

Using the Reflective Teaching Model in a Year-long Professional Development: A Case Study of a Second Year Urban Elementary Teacher

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Abstract

This study examined the change in a third grade teacher (Jennifer) who engaged in a year-long professional development model during her second year of teaching in an urban district. In particular, she embraced the Reflective Teaching Model (RTM) which was unique to this professional development. Jennifer and nine other teachers from her school participated in 120 hours of professional development over a ten month period. In addition to a 2-week summer institute, Jennifer engaged in 14 RTM cycles from September to May, attended five Saturday workshops, and corresponded through many email dialogues. Four themes emerged from field notes, teacher reflections, email communication, observations and interviews. Three were not a surprise as they paralleled the goals of the professional development (growth in content knowledge, increase of pedagogical skills, and value of prolonged professional development, especially the RTM). However, the fourth (alienation by her team) was a surprise and raised questions about the professional development and the culture of schools.

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Introduction

The early 1990s were filled with calls for changes in the way science was being taught in U.S. schools (AAAS, 1993; NRC, 1996). In response, professional development for science teachers changed to include an emphasis on ways to help teachers develop and implement more inquiry based instruction as well as increase their content knowledge. This emphasis asked teachers to change their behaviors as well as the way many of them thought about teaching and learning. However, educational change and innovation proved to be difficult and slow (Pace, 1992; Tyack & Cuban, 1995). Two reasons cited by teachers for why they had not tried innovative approaches include lack of confidence in their own ability and lack of collegial support (Pugh & Zhao, 2003; Tyack & Cuban, 1995). Research into models of professional development reported

some common aspects among successful professional development. One aspect cited is having a critical mass of teachers from one location (Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003; Rhoton & Bowers, 2001); a second is working with teachers over an extended period (Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003; Weinburgh, 2005); a third is co-teaching in their classrooms (Hart, Najee-ullah & Schultz, 2004; Weinburgh, 2003); and a fourth is using local issues/concerns to help contextualize the learning (Burroughs, Schwartz & Hendricks-Lee, 2000).

With these four components in mind, we planned a professional development experience for teachers at two high-needs, urban elementary schools. The experience was designed to help increase (1) science content knowledge about water issues, especially concentrating on Texas issues; (2) pedagogical skills, especially inquiry-based teaching; and (3) reflective practice, as encouraged by the Reflective Teaching Model. Twenty teachers (ten from each school) volunteered for the experience knowing that it involved a two-week intensive summer institute, monthly Saturday follow-up workshops, and Reflective Teaching Model (RTM) sessions at least once a month during the academic year. The principal of one school and the instructional lead teacher at the other school were aware of all activities during the academic year and were highly supportive of the program.

Theoretical/Conceptual Framework

Professional Development

The term professional development encompasses many different types of activities. One of the most familiar is non-degree seeking activities through which teachers up-grade their knowledge and skills. In the mid and late 1990s researchers proposed several models of professional development that build on a conception of knowledge construction derived from the work of Vygotsky (Haney & Lumpe, 1995; Howe & Stubbs, 1997; Loucks-Horsley, Love, Stiles, Mundry & Hewson, 2003; Radford, 1998; Rhoton & Bowers, 2001). These models stress that the teachers, like any learners, use new experiences in building (constructing) their own understanding. The models also stress that the teachers become active participants in knowledge generation. They recognize the role of the more knowledgeable other in helping the learner move through the zone of proximal development while stressing the active nature of learning. These contextual topics may then be used to suggest larger, more generalizable ideas.

Research tells us that teachers' knowledge is local, contextualized, personal, and relational (Burroughs, Schwartz & Hendricks-Lee, 2000). Therefore, many of the models suggest that the providers of the experience tailor it to the population, including specific content that is most relevant to the participants. Using topics and examples that are 'local' to the district, school, and classroom, results in more authentic learning for the teachers and may result in teachers taking ownership of the content.

Time is an important factor for successful professional development, with many of the models suggesting that teachers need to have an extended period of time during

which to involve themselves with the new ideas. An approach cited by several researchers is having more than 100 hours of contact with each teacher (Haney & Lumpe, 1995; Howe & Stubbs, 1997; Loucks-Horsley, Love, Stiles, Mundry & Hewson, 2003; Radford, 1998; Rhoton & Bowers, 2001). Having an intensive summer workshop allowed the teachers to experience new teaching methods, multiple outdoor activities, and new content. Continuing to meet during the academic year encouraged the exchange of ideas between the teachers.

Professional development stops short when it fails to include an implementation component to bring new behaviors and skills from the training program into the classroom (Anderson & Mitchener, 1994; Gibbons, Kimmell & O'Shea, 1997). To nurture real changes in teaching behavior, opportunities to practice and to receive coaching are crucial (Guskey, 1986.) Models such as the RTM give teachers time to practice their new skills and time to reflect on the effectiveness of these skills in their classrooms at that point in time.

Reflective Teaching Model

The Reflective Teaching Model (RTM) has been used with mathematics and science teachers to help them implement reform teaching strategies (Hart, 1994; Hart, Najee-Ullah & Schultz, 2004; Weinburgh, Hart & Carriere, 2007) since the early 1990s. The RTM is grounded in the theories of constructivism and metacognition. It relies heavily on a pair of teachers (or teacher and teacher educator) being able to *model effective practice, share authority, and reflect on practice*. The model recommends consistent, on-going sessions of joint planning/teaching/reflecting. Either member of the team may teach the lesson created during shared planning sessions or both may co-teach the lesson. Reflecting on one's practices requires a form of deep thinking in which one poses questions and solves problems. This reflection is encouraged in the planning and the debriefing phases of the RTM.

Modeling. Teaching is a very complex activity. Goldsmith and Schifter (1997) suggest that teachers may not have useful images of non-traditional teaching practices. Therefore, they may not be able to enact new ways of teaching without first seeing examples. Having another person model ways of teaching that are different from their own, especially if it is done in their classroom with their students, can give them new images of teaching. These new images in turn provide a foundation on which they may construct new ideas of how classrooms can look and sound.

Authority. Weinburgh et al. (2007) suggest that part of the strength of the RTM lies in changing the power structure usually seen in professional development models. This power shift occurs when authority is shared by the classroom teacher and the teacher educator for all parts of the lesson – planning, implementing, and reflecting.

Sharing authority is critical for the successful interaction of teachers and teacher educators, as well as teachers and students. All participants in the RTM (teachers and teacher educators) are seen as learners and all are seen as teachers. The

ability of an inservice teacher or a teacher educator to relinquish intellectual control and allow others to share in the generation of content or pedagogical ideas is a subtle but significant shift in roles from the traditional teacher as teller. It builds trust, ownership, and cohesion among those involved. RTM requires that the teachers plan with a partner, teach using a new strategy/pedagogy, and debrief about the lesson” (Weinburgh et al., 2007, p. 24).

Reflection. The critical construct of reflection helps teachers in changing their practice. Teachers need to engage in experiences in which they not only try innovations but also are challenged to think deeply about their assumptions of teaching. The discussions during the planning of lessons and after the teaching of the lessons give the teachers time to question the goals, values, and beliefs that guide their work. They are encouraged to articulate their questions and formulate answers. With questioning comes change.

Purpose of Study/Research Questions

The case study presented here examined the change in a third grade teacher (Jennifer) who embraced the Reflective Teaching Model (RTM) as a professional development model during her second year of teaching in an urban district. In particular, this was an attempt to examine change in content knowledge, pedagogical skills, and reflective practice. A close examination of one teacher in an urban school who utilized the RTM had the potential to shed insight into factors which facilitate or hinder teacher change.

Context

School

The research was conducted in an elementary school (student population of 500) in a large urban area in the southwestern part of the USA. The school served kindergarten through 5th grade students with three teachers per grade level. Table I shows the comparison of the demographic information for the school and the state. Teacher turnover in Jennifer’s school was about 20% per year which was higher than the state average but less than the district. The principal wanted the science scores to improve at Johnson Elementary School (pseudonym) and appeared to support the teachers in their participation in the project offered by a nearby university.

Table I

Demographics of the school and the state.

	% by Ethnicity				% by Subgroups	
	Hispanic	African-American	White	Asian	Economically Disadvantaged	Limited English
State	45	14	38	3	55	16
School	65	25	10	0	66	67

Jennifer

Jennifer was a 24-year old, white female with a bachelor's degree in elementary education at the time of the study. She was a second year teacher who taught a self-contained third grade class. She was on a team of three teachers, was the youngest of the three in years and in teaching experience, and was the only one with the state endorsement for English Language Learners (ELL). Jennifer, her two third grade team mates, and seven other teachers from her school participated in the project. Although Jennifer was the most active, all of the Johnson Elementary School teachers participated in at least 4 RTM cycles (five other teacher participated in 8 RTM cycles, one participated in 7 RTM cycles, two in 5 RTM cycles, and 1 in 4 RTM cycles).

RTM for Jennifer

The RTM cycle used by Jennifer, Erin and Sally was typical of those used throughout Johnson Elementary School. For the first cycle, Molly met with all three and helped plan a lesson that would be taught to each of the 3rd grade classes. The next day she observed each teaching the lesson and debriefed with each of them later in the day. This pattern of planning a grade-level lesson did not continue, instead, for the rest of the RTM cycles each teacher scheduled planning times independently of each other. Because each lesson was co-planned with Molly, the lesson could be taught by either Molly or the teacher alone or co-taught by both. In Jennifer's case, Molly taught two lessons, Jennifer taught seven lessons, and they co-taught five lessons. Jennifer did not observe Erin and Sally teaching nor did they observe her teaching.

Methods

Research Paradigm

A case study is "...an intensive, holistic description and analysis of a single instance, phenomenon, or social unit" (Merriam, 1998, p. 27). It offers a ways of examining "... complex social units consisting of multiple variables of potential importance in understanding the phenomenon" (Merriam, 1998, p. 41). The case described here occurred in a bounded context – one teacher during a year-long professional development experience. The investigators were the primary instrument for gathering and analyzing data and, therefore, had the ability to respond to each situation by maximizing opportunities for collecting meaningful information (Merriam, 1998).

Data Collection

Data were collected during the two-week intensive summer workshop and during the following academic year. To assess the teachers' content knowledge directly related to water issues covered by the project, a 10-item short-answer paper-pencil test (Appendix) was administered on three occasions. The test data were collected on the first and last days (pre- and post-program) of the 2-week summer workshop in July and approximately one year later (follow-up), after the school year ended in June. Teacher

products such as graphic organizers, KWLs, lesson plans, and reflections were collected for ten months. Notes made by the primary researcher during RTM planning sessions and lesson observations also added data about content knowledge, especially as related to the specific lesson to be taught.

Each of the teachers had the opportunity to engage in RTM cycles two times a month during the following school year (September, October, November, January, February, March). Participation varied among the teachers. To assess pedagogical skills and reflective practice, data were collected from several sources during the academic year including the primary researcher's field notes, teacher reflections, email communication, and written lesson plans. During observations, the primary researcher looked for and recorded the use of inquiry-based teaching techniques and strategies modeled during the summer workshop and discussed during the planning of the lesson. In February, all of the teachers discussed their experience while being audio taped.

Data Analysis

Scoring keys were constructed for the paper-pencil 10-item test such that each item could receive a total of 0 to 3 points, yielding a top possible score of 30. Using this grading rubric, three raters (the first author, second author, and graduate assistant) independently scored each test without knowledge of the test-taker or time of test. Inter-rater agreement was determined by summing the item totals and obtaining correlations (Pearson's r) among the raters' total scores. Correlations ranged from .99 to .96, indicating high scoring reliability. The average scores from the three raters for each teacher were then calculated and used for further analyses. The data from the paper-pencil were analyzed by comparing the total pre/post scores.

Data from the teacher paragraphs, researcher field notes, teacher reflections, email communications, Jennifer's discussion of her experience, and lesson plans were analyzed independently by the first and second authors using a constant comparative method (Denzin & Lincoln, 1994; Glaser & Strauss, 1967). Triangulation, using multiple sources of data to confirm the emerging findings, established validity in case studies.

Yin (1994) suggested organizing the large amount of data collected in case studies in a case study data base. From this data base categories or themes that capture some recurring pattern are established. Merriam (1998) pointed out that "devising categories is largely an intuitive process, but is also systematic and informed by the study's purpose, the investigator's orientation and knowledge" (p. 179). The data were examined recursively by the first and second author and comparisons were made between the authors. As the data were examined, themes emerged and descriptions were written. Jennifer was asked to read all interpretations of data made by the researchers (member checking).

Results

The data indicate that Jennifer changed in several ways over the 10 months of this study. Not surprising and consistent with the goals of the project as well as with a previous study (Weinburgh, 2003), three themes emerged from the data: (1) growth in

content knowledge about water issues (summer topic) and topics covered in the third grade standards for the state, (2) increase of pedagogical skills, especially engaging students in inquiry, and (3) value of the RTM as a professional development model. However, a new, unexpected, and concerning theme emerged for Jennifer as the year progressed – alienation by her two third grade team mates. The idea of alienation had not emerged in other studies about RTM and did not appear in the literature on science professional development and, therefore, had not been part of the theoretical framework.

Summer

Jennifer's pre-program test resulted in 6 points out of 30 (20%), the post-program test resulted in 27 points out of 30 (90%), and the follow-up test resulted in 28 points out of 30 (93%). She made the lowest pre-program score of all twenty teachers in the project. Immediately after the test, she told the college professors that she really liked science, but that she did not know much science content and did not feel comfortable teaching science. After participating in the summer workshop (field trips included a trip to the water treatment plant, sewage plant, Trinity River, and Eagle Mountain Lake; labs included simulations of lake turn-over, single-point pollution, and a tasting test of bottled water; inquiry-based activities included building the most efficient water tower, determining what grass required the most water, and proposing a xeroscaping plan for their school; lessons included mini-lectures on major water issues), Jennifer wrote the following entries in her journal.

I have learned so much. I hope I can excite my students the way that you have excited me. [July 29]

I questioned the value of doing the water tower, especially since there were no directions given, but I learned so much – like head pressure – and became convinced that students can work without all the step-by-step directions that I usually give. [July 29]

Jennifer was already seeing the value for herself and her students of less structured activities in learning science. She found the open debate on how to build the tower stimulating and realized that all the content objectives for the lesson were met as a result of the student-generated [in this case the workshop teachers] data. This entry also indicated that she was reflecting on the summer activities and connecting them to her students and their needs. During the summer, the college professors modeled parts of the RTM by debriefing their lessons. These debriefings were unrehearsed. Jennifer was skeptical of the RTM at first. After observing the third debriefing session modeled by the professors, she wrote,

At first I thought the discussion about the lesson was faked but today Ray was pretty harsh with himself and Molly about the lesson. Together they did a 'think aloud' in which they re-thought the lesson and came up with a really good idea for next time. I hope my team can have this kind of frank talk about teaching. [July 27]

From the very beginning, Jennifer made references to her 3rd grade team mates, both of whom were in the professional development program. She was pleased that they could learn together and could then use their new skills and knowledge with their students. She looked forward to a form of collegiality that she saw between the college professors. As she said,

This is the first professional development that I have attended with my team mates. I am so glad that we are here together. [July 25]

Sally and Erin [pseudonyms for her team mates] know so much more science than I do. I know that I will learn from them. [July 29]

We (her team mates) talked today about ways to use the water-treatment plant with our 3rd graders. This is going to really help me with my ELL students. [August 2]

Jennifer's lack of confidence was evident in her journal entries but so was her willingness to learn. In actual fact, she was the least knowledgeable about science within her grade level. Trained as a generalist, she only had one science course at the college level. Erin, in contrast, had six college science courses and Sally had three courses.

Academic Year

Molly met with the ten teachers at Johnson Elementary School in August to establish the first RTM session. Jennifer and her two third grade team mates decided to plan together with Molly during the first week in September as did the seven other Johnson teachers. Molly's notes indicate that she arrived at the school early on the day of the planning session and spoke briefly to three other participating teachers before going to Jennifer's room. Jennifer finished teaching, sent her students to "specials" and began an animated discussion of the beginning of the year and her students as she and Molly waited for Sally and Erin to join them.

The first RTM session was a little slow but resulted in the three teachers admitting that they wanted to help the students compare the sun and moon as a review but were not sure how to do this. Jennifer expressed concern on two levels – her lack of confidence in her own understanding of the sun and moon and her skills in helping her students. As she said,

I am not sure about the topic myself and I am not sure I know how to help the students. You know, I have most of the ELL students this year. Also, many of them are from the apartments [a low SES housing complex with high crime rate and high mobility]. [September 9]

Together, the three teachers and Molly planned a review lesson. Part of the planning involved Molly helping the teachers articulate what they wanted for the students

as a result of the review. She took the time to add a discussion about the moon and the sun thereby helping the teachers with content. When asked if any of them had ever used a VENN diagram, Jennifer responded that she had not and expressed concern about how her students would react to using it. She originally planned to only do a class VENN on the board. After some thought she changed her plan and gave groups of four students a set of hoops and sentence strips to use on the floor. She bought the hoops that night at Wal Mart. Molly watched the lessons of all three teachers the next day. Each teacher debriefed separately due to scheduling issues. Jennifer's schedule allowed her to debrief the lesson immediately afterward. Jennifer was very hard on herself but was pleased with the use of the VENN diagram. During the debriefing, she said,

I would never have thought of this on my own and was not sure about using it, but it worked. I liked the big ones on the floor. The students, especially the ELLs, liked moving the sentence strips around. I think the students were able to use the strips to express what they know. It gave me a change to ask them to read to me. [September 10]

Jennifer emailed Molly twice before the next RTM session in late September to tell her about a class or to ask a question. She used the VENN once again during that time. One of her main concerns was working with low income, ELL students. She was not sure she could relate to their needs. This concerned her on a personal and professional level. By November, Jennifer had engaged in five RTM sessions. An email on November 13 was characteristic of her communications:

Molly-Friday the 14th I now have an ARD during the time we were going to meet! Could you still meet with Sally and Erin at that time? Could I meet with you from either 11:35-12:10 or my music time is 12:30-1:10. Do either of those times work? I do not want to miss a planning session with you. [November 12 email]

As it turned out, Jennifer and Molly met, but her team mates did not. This was the beginning of a pattern in which Jennifer found time for RTM sessions, but Sally and Erin found reasons why they could not meet at the agreed upon time and rescheduled without Jennifer or missed a session completely. Molly's notes describe her impressions after being in the school for a RTM session with other teachers in the building saying,

Although Sally and Erin seem pleased on one level that Jennifer is introducing new ideas into her teaching and sharing them (and her handouts) with them, there appears to be some tension. Neither Sally nor Erin seemed to want to put the effort into teaching that Jennifer is showing. Neither appeared to hold Jennifer's belief that the students they teach can learn and deserve exciting lessons. [November 15]

Jennifer is using many of the ELL strategies that we have discussed. She is using science as a way to add reading, writing and speaking into the daily lives of her students. Her room is now overflowing (in a good way) with plants, animals, lots of pictures, books, and a growing word wall. Her science content is improving as

she is more interested in researching the topic she is introducing to her students.
[November 17]

By December, Jennifer was using each RTM to check her content and to try new teaching strategies. She often came to the planning session with questions about how to best engage her students and to clarify a science content concern. Her reflections on what worked and what did not work became more analytical and looked more closely at the children's work and responses rather than at her own reactions and thoughts. However, she was concerned because her team mates were not planning with us as often and because they were commenting that Jennifer's children were much too active. As she observed,

I wish the team planned together better. [December 2]

Erin suggested that I wanted to do things with our 3rd graders that urban, ELL students could not do. I could not make her see that the (state standards) actually required this type of activity and depth of content. [December 2]

In a separate RTM with Erin, Molly noted that Erin thought the students should be in their seats with less talking (even though she had a few students who were ELL and needed to speak as often as possible). Erin indicated that her students were always quiet and very well-behaved, unlike Jennifer's class. By this time, Sally was finding it impossible to meet for a planning session - some student "emergency" occurred, pre-empting each scheduled planning session. In addition, she was not using materials that Jennifer gave her to help supplement lessons.

During a RTM session in March, Jennifer planned a lesson on the food web. She had the common misconceptions that she should draw arrows from an organism to what it eats. She did not understand that the web shows energy flow. The planning session helped her understand the concept of a food web more fully.

Thinking about the whole energy and matter cycle with Molly allowed me to have an understanding of the food web that I had never had. [March 28]

Her first thought was to give all groups the same set of organisms. While Jennifer and Molly discussed what Jennifer wanted the students to learn and how best to do this, Jennifer decided to have different organisms for each group. She wanted the students to see that there could be lots of combinations. After teaching the lesson, she commented,

The group with the organisms that were almost the same as the book did very well, the other groups had trouble. I realized that they (the children) did not really get the concept but had just memorized the one in the book. I was so glad that the activity was designed in way that would let me know that they did not know.
[March 29]

I was unsure how to answer Pedro's question and it just felt right to look to you for help. I love that you are there for me and can guide my students and model good questioning for me. I could not have done it. [March 29]

Planning with you and having you here to watch or to intervene as needed has been the BEST. I mean the BEST thing that could happen to me as a teacher. How do others teachers grow if they do not have this type of help?" [March 29]

Her content knowledge and confidence in her own teaching improved with each RTM cycle. In addition, Jennifer had become very reflective, asking questions about teaching and learning that would not have occurred to her prior to participation in the project. Molly reflected about the same plan/teach/reflect session,

Jennifer was very relaxed today when the students asked the question about the mouse. She handled it well. I was glad to be there to support her. [March 29]

She also wrote about Jennifer's academic growth. Later in the day, Molly added an entry to her journal. She noted,

Rumor has it that Jennifer is not liked by her team mates. They feel that she is stepping beyond her bounds. They are critical of her trying things that most other teachers in the building are not doing. Becky (first grade teacher) is complimentary of Jennifer, saying she is an excellent teacher. [March 29]

Jennifer wants to continue the RTM into April even though the project officially ends. [March 29]

By April, Jennifer wrote,

I cannot imagine what this year would have been like without Molly. My skills as a teacher and my confidence in myself have sky-rocketed. [April 11]

Yesterday the students designed their own investigation. The only rule was that I had to approve it prior to their starting and that the materials had to be easy for me to get by today. Today, they conducted their investigation and it was amazing. Without the planning sessions all year with Molly, I would never have done this and my students would have been the ones to suffer from my lack of knowledge and confidence. [April 20]

From the experience, I know that students can do things that many adults think they cannot. With just a little planning on my part and setting a rich environment, I can see the children increase their knowledge and skills in science and increase their use of English. [April 20]

Jennifer specifically comments about her growth in knowledge and confidence. She attributes this to being in the project. In particular, she comments on being able to

help her students move toward their own inquiry as a large step for her as a teacher. She is glad that she participated. Molly's notes from April captured Jennifer's growth and her feeling of despair,

Jennifer has grown as a teacher. Her science content is much stronger and her teaching shows her confidence. She is reflecting on her teaching in a deep and thoughtful way. Her students are engaged in activities that her team-mates think are too hard for 3rd graders. [April 05]

Jennifer is looking for another job. My heart breaks for her – she feels that she is deserting her students by leaving this school. [April 05]

Molly visited the school again the next week. She spoke to all the teachers briefly to wish them a good summer. An entry in her journal captures the conflict between Jennifer and Erin.

I talked with Erin today about Jennifer not returning. She indicated that Jennifer did not really fit with the 3rd grade team, that her students were talkative and often out of their seat. She was not sure why Jennifer's students had good scores on the state tests because she saw the students as undisciplined. [April 11]

The End of School

The academic year ended, Erin and Sally signed contracts to stay at Johnson Elementary while Jennifer did not sign her contract. Jennifer told the others that she wanted to work closer to her home, but she told me that she did not feel comfortable working with Erin and Sally. She felt that her values no longer matched theirs. Her new belief in the value of student talk and more open inquiry did not parallel the beliefs of Erin and Sally. She also realized that she would never influence them to change their beliefs. She stated that, in her opinion, both Sally and Erin were better teachers for having been in the project but that neither were “where I am” (Jennifer, April 11). She expressed sadness that there would be more distance between her and Molly which would result in less contact. On a positive note, she was looking forward to her new assignment in a new district.

Discussion

The purpose of the research was to seek an understanding of the effect of the RTM as a professional development tool for elementary teachers who teach in urban schools. Jennifer, as a 3rd grade teacher in an urban school engaging in multiple iterations of the RTM, helped provide the researchers with rich description and understanding of the RTM process but also of the dilemmas and conflicts that Jennifer encountered. This study left the researchers with many more questions than answers. Jennifer's personal and professional growth was remarkable yet sad. One might ask if the professional development was effective. As we examined each of the themes that emerged, we began to see a complex, confusing, and complicated answer.

Content

The significant gain in test scores showed that the intensive summer workshop did improve her recall knowledge about water issues. Also, highly important was the follow-up score a year later, showing that the new content knowledge was retained. As with any assessment instrument of this type, one should note that a paper-pencil test can serve only as a general indicator of what has been learned. The qualitative analysis suggests that Jennifer constructed much richer representations of the information she encountered, beyond the sample of items included on the test. In addition to the knowledge about water, Jennifer continued to learn new content as she engaged in the RTM with Molly. Her content as well as her knowledge-in-action (Ethell, 1997; Korthagen & Kessel, 1999) improved over the academic year. It is possible, but not probable, that her content knowledge would have increased substantially without the RTM sessions. However, Jennifer believes that the professional development greatly affected her content knowledge and her ability to help students.

The RTM sessions also helped contextualize and localize her knowledge as she used it with her students (Burrough et al., 2000). She used her new knowledge to enrich instruction and to engage the students in discussions about science that would have been impossible for her the year before. Her confidence in her ability to help students understand, and even like, science improved. She became more interested in making connections between science and other disciplines.

Pedagogy

Jennifer recalled that she was very structured in her approach to teaching during her first year and that working with Molly allowed her to try teaching innovation with her students. She began to use strategies, such as word walls, sentence strips, open-ended questions, think-pair-share, and manipulatives, that were modeled in the summer and discussed during the planning sessions of the RTM. She also moved from guided inquiry to much more open inquiry. As suggested by Guskey (1986), Jennifer found that having the opportunity to try new skills while having a more experienced person in the room in case she needed help was invaluable. She was able to perfect her new skills before she used them “solo”. The transfer of skills from the summer workshop to the classroom was facilitated through the RTM sessions. The most significant advancement was an inquiry activity in which the students asked their own science questions, developed a method to answer their questions and supported their conclusions with evidence.

In addition, Jennifer used skills with her students that she learned about and saw modeled during the summer and reviewed during the RTM sessions. She could not take the students on a field trip to the Trinity River but did take them three blocks from the school to investigate a creek. She incorporated more pairing of students and talking in small groups into her lessons and asked students to support their statements with data.

Jennifer’s concern that she could not help her ELL students diminished as she sought ways to include them in a more active way. She used strategies specific to ELL

students that she learned during the summer or that she and Molly discussed during the RTM sessions. Her students, both native speakers and ELL, found multiple ways of expressing their science ideas.

Reflective Teaching Model

Field notes provided evidence that the project fostered new awareness and attitudes about the learning and teaching of science, beyond the study of water. This research is consistent with other research (Hart et al., 2004; Weinburgh, 2003, 2005; Weinburgh et al., 2007) concerning the use of the RTM. Teachers who engage in reflective planning and analysis of their teaching do appear to gain in positive ways not seen in other professional development models.

Jennifer enjoyed the two-week summer workshop but found that her greatest content and pedagogy gains were during the academic year when she taught her own students. She took advantage of the RTM from the beginning, embracing it as a way to engage in one-on-one coaching and mentoring. She quickly felt a sense of shared authority as seen in her enthusiasm for learning from Molly as well as teaching Molly. She also began to trust herself and Molly as they co-taught her 3rd grade students. Of particular note was her unwavering belief that the ELL students in her class could learn if she provided them with rich, engaging environments.

This model of professional development stressed the importance of thinking about teaching. By October Jennifer was engaging in discussions about her teaching as she began thinking about why she made decisions about teaching and how those decisions affected her students. At first her questions were directed to Molly with the expectation that an answer would be quickly found. Over time, her questions were more introspective and less answer-bound.

Alienation

Jennifer gained from the experience but she also lost. An unexpected outcome of the professional development experience for Jennifer was the growing alienation from her team mates. She began the summer as a member in good standing with her two 3rd grade teachers but by December they were seeing her as being deviant. Her belief in the ability of her students and her efforts to improve her teaching appeared to threaten Erin and Sally. Rather than embracing her attempts to share materials and ideas with them, they began to work in subtle ways to discredit her. By January they were dropping hints that her 'rich' parents were buying her supplies and letting her use the color printer for her handouts. They did not add that she also made copies of the color handouts for them. In addition, they suggested that her students were out of control, citing behaviors that Molly did not find to be inappropriate. Pace (1992) reported a similar conflict with teachers who were trying to implement literacy instruction.

While her relationship with her team diminished, her love of teaching, her understanding of her students, and her ability to teach science increased. When other

teachers in the building were asked to describe Jennifer, all but her team mates praised her enthusiasm and hard work. Although the principal supported the professional development and thought that Jennifer was a good teacher, she did not take any steps to understand why Jennifer was considering leaving the school and did leave. This treatment was most painful for Molly as she watched a good teacher being pushed away from an urban school in which she could have had a great influence on minority students and especially ELL students.

Conclusions

In designing professional development, we sought to get a critical mass from one school because we held the assumption that the teachers would provide support for one another as they tried new teaching strategies. In this case, conflicts developed between Jennifer and her 3rd grade team mates. Pace (1992) and Tyack and Cuban (1995) concluded from their studies that this may be more common than we generally acknowledge, certainly more so than most of the literature on science professional development indicates (Loucks-Horsley, Love, Stiles, Mundry & Hewson, 2003; Radford, 1998; Rhoton & Bowers, 2001).

Although there are several definitions of alienation dating from Seeman's 1959 essay, "On the Meaning of Alienation", most include the three constructs of isolation, normlessness, and powerlessness (Brooks, Hughes & Brooks, 2008; Shoho & Katis, 1998). Isolation can be a physical or sociological condition. In the social sense, "isolation has to do with the degree to which an individual feels an affinity to their community's values, beliefs, and norms of behavior" (Brooks, Hughes & Brooks, 2008, p. 48). Jennifer's isolation from her 3rd grade team mates was based in her change in beliefs about teaching and learning and the value she placed on them. During her first year of teaching, she fell into a pattern of following the lead of Sally and Erin. This changed as she embraced ideas from the project more completely than either of them.

Normlessness is similar to isolation in that it is associated with teachers who do not feel as if they are a part of the norms within the school. In this case, the teacher's difference is often seen as negative rather than as positive. The norms of Johnson Elementary were changing as a result of the project but Jennifer's two team mates were the most resistant to change. Because Jennifer identified with the 3rd grade, she felt the normlessness associated with her grade level more than the normness of the school.

Powerlessness "represents an inability to influence one's choices in a given environment. Teachers who feel powerless believe they can not affect the decisions of others" (Shoho & Katis, 1998, p. 52). During September, October and November, Jennifer tried several ways of affecting the decisions made by Sally and Erin. She first found passive-resistance and later more open opposition to her ideas.

Jennifer appeared to exhibit all three of these toward the end of her tenure at Johnson Elementary. Pugh and Zhao (2003) suggest that two main sources of alienation may result from the type of professional development offered in the project. The first is a disruption of the existing culture within the school. Schools cultures strongly embrace the

idea of equity. When it is perceived that a teacher is getting an unusual amount of the resources, the results may be alienation (Kerchner, 1992). Jennifer got concrete resources for her classroom and one-on-one mentoring – both of which may have upset the egalitarian culture found in many schools (Pugh & Zhao, 2003).

Another source of teacher alienation, according to Pugh and Zhao (2003), is an escalation of existing conflicts between peers and/or administration. Although Jennifer did not appear to have pre-existing conflicts, she already had a reputation for spending a lot of time at school and providing her students with ‘extras’. For example, she did not think it was unusual to buy hula-hoops for her students to use in making VENN diagrams to show their understanding of the moon and sun.

Emerging from this research is the reminder that the complex social structure of schools can have an impact on professional development. Jennifer’s team mates did not grow professionally at the same rate as Jennifer, which resulted in an uncomfortable situation for them and for Jennifer. Jennifer was personally hurt by the reaction of her team mates.

This case study adds to the body of literature on professional development by describing the positive and negative implications for professional development. Our assumption that a critical mass of teachers in a building would lead to more substantial change needs to be rethought. Schools are complex social structures with many unwritten rules. This research highlights the need to more fully understand schools and the power structures within them as we provide professional development for teachers.

References

- American Association for the Advancement of Science. (1993). *Benchmarks for Science Literacy*. New York: Oxford University Press.
- Anderson, R. D., & Mitchener, C. P. (1994). Research on science education. In D. L. Gabel (Ed.), *Handbook of Research in Science Teaching and Learning*, (pp 3-44). New York: MacMillan.
- Brooks, J.S., Hughes, R. M., & Brooks, M. C. (2008). Fear and trembling in the American high school: Educational reform and teacher alienation. *Educational Policy*, 22, 45-61.
- Burroughs, R., Schwartz, T. A., & Hendricks-Lee, M. (2000). Communities of practice and discourse communities: Negotiating boundaries in NBOTS certification. *Teachers College Record*, 102(2), 344-374.
- Denzin, N. K., & Lincoln, Y. S. (eds). (1994) *Handbook of Qualitative Research*. Thousand Oaks: Sage.
- Ethell, R. G. (1997). *Beginning teachers; knowledge in action*. Unpublished PhD dissertation, Griffith University.
- Gibbons, S., Kimmell, H., & O'Shea, M. (1997). Changing teacher behavior through staff development: Implementing the teaching and content standards in science. *School Science & Mathematics*, 97(6), 302-310.
- Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago: Aldine.
- Goldsmith, L.T., & Schifter, D. (1997). Understanding teachers in transition: Characteristics of a model for the development of mathematics teachers. In E. Fennema & B. S. Nelson (Eds.), *Mathematics teachers in transition*. (pp. 19-54). Mahwah, NJ: Erlbaum.
- Guskey, T. R. (1986). Staff development and the process of teacher change. *Educational Researcher*, 15, 5-12.
- Hart, L.C. (1994). Shared authority: Roadblock to teacher change? In J. R. Becker & B.Pence (Eds.), *Proceedings of the International Group of the Psychology of Mathematics Education, North American Chapter*, (Vol. II, 189-197), Asilomar.
- Hart, L.C., Najee-ullah, D., & Schultz, K. (2004). The Reflective Teaching Model (RTM): A professional development model for inservice mathematics teachers. In R. Rubenstein (Ed.) *Perspectives on the Teaching of Mathematics* (pp. 207-218). Reston, VA: National Council of Teachers of Mathematics.

- Haney, J.J., & Lumpe, A. T. (1995). A teacher professional development framework guided by science education reform policies, teachers' needs, and research. *Journal of Science Teacher Education*, 6(4), 187-196.
- Howe, A., & Stubbs, H. (1997). Empowering science teachers: A model for professional development. *Journal of Science Teacher Education*, 8(3), 167-182.
- Kerchner, C.T. (1992). *Louisville: Professional development drives a decade of school reform*. Claremont, CA: Claremont Graduate School, Claremont Project VISION.
- Korthagen, F. A., & Kessels, J.P. (1999). Linking theory and practice: Changing the pedagogy of teacher education. *Educational Research*, 28(4), 4-17.
- Loucks-Horsley, S., Love, N., Stiles, K., Mundry, S., & Hewson, P. (2003). *Designing Professional Development for Teachers of Science and Mathematics*. Thousand Oaks, CA: Corwin Press.
- Merriam, S. (1998). *Qualitative Research and Case Study Applications in Education*. San Francisco: Jossey-Bass Publishers.
- National Research Council. (1996). *National Science Education Standards*. Washington, DC: National Academy Press.
- Pace, G. (1992). Stories of teacher-initiated change from traditional to whole-language literacy instruction. *Elementary School Journal*, 92, 461-476.
- Pugh, K. J., & Zhao, Y. (2003). Stories of teacher alienation: a look at the unintended consequences of efforts to empower teachers. *Teaching and Teacher Education* 19, 187-302.
- Radford, D. (1998). Transferring theory into practice: A model for professional development for science education reform. *Journal of Research in Science Teaching*, 35(1), 73-88.
- Rhoton, J., & Bowers, P. (2001). *Professional Development: Planning and Design*. Arlington, VA: NSTA press.
- Seeman, M. (1959). On the meaning of alienation. *American Sociological Review*. 24(6), 783-791.
- Shoho, A., & Katims, D.S. (1998). *Perceptions of alienation among special and general education teachers*. Paper presented at the meeting of the American Education Research Association, San Diego, CA.

- Tyack, D., & Cuban, L. (1995). *Tinkering toward utopia*. Cambridge, MA: Harvard University Press.
- Weinburgh, M. H. (2003). Changing elementary and college science teaching through co-teaching/co-generative dialogue. In D. Berlin & A. Whites (Eds.). *Improving Science and Mathematics Education: Insights for a Global Community*. (pp. 73-74). Columbus, OH: ICRSME.
- Weinburgh, M.H., (2005). Long-term professional development for elementary teachers: Cost and benefits. Berlin, D. F., & White, A. L. (Eds.). *Collaboration for the global improvement of science and mathematics education* (pp. 133-140) Columbus, OH: ICRSME.
- Weinburgh, M. H., Hart, L., & Carriere, J. (2007). A new perspective on integrating math and science: The Decatur elementary math/science project. In Berlin, D. F. & White, Al. L. (Eds.). *Global Issues, Challenges, and Opportunities to Advance Science and Mathematics Education* (pp. 21-38). Columbus, OH: International Consortium for Research in Science and Mathematics Education.
- Yin, R. K. (1994). *Case study research: Design and methods*. (2nd ed.). Thousand Oaks, CA: Sage.

Appendix

Water Project
Pre/Post Test
(scored on a 3 point scale)

Name: _____ Date: _____

Please answer the following questions as fully as possible. You will be asked to answer them again in August. This will help us determine how well we presented the materials.

1. Where does scientific knowledge reside? How does it get there?
2. What evidence is there that there may be a water crisis?
3. Why can you buy laundry detergent that does not contain phosphate?
4. Pesticides appear to be very beneficial. What are the harmful effects of pesticides such as DDT?
5. What made lakes in Canada and the Eastern US become devoid of fish and what has been done about it?
6. How have river systems been altered by human beings and what has this done to fish such as the salmon?
7. How does the water treatment plant work?
8. How does the sewage treatment plant work?
9. List some benefits and some hazards of wetlands and marshes.
10. What is the “learning cycle”?