TEMP Research Project

Introduction

My role in the ongoing TEMP Project (Teacher Education Model Programs) proved to be an experience like none other I have had in my years in education. My own training and experience has taken place in classrooms ranging from 7th grade to college undergraduate literacy courses. Observing an elementary math class ensured I would be a wide-eyed learner absorbing that fascinating environment.

To be sure, I was a bit nervous as I pondered the prospect of observing an elementary classroom, for I bow at the feet of elementary school teachers and their endurance and dedication to our children. What drew me to the TEMP Project was the possibility of working with a professional development model that not only addresses targeted needs of the individual school identified from the disaggregation of assessment data, but also allows teachers to learn from observing one another as peers. While, historically, teachers have gone into their classrooms and closed their doors, responsible in virtual isolation for the planning, implementation, and assessment of curriculum, this is changing. Recent reform efforts have included teacher collaboration as an integral part of the effort to improve our schools, and as Grant and Murray (2002) assert, "There is substantial evidence that teacher collaboration can be a source of teachers' professional development, and schools where extensive collaboration is the norm are often more successful than those where teachers collaborate less" (186).

Pre-service teachers are not often taught the skills needed to examine data for the purposes of improving curriculum and instruction. Heritage and Chen (2005) consider the

need for using data to inform school improvement. They note that "…the development of these skills has not been a part of more administrator preparation programs and hardly ever has been a feature of preservice or inservice teacher training" (708). With the growing body of evidence that using data at the classroom and school community level can lead to gains in student learning, there is an urgent need for teacher educators to be exposed to the effective use of such skills. Heritage and Chen describe the CRESST (the National Center for Research on Evaluation, Standards, and Student Testing) initiative that "…helps educators develop the skills to collect, analyze, and be guided by data" (707); it teaches them to be teacher researchers. This initiative identified five core skills deemed necessary to effectively use data in school-based decision making: determining what you want to know; collecting data; analyzing the results you receive; setting priorities and goals based on the analysis of data; and developing strategies (708-710).

An ambitious undertaking in its entirety, the TEMP project purposed: "(a) to strengthen the curriculum of participating schools and our Elementary Education Teacher Education Program (ETEP), (b) to develop a plan for integrating technology into the school curriculum and the ETEP, (c) to increase the percentage of candidates in ETEP from underrepresented populations" (Brennan, 2003). The lesson-study format followed in the TEMP project aligns with the five core skills described by Heritage and Chen. As lesson-study requires a high level of participation from teachers, those without whom successful reform cannot happen, it has enormous potential as a professional development model for schools desiring to effect strategic, data-driven reform.

My participation in this effort as a student researcher involved addressing the following question relating to the first goal stated above:

- How viable is the lesson-study model of professional development enacted in the TEMP project in terms of strengthening teacher practice and ultimately student learning?

Theoretical Perspective

Constructivism

People are constructed and are co-constructors of themselves by the surroundings in which they find themselves born, raised, exposed, trapped, etc. James Wertsch (1985) in his text *Vygotsky and the social formation of mind* considers constructivist frameworks as he meticulously examines Russian psychologist L. S. Vygotsky's works. Departing from psychological models of learning and construction of self popular in his time, Vygotsky saw the sociocultural influence on people as one that cannot be ignored. As Wertsch states in chapter 1, "In psychology we tend to view culture or society as a variable to be incorporated into models of individual functioning. This represents a kind of reductionism which assumes that sociocultural phenomena can ultimately be explained on the basis of psychological processes" (1). Wertsch departed from agreement with Vygotsky on very little, however one important aspect of departure involved Vygotsky's assertions that in the development of people, biological functions cease to be influential when sociocultural

influences take over. Vygotsky argued, "it is not nature, but society that above all else must be considered to be the determining factor in human behavior" (qtd. in Wertsch, 26). Wertsch argues, and I agree, that the two, along with other influences, co-exist as influences throughout a person's life. This is not to say that the sociocultural surroundings in which one finds herself may not become the primary influences, nor are Vygotsky's primary arguments to be discounted because of his belief about the transition from biological to cultural influences. "In particular, it does not weaken his claim that with the emergence of sociocultural activity the very nature of development changed" (Wertsch, 30).

What about with teachers? Are teachers able to enter a classroom, leaving all that they are at the door before facing their students? And do they, and should they learn from social interaction with their own peers as they expect their students to do? Marsh (2003) asserts that, "Teacher thinking is an ongoing dialogue among one's personal history, present conditions, beliefs, values, and the social, cultural, historical, and political forces that surround groups of individuals in a given time and place…From this perspective, teacher thinking is a mélange of past, present, and future meanings that are continually being negotiated and renegotiated through social interaction" (5-6). How, then, could our teachers identify needs in their curriculum and learn new, effective strategies for teaching to address those needs? Once a teacher assumes responsibility for a classroom, does the door shut leaving the teacher on her own? Borko (2004), citing many supporting studies, states that, "Indeed, while the field of research on teacher learning is relatively young, we have made a great deal of progress in the last 20 or so years. For example, we have evidence that

professional development can lead to improvements in instructional practices and student learning" (3).

Professional Development

Summarizing existing research literature on professional development, Borko (2004) states, "Each year, schools, districts, and the federal government spend millions, if not billions, of dollars on in-service seminars and other forms of professional development that are fragmented, intellectually superficial, and do not take into account what we know about how teachers learn (Ball & Cohen, 1999; Putnam & Borko, 1997)" (2) and goes on to say that "For teachers, learning occurs in many different aspects of practice, including their classrooms, their school communities, and professional development courses or workshops" (4). Teachers need to find questions to which they need answers from what is immediate to their work. "The very purpose of lesson study is to provide a non-threatening context for teachers to share constructive and concrete feedback about the lessons that they have planned or observed together" (Chokshi & Fernandez, 2004, p.524). The challenge, then, is to design carefully constructed professional development opportunities for teachers based on identified research data-driven needs on an individual school, or even classroom, basis. Further, as professionals, it is the teachers who design, implement, facilitate, and assess learning on a daily basis in their classrooms, and who should be involved in the curricular decision affecting their students. "In the end, lesson study has the power to keep teachers in control because it honors and professionalizes their work" (Chokshi & Fernandez, 2004, p. 525).

Through the high level of involvement required by the implementation of lesson study, teachers demonstrate their involvement, dedication, intellectualism, and professionalism.

Lesson-Study

Grant and Murray (2002) assert, and I agree, that, "Real colleagueship involves learning together, interrogating each other about questions of practice, comparing approaches and results, visiting each other's classrooms, engaging in mutual criticism, and taking responsibility for getting better results" (65). Those from whom teachers might learn the most are right next door, at another school, or just down the hallway from them – their own peer educators. Teacher participant in this project, Angie Gonzalez asserts that there is a need to "Get professionals together, discuss that positives and negatives of actual lessons, agree, disagree, ask for help, and offer advice. Who else understands a teacher and her needs better than another teacher?" (Gonzalez, 2005, p. 6); "…professional development leaders must help teachers to establish trust, develop communication norms that enable critical dialogue, and maintain a balance between respecting individual community members and critically analyzing issues in their teaching" (Frykholm, 1998; Seago, 2004, summarized in Borko, 2004, p. 7).

Other researchers have discovered the value of classroom-based research as well (Fishman et al., 2003; Chandler-Olcott, 2002; Wang & Paine, 2001; Frank & Uy, 2004; Little et al., 2003; Falk & Blumenreich, 2005). Chandler-Olcott (2002), guiding teachers in the

Mapleton Teacher-Research group research project through such classroom-based research, asserts that, "Most members of the Mapleton Teacher-Research Group…perceived classroom-based inquiry as more effective…than other kinds of professional development" (35). Guiding teachers through lesson-study, a professional development model adopted from Japanese education, can achieve these goals, as evidenced by my experiences with the TEMP project.

Comparing U.S. and Chinese mathematics teaching and learning, Wang and Lin (2005) point to a series of studies concluding that "U.S. students underperformed in various international tests in contrast to their East Asian counterparts" (3). Acknowledging the influence of cultural differences, Wang and Lin, summarizing other research, further assert that, "teachers in these countries are organized to study the curriculum and plan lessons together, observe and critique each other's teaching, and analyze student learning collaboratively, activities that presumably further shape their teaching knowledge and practice (Lewis, 2000; Lewis & Tsuchida, 19998; Paine, 1997; Paine & Ma, 1993)" (3). Despite the fact that some of the difference between U.S. and East Asian mathematics teaching and evidenced learning might be "culturally scripted" (Wang and Lin, 2005, pg.4), methods used to approach the level of conceptual thinking used by our East Asian counterparts can be successfully used in U.S. classrooms, as well. Wang and Lin go on to cite a study by Stigler and Perry (1988) in which it was discovered that "…Chinese students spent substantially more time on learning activities led by their teachers than did their U.S. peers. Chinese

teachers were more likely to use whole-group instruction to present information, engage students in practice, and offer feedback to students" (qtd. in Wang and Lin, 2005, pg. 6). The goals, and successful attainment of them, for each of the three teachers I studied in this project, included the use of more whole-group explanation and discussion, and can be considered to have been successfully borrowed.

Methods and Design

As a novice researcher to the field of professional development and elementary mathematics teaching, I returned to the literature constantly throughout the collection and analysis of my data. My belief that theory is very relevant to all research, and that the intricacy of the situations in which teachers and professional development facilitators find themselves warrants careful consideration and thorough review led me to select grounded theory as the approach that would best fit this research project. Strauss and Corbin (1998) list eight components of grounded theory:

> (a) the need to get out into the field to discover what is really going on; (b) the relevance of theory, grounded in data, to the development of a discipline and as a basis for social action; (c) the complexity and variability of phenomena and of human action; (d) the belief that persons are actors who take an active role in responding to problematic situations; (e) the realization that persons act on the basis of meaning; (f) the understanding that meaning is defined and redefined through inter-

action; (g) a sensitivity to the evolving and unfolding nature of events (process); and (h) an awareness of the interrelationships among conditions (structure), action (progress), and consequences (9-10).

The final product of this research will be a case study (Yin, 2004; Creswell, 1998) grounded in theory with the unit of analysis being the TEMP project of which the three teachers I observed were participants. The selection of a project such as TEMP and the embedded units involved (teachers and professional development facilitators) lends itself well to the use of case study methods. In sum, I hope to be able to make suggestions for enhancement of teacher professional development programs and in the preparation of our pre-service teachers to make the use of classroom inquiry enacted through such methods as lesson-study an embedded part of their practice.

Data Analysis and Collection

My involvement in this project included observing three teachers at Northern Elementary School: Angie Madden, Angie Gonzalez, and Emily White, who taught 3rd, 4th, and 3rd grade respectively during the 2004-2005 school year. I observed each teacher one time during the same week and followed with post-conferences and review of each teacher's project portfolio a few weeks later. During open coding of field notes and teacher-participant portfolios, I search for evidence that the teachers had been able to use the lesson-study model for professional development to accomplish goals set for their individual classrooms.

Findings/Discussion

As an ancillary student researcher, I had never met Angie Madden, Angie Gonzalez, or Emily White until the day I entered their elementary classrooms to observe mathematics lessons. As a non-elementary trained educator, I had no pre-conceived notions of how mathematics could be taught most effectively. Along with their fellow teachers and administrators at The Elementary School, these women had identified the written, open-response mathematics portion of their school's annual test as an area of concern. Math scores had revealed that 75% of students had scored Proficient on the multiple choice section of the

mathematics portion of the test, while only 25% had scored Proficient on the open-response portion (Madden, 2005, p. 1).[1]

As the overarching TEMP project encouraged the use of lesson-study, plans were put into place for the teachers involved to identify goals for improving their instruction, observe other teachers, be observed by other teachers, administrators, and TEMP researchers, and continuously assess the effectiveness of their modified instruction. By using school-based data, those involved were able to identify and problematize the need for improving open-response item mathematics scores school wide. Brainstorming along with those at their school, researchers, and mathematics professors from the University of Kentucky, teachers concluded that they needed to teach meaningful math and provide opportunities for students to discuss their thinking and answers before they began to write about them (Madden, 2005, pg. 1), elevating the thinking in mathematics lessons from

procedural to conceptual. Fourth grade teacher Angie Gonzalez asserts that, "…as a teacher of nine years, I will tell you that most instructors teach procedurally. The students are taught ½ of ½ = ¼, but most children as not able to why it works and how we can use it" (Gonzalez, 2005, p. 2). Implementing carefully designed lessons involving whole class, group, and individual discussions about math concepts, these three educators were able to produce phenomenal results in their classrooms:

Angie Madden

Third grade teacher Ms. Madden began this project with a multiplication unit. Her goals were to be deliberate in her planning and implementation of mathematics lessons, use many types of questions during lessons, use think alouds, and whole class and group discussion. At the end of this first unit, Ms. Madden asked the students to complete an open-response question to demonstrate their knowledge of multiplication. Although scores were not what she had hoped for (62% scoring Novice and none scoring Distinguished), Ms. Madden continued to assess her own instruction as evidenced through student learning and made changes for the next unit on fractions. For this second unit, she continued encouraging students to think aloud and discuss how and why they arrived at the answers they did, increasing their confidence with "talking math." Having arrived at the conclusion that the first open-response she had used was too complex with too many steps for her third-graders, she chose a simpler, more direct open-response for the culmination of the second unit. This

[1]State assessment scoring in Kentucky writing uses the ascending Novice, Apprentice, Proficient, and Distinguished scale, also represented as a numeric scale 0, 1, 2, 3, or 4 with 0 being Unscorable. For more information go to http://www.education.ky.gov/KDE/default.htm

open-response asked students to perform three steps which were designated clearly as A, B, and C. After modeling with the class how to procedurally perform the steps, Ms. Madden was able to report these scores on the second open-response: 50% Distinguished and 37.5% Proficient! Greatly encouraged by the improvements garnered by her students, Ms. Madden commits that she "..will change my teaching by always ensuring that I am teaching mathematics concepts, not procedures" (Madden, 2005, p.5).

Angie Gonzalez

Fourth grade teacher Ms. Gonzalez also designed two units (the first on fractional parts, the second on fractions and decimals) which included pre- and post-tests, carefully constructed questions that addressed all levels of thinking in Bloom's Taxonomy, entrance and exit slips that required students to immediately apply math concepts, whole, group, and individual discussion and work with math concepts, and an atmosphere in which the only thing to be ashamed of was "not asking" (Gonzalez, 2005, p.8).

For the first unit on fractional parts, Ms. Gonzalez's students scores on the pre-test were as follows: no students scoring Distinguished, one student scoring Proficient, and the rest (out of 31) scoring Apprentice, Novice, or Unscorable. For the post-test: 61% of the students scored Proficient or Distinguished and only 5 students scored Novice. The results of this teacher's second unit on fractions and decimals were even more encouraging: Pre-test – 14 % Distinguished, 29% Proficient, 39% Apprentice, and 18% Novice; Post-test – 64% Distinguished, 14% Proficient, 18% Apprentice, and 5% Novice.

Directing the reader of her report to the student examples included in her project portfolio, Ms. Gonzalez concludes with evident enthusiasm, "…you will see students initially guessing or leaving areas blank, while on the post-test students were using math words to confirm their mathematical procedures. They were explaining themselves!" (Gonzalez, 2005, pg.4).

Emily White

Third grade teacher Emily White's goals for this project were to use manipulatives effectively, to use conversation at the whole class, group and individual levels, to model wording of conceptual explanations, and to improve student explanations through writing. She began this project with a decimals unit. She required her students to complete two open-response questions during this unit: first open-response scores – Distinguished 0%, Proficient 31%, Apprentice 46%, and Novice 23%; and the second open-response: Distinguished 15%, Proficient 28%, Apprentice 32%, and Novice 15%. During her second unit on fractions, Ms. White was pleased to see the trend toward higher scores continue: first open-response – Distinguished 12%, Proficient 19%, Apprentice 19%, and Novice 50%; and the second open-response: Distinguished 35%, Proficient 17%, Apprentice 24%, and Novice 24%. She was encouraged that she, "…did see some growth in the students' writing about concepts, but I saw more growth in their ability and confidence in explaining why they did something" (White, 2005, pg. 6).

Finally, while some researchers, through meta-analysis of many studies, rightfully claim that "We continue to know very little about what teachers learn from professional development (Frechtling, Sharp, Carey, & Vaden-Kiernan, 1995; Wilson & Berne, 1999), let

alone what students learn as a result of changed teaching practices (Supovitz, 2001) Fishman et al., 2003), studies such as the TEMP project are reason to be encouraged. By identifying school and even classroom-based needs through the disaggregation of data and careful observation of their own instructional practices, these teachers were able to effect marked improvement using their own authentic assessments in their own classrooms.

Chandler-Olcott (2002) identified three recommendations for improving classroom instruction through teacher inquiry: "1. Teachers need sustained time for inquiry on a regular basis; 2. Teachers need choice about inquiry topics; and 3. Teachers need assistance to develop control over research strategies" (33-35). The TEMP Project fulfilled these needs for teachers; they were given time to address inquiry, as a group they chose which area of need to address, and school-based and university assistance was made available to them. As a model for increasing teacher and student learning and the effectiveness of teacher inquiry, lesson study, for this project, has proven to be a viable one.

How do Angie, Angie, and Emily feel about using lesson-study as enacted through this project as a form of professional development? In their own words:

Angie Madden – "Participation in the TEMP project has encouraged me to seek research on what instructional methods are effective for teaching mathematics…it helped me focus my energy on improving an area that really needed it in a deliberate fashion" (Madden, 2005, pg. 5).

Angie Gonzalez – Ms. Gonzalez maintained that one of the most powerful benefits was that her student became, "… not just empty vessels waiting to be filled with math procedure; they were co-creators of math concepts" (Gonzalez, 2005, pg. 3). "What it ended up being was an opportunity for classroom educators to debate, discuss, refine, and develop math techniques in the classroom that truly benefited children" (1).

Emily White – "I believe that before I felt very rushed during math and I was trying to get too much into the hour. I will not take the time to ask the questions that really get the students to think. It is not about how much I can get in or how many different things we can do within our math time, but instead the quality of the time and the meaningful conversations that we have" (White, 2005, pg. 6).

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