Building Mathematical Power: Why Change is So Difficult

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Abstract

The purpose of this paper is to report the lessons gleaned from a year-long staff development teacher training experience with urban teachers. The paper addresses the current research on teacher development, describes the implementation of best practices, and shares the results of the year-long study. Very little has been written on the role and the accountability of the facilitators who are hired to provide staff development. These staff developers recognized the need to address their own practices before questioning the impact on teacher development. The study found that teacher growth has much to do with who facilitates the experience, how responsible they feel, and what they do to foster deeper relationships with the faculty and the organization.

Introduction

The purpose of our story is to share the experiences, reflections and lessons gleaned from our journey in providing a year long staff development experience on “Building Mathematical Power” for urban teachers. As staff developers we have spent over twenty years grappling with whether our work makes a difference to teachers and the children they serve. We agree with Guskey’s (1995) view that staff development needs radical transformation and re-thinking. The current trend in staff development is based on a
limited conception of teacher learning, and is grounded in a set of assumptions about teachers, teaching, and the process of change that does not result in teacher growth. Therefore, instead of focusing on the process, we bring to light the crucial role of those individuals responsible for teacher development. Very little has been written on the role and accountability of the facilitator and this is an attempt to add to the literature in a small way. We learned that teacher growth has much to do with who facilitates the experience, how responsible they feel, and what they do to foster deeper relationships with the faculty and the organizations they represent.

The Journey

The principal of a small, low-performing, high poverty, urban elementary school contacted us through our University and asked us to provide professional development for her teachers. Through the “No Child Left Behind Act” the principal had a budget set aside for staff development in mathematics. As staff developers, we used our own experience and knowledge of schools, teachers, teaching, research and mathematics to design a plan and met with the principal and district representatives to have this plan approved. We clearly specified our expectations to the principal as we had both experienced poor staff development in the past. The follow-up, coaching component of the workshop experience was stressed as a necessary element. Two cohorts by grade appropriateness (classroom teacher’s grades 1-4 and support teachers) were formulated and the teachers were informed that this would be an on-going process, including regular meetings and classroom visits (twice a month) throughout the year.
Our prior experience with staff development proved that, although we were often welcomed and enjoyed by teachers, the development did not always result in any lasting change. According to Hiebert (2001), in order to gain long term results in improving classroom practice, focus must be on continuous steady improvement rather than “quick fixes”; improving student learning using measurable goals; and learning from the implementation process. We used our experience and research to develop a program that would address the school’s culture in order to get long term results.

We began with a series of workshops focused on strengthening teachers understanding of the NCTM (2000) content standards (Number and Operations, Algebra, Geometry, Measurement, and Data Analysis and Probability) which explicitly describe the content that students should learn. At the same time, we introduced them to the NCTM process standards (Communication, Connections, Problem Solving, Representation, and Reasoning and Proof) which highlight ways of acquiring and using content knowledge. From past experience, we knew that the majority of teachers were not familiar with or comfortable with the process standards. Therefore, we did not expect them to be using these techniques in their classrooms. Our work was real application by having the teachers participate as learners, thus using the process standards while exploring the content.

We have found that teachers often harbor negative feelings towards staff development because they have had numerous poor experiences with staff development and they are frustrated by the annual new district initiatives pushed on them. Our goal was to have the
teachers working cooperatively, while communicating about mathematics and using
manipulative resources to formulate concepts. At the same time we were establishing
trust with them and working on building a community of learners. During our
development period, we received assurance from the principal and district supervisor that
the teachers would not be bombarded with other staff development initiatives.

After just three meetings we determined that the district was continuing to put emphasis
on standardized test scores and other district initiatives. Teachers were more concerned
with test results than increasing mathematical thinking. We immediately changed our
focus in order to meet the needs of the teachers and the priority of the district. Knowing
that they were so concerned with test results, we decided to work backwards and use
these tests as a vehicle for building mathematical thinking. We exposed teachers to
sample items from the state test and assisted them in analyzing the math that students
need to know in order to be successful. Upon giving them a practice fourth grade test,
we realized that their knowledge of mathematical content was limited and that they
struggled with open-ended questions. We engaged the teachers in practice lessons
involving the use of manipulative materials and modeled the process standards in hopes
of increasing content knowledge.

The next step in our plan was to complete in-class coaching. The teachers were nervous
about inviting us into their classrooms but we did not receive any resistance. We thought
that we had made a lot of headway with our workshops and were very surprised by what
we saw upon entering the classrooms, as the teachers were not transferring the lessons
from our workshops. For example, one teacher began the lesson by saying “let’s see what the book says” and continued to follow the teacher’s edition step by step. She then became confused with the concept (using base 10 blocks for division). Teachers were trying to incorporate ideas from our sessions, such as, teaching for conceptual rather than procedural understanding and using manipulative materials, but were struggling with proper implementation. Our workshops did not prepare them in the way that we had expected. This is supported by research from the TIMMS study (1999) which points to the fact that American teachers adopt surface features of the NCTM Standards documents without changing their teaching philosophies (Stigler, 1997, p. 15). Although we found some changes in teacher behavior, such as, using mathematics’ journals, integrating manipulative materials, and incorporating group work, our findings were consistent with Stigler’s. Therefore, we realized that coaching alone would not be enough due to the limited transfer of knowledge. This is when we turned to the Japanese model of lesson study.

Lesson study or *jugyokenku* is a practice that Japanese teachers engage in to constantly improve the quality of the lessons that they present to their students. In the Teaching Gap, Stigler and Heibert (1999) compared the classroom methods of U.S., Japanese, and German teachers and found that “lesson study is an effective method for systematically improving classroom instruction by replacing teachers’ ingrained assumptions and solo practices with collaborative brainstorming, planning, observation and evaluation” (Kelly, 2002, p. 4) Using the lesson study model, we continued to work with the teachers in their classrooms while supporting them in developing comprehensive lessons for their
students. We felt that this would address the implementation of isolated skills and assist them when applying concepts to real classroom situations. Furthermore, lesson study would promote reflective practice and encourage teachers to work collaboratively after our development was complete.

**Reflections**

We chose to analyze our journey from the facilitator’s perspective rather than the teachers because we believe that professional development is akin to teaching and learning. Facilitators, like teachers, must reflect on their practice in order to grow. We used Guskey and Spark’s (1996) model for evaluating staff development, which is based on the premise that the quality of staff development is influenced by a variety of factors. Factors that have an immediate and direct influence are classified in three major categories: content characteristics (the what), process variables (the how), and context characteristics (the who, when, where, and why) (Guskey and Sparks, 1996).

We wondered why change was so slow, even though we worked very hard at implementing the research recommendations. We looked for patterns to tell us how well our work served teachers and looked at the journey to find ways to challenge our assumptions. We clarified our concerns and asked ourselves how we would improve our practice and how we would know that our practice improved? Lastly, we engaged in conversations with teachers and the principal to obtain their perspective. Out of these findings we designed recommendations for future facilitators and others as they move forward to use staff development as a vehicle for increased teacher effectiveness.
Patterns and Assumptions

Content Characteristics

While reflecting on our content we realized that focusing on mathematical power alone was insufficient. While our content was aligned to the NCTM standards, it failed to address the more contemporary issues affecting today’s teachers. Teacher expectation and efficacy play a key role in teacher interaction with students. We initially thought that teachers had low expectations for their students but later realized that in some cases the barrier was low confidence in their own ability. Teacher’s past experiences with mathematics played a key role in their mathematical understanding. In their own learning of mathematics the emphasis was on procedural skills development, rather than conceptual understanding. It became clear that implementing the NCTM Standards required a change in pedagogy and teachers were fixed in the traditional mode of teaching. For example, they still thought of teaching as telling and stressed numbers instead of application. Furthermore, we realized that the misalignment between district goals and our plan led to teacher overload, which caused them to be overwhelmed, frustrated and anxious.

Process Variables

In terms of the process variables our analysis is consistent with the work of Joyce and Showers (1995) which stressed that the effectiveness of training requires follow-up activity. We strongly believe that workshops, coaching, and lesson study are necessary vehicles for success; however each one requires more in-depth thought. In the planning
we should have considered a more differentiated approach at each teacher’s level of development. In retrospect we gave up on coaching too quickly and immediately turned to another model. In planning our work we should have considered the “less is more” philosophy. We did too much, too soon, without allowing teachers a time period to process the new learning.

Context Characteristics

The context proved to be the most challenging aspect of our work. We found that teachers were bombarded by district initiatives such as guided reading in language arts, silent sustained reading, use of manipulative materials, a new mathematics text, pacing charts in math and test preparation workshops. The role of the district office and their overwhelming mandates left the teachers struggling with what to do next. The newly appointed principal was supportive; however, teachers had not yet developed a trust level. The whole concept of teachers working together as teams required new interpersonal skills.

Lessons Learned and Recommendations

1. The beliefs teachers held about their own capabilities, as to whether they could make a difference, was our most powerful lesson. Overall, we found a low sense of efficacy and wondered how to address this.

Recommendation: We need to research and understand the impact of efficacy on teacher development and find ways to build or strengthen teachers’ capacity.
2. One of our major findings was the need to address district goals and teacher needs when designing the plan. We needed to be more cognizant of what was taking place in the school and the district to determine the impact on teachers.

**Recommendation:** Ask schools and teachers to identify the problem that they are having and then outline a plan with facilitators and teachers to remedy that specific problem.

3. In planning the content it is important to design the goals and objectives based on student needs rather than teacher needs. A process like lesson study allows conversation to begin with “how can we help learners?” This takes the focus off of the teachers and puts it onto the children.

**Recommendation:** Focus on the children and their learning needs as a vehicle for teacher growth.

4. As facilitators we often don’t take responsibility for outcomes as we teach and we leave, yet we expect teachers to be accountable for student learning.

**Recommendation:** Facilitators must practice what they preach. They too must reflect on their practice and use best pedagogical practices to engage the learners and to assess outcomes.

5. Lesson study allows teachers to have more participation in the process.

**Recommendation:** Use lesson study as a powerful vehicle for staff development because it enhances participation, allows teachers to take ownership, addresses individual needs,
and builds accountability. However, you need to adapt it to the American schools’ systems and structures.

6. In observing the teachers we realized that our process goals for the first year were unrealistic and too demanding.

**Recommendation:** Less is more and teachers need time to process and practice new behaviors.

7. Coaching, just like lesson study, has a place in staff development. The process model used for follow-up is as important as meeting the needs of teachers.

**Recommendation:** Carefully assess the school culture and individual teacher styles and needs to determine the appropriateness of the follow-up.

8. In adult development, building trust is crucial. We found that teachers, like students, try to hide what they do not know as well as the difficulties they are experiencing.

**Recommendation:** The facilitator must participate in the school culture by committing for an extended period of time and actively working on building trusting relationships.

9. The staff developer cannot ignore the pressure that the district puts on principals and teachers; in fact, they must learn to work collaboratively for teacher success.

**Recommendation:** Meet with district representatives to discuss their plans and have ongoing conversations on how the two goals can merge as one.
10. Facilitators must help the principal by meeting with them regularly and providing suggestions on how they can support their teachers in their growth and development.

**Recommendation:** Request that the principal be an active participant in the plan and its implementation. Leave time during each visit to meet with the principal.

**The Sequel**

A year has transpired since we began this journey. We have learned much to inform our practice and yet the challenges are still daunting. Can staff development and staff developers make a difference? The answer is yes. The teachers and the principal have invited us back to continue our work, a sign that at least the willingness continues. More importantly, the children are growing. Last week the principal called to say that the math scores have increased by 40% from the previous year. Whether this is a result of our work or the teachers alone, it really doesn’t matter. What matters is that together we make a difference.
REFERENCES


