1999, p.4). Interviews were conducted with groups of three or four teachers, organized by grade level (seven groups), and some resource teachers. They lasted approximately 45 minutes and were all audio-taped and transcribed.

The main data source for this report is participants' language during the interviews. Through content analysis of the interview transcripts, we searched for patterns in the teachers' discussion of SIPS and for recurring words and themes that expressed teachers' interpretations of and engagement with the project. We looked within interviews and across the seven interviews to identify issues that were important to many teachers, trying to represent an overall view of the teachers instead of particular aspects commented by one or two teachers only. We contrasted and augmented these findings with those reported by the external evaluator.

Results

Results from interview data revealed that teachers found the mathematics education community afforded them with opportunities to learn, share, and think about mathematics learning as a collective community. Through their interpretations we learned that the word sharing was used in a broad sense to represent a variety of opportunities.

Sharing To Learn

Teachers found sharing with colleagues allowed them to hear what their peers were doing in their classrooms and to learn new teaching approaches from each other. A kindergarten teacher spoke of the value of sharing in grade-specific worksessions while a fifth-grade teacher spoke of the cross-grade sharing during faculty meetings:

> There were some things that other teachers were doing that I had never seen before and I've taught for 20 years. You know, it was like- that's I think the biggest thing in teaching is that teachers need to share. And that [worksessions] gave us that time to sit down, and you know, say now "What are you doing in your class?"
>
> We never have a chance to sit down and watch someone else do anything. And you learn something. It's not just the University—we need to do it at Adams, not just within but also across grades. I was amazed to see the advanced geometry they're doing in kindergarten- that's what we're doing in 5th grade too!

For experienced teachers, sharing helped them revisit familiar ideas and teaching approaches:

> [S]ometimes you can come up with something that was just a little bit different from how you had done it in the past. And it was just to get an idea across to a student that you may

not have thought about. You know, two brains are better than one, you know, when bouncing ideas.

Sharing to learn was especially important to teachers that have witnessed a change in the school's demographics. As a kindergarten teacher explained:

> [H]earing what other people were doing lets you know what was going on and how their children were reacting and I think that is important because over the years at Adams our population has changed greatly, our approaches with teaching them have changed, and I think it is important that we share those experiences with others.

Sharing For Support

Both new and experienced teachers found the opportunity to share gave them support as they thought about and tried new teaching strategies in their classroom. Two teachers, a kindergarten and first grade teacher, expressed how the SIPS mathematics community gave them the needed support to teach:

> As a new teacher coming from a different country, it helped a lot to understand how to teach math here, how to help [the children], you know, and listen to my peers.
>
> As a new teacher in the schools in the United States, you gave me a level of comfort and awareness that I was on target, you know, on track, doing what I was supposed to be doing.

By consulting with other teachers and the mathematics educators, most teachers were more willing to try new approaches. For example, a fourth grade teacher spoke of her confidence attempting new ideas in her classroom because "everybody was trying"

> I just like the fact [that] in talking about it and sharing, I personally felt a lot more confident to do.. an idea or attempt to, not take it directly, but I'll get an idea and jump, you know. All of the work that we did hands-on was so physically engaging. One of the things that I did that I thought could help.. the kids remember,, the multiples of certain numbers…[W]e did goofy things like jumping jacks and stuff with counting the multiples instead of 1,2,3,4, 5. And just silly things like that, I would have possibly thought of before but wouldn't have felt daring enough to try it. But because I knew everybody was trying..

Sharing To Think About Mathematics Together

Many teachers spoke of their experiences as "learners of mathematics" and how they valued hearing about the different approaches their colleagues used to solve problems. As a second grade teacher stated:

> It is amazing how they would say work through this activity, and you would see how she would work through it opposed to how I would work through it and you come up with the same answer. It's just our approaches was *so* different but yet they were not.

As teachers collaborated on problem solving activities, they saw how their ways of thinking were similar to, or different from, their students' mathematical thinking. A second grade and a first grade teacher suggested:

> [Y]ou actually got to feel how the kids felt and even doing the projects on a larger adult scale we still came up with a lot of the same concepts in the same orders that our students do.
>
> One of the goals that really helped me this year was to think about math not necessarily as the teacher teaching the math, but also from the students' points[s] of view and their perspective and how they do take in math concepts and process them and the many different ways there are for students to do that.

The professional development activities also helped teachers to think about how they encouraged their students to share and think through mathematics problems. A third-grade teacher explained:

> I think we emphasize, even more, student sharing…Sharing solutions or ways to [problem solve].. I mean they were allowed to draw the picture on the board and they were allowed to solve it in any way and then they explained it to the class, how they did it.

Sharing Beyond The Worksessions

Teachers found that they shared their learning experiences with their students especially after a SIPS worksession.

> My students are always asking me what's your meeting about. So I have to tell them.
>
> I would come back and actually, you know, if there was something I thought was particularly interesting or cool, I would share it. And they just loved the fact that I was a student, something, that really got them.

Some teachers also made more of an effort to talk to colleagues about mathematics at different times of the day (e.g., at recess on the playground or after school in the hallway). As a second grade teacher explained:

> [S]he's right next door to me, and it's amazing, we don't see each other. I may hear her going up and down the steps, but you know now I make an effort; I try to go out and talk to people during different times when I see them on the playground.

Although teachers in this project expressed agreement with the premise that a mathematics community is anchored on the sharing of ideas, they also expressed concerns about how well the sharing was being fostered. As a kindergarten teacher suggested:

> I don't think we have done as much sharing on a routine basis as I would have hoped. One of the things we were supposed to do was to be able to visit in each other's classrooms. And we really didn't find ways to make that work and I think that would have been a valuable thing to do.

Teachers were often confused about when and what to share and did not feel that enough teachers shared to truly have everyone as active members in the community. A second grade and special education teacher explained:

> It's real hard at the end of the day, and it got kind of confusing in there too, as to who was supposed to be, what grade level was supposed to be sharing for that month and everything so people weren't prepared because they weren't sure if it was supposed to be fourth and fifth grade that was sharing this month or if it was kindergarten or pre-K. I think that once we got into the staff meetings a lot of people shared, but I think sometimes you don't want to share because of a large group. It's better to have smaller groups, you know, and then maybe that person wants to share.

Discussion and Conclusion

The findings presented in this paper highlight the possibilities and tensions that manifest when establishing a mathematics education community. With respect to possibilities, we believe teachers saw sharing ideas and strategies a worthwhile activity, where they learned from and supported each other and collectively thought about mathematics teaching and learning. Teachers valued both the grade-specific and mixed-grade sharing and the time that they were afforded to think and plan. By engaging in professional conversations, teachers learned what their colleagues expect across the grades and worked on ways to attend to these expectations. Teachers also began to examine the ways their students thought about mathematical concepts. We are also optimistic that teachers will continue to engage in professional conversations about mathematics

and to share after the SIPS project. Thus, we concur with Britt et. al. (2001) that professional conversations provide an important vehicle for teachers to examine their beliefs and practices.

Our work also highlights several tensions when establishing a mathematics education community. In spite of our efforts to maintain an emphasis on student's mathematical knowledge, teachers' comments focused more on students' flaws than on their actual teaching. For example, teachers would share how students could not solve specific problems when we really wanted them to talk about what the answers said about students thinking and instruction. Similarly, teachers rarely spoke about teaching mathematics to poor students of color. Some teachers would imply that their students were different and that they had to teach differently without any elaboration. In both situations we opted not to probe teachers further because we placed more emphasis on establishing trusting relationships with the teachers and wanted teachers to feel comfortable sharing their thoughts.

Another tension that arose was that teacher sharing was usually "*by invitation only*." That is, teachers rarely initiated conversations but would share their ideas and "success stories" after we started talking about specific instances. Teachers were more comfortable sharing their strategies for solving problems than they were for talking about their teaching.

In closing, our research on a mathematics education community underscores the importance of providing opportunities and time for teachers to engage in professional conversations to share knowledge and ideas and how difficult it is to focus that sharing on mathematics teaching and learning. As university mathematics educators we valued teachers opinions and wanted them to have ownership of the community while trying to maintain the goal of improving student learning. Therefore, teachers usually determined the scope and direction of their sharing which often focused on other school issues. However, the realities of schools, especially schools that have specific challenges, have to be an integral part of the community. Therefore, teachers must have the freedom to express their concerns and suggestions.

As we continue to analyze the data from SIPS we are examining other aspects of teacher sharing and building trusting relations with teachers when establishing a mathematics education community. In particular, we are examining what specific mathematical ideas teachers share, how the sharing evolves over time, and how to facilitate teachers sharing their unique views on teaching mathematics to poor students of color.

References

Britt, M. S., Irwin, K. C., & Ritchie, G. (2001). Professional conversations and professional growth. *Journal of Mathematics Teacher Education*, *4*(1), 29-53.

Campbell, P. F., & White, D. Y. (1997). Project IMPACT: Influencing and supporting teacher change in predominantly minority schools. In E. Fennema & B. S. Nelson (Eds.), *Mathematics teachers in transition* (pp. 309-355). Mahwah, NJ: Lawrence Erlbaum Associates.

Clarke, D. (1994). Ten key principles from research for the professional development of mathematics teachers. In D. B. Aichele & A. F. Coxford (Eds.), *Professional development for teachers of mathematics* (pp. 37-48). Reston, VA: National Council of Teachers of Mathematics.

Franke, M. L. & Kazemi, E. (2001). Teaching as learning within a community of practice. In T. Wood, B. S. Nelson & J. Warfield (Eds.), *Beyond classical pedagogy: Teaching elementary school mathematics* (pp. 47-74). Mahwah, NJ: Lawrence Erlbaum Associates.

Fullan, M. (1990). *The new meaning of educational change*. New York: Teachers College Press.

Gutierrez, R. (2000). Advancing Latina/o urban youth in mathematics: The power of teacher community. *Paper presented at the Annual Meeting of the National Council of Teachers of Mathematics*.

Hawley, W. D. & Valli, L. (1999). The essentials of effective professional development. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as a learning profession* (pp. 127-150). San Francisco: Jossey-Bass.

Kitzinger, J., & Barbour, R. S. (1999). The challenge and promise of focus groups. In R. S. Barbour & J. Kitzinger (Eds.), *Developing focus group research: Politics, theory and practice*. Thousand Oaks, CA: Sage.

Loucks-Horsley, S., Hewson, P. W., Love, N., & Stiles, K. E. (1998). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: NCTM, Inc.

Stein, M. K., & Brown, C. A. (1997). Teacher learning in a social context: Integrating collaborative and institutional processes with the study of teacher change. In E. Fennema &
B. S. Nelson (Eds.), *Mathematics teachers in transition* (pp. 155-191). Mahwah, NJ: Lawrence Erlbaum Associates.

Stein, M. K., Silver, E. A., & Smith, M. S. (1998). Mathematics reform and teacher development: A community of practice perspective. In J. Greeno, G. & S. V. Goldman (Eds.). *Thinking practices in mathematics and science learning* (pp. 17-52). Mahwah, NJ: Lawrence Erlbaum Associates.

Wideen, M. F. (1992). School-based teacher development. In Fullan & A. Hargreaves (Eds.), *Teacher development and educational change* (pp. 123-155). Bristol, PA: Falmer.