Reflective Teaching Model:
A Tool for Motivation, Collaboration, Self-reflection, and Innovation in Learning

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Abstract: This study examines the dynamics and effects of the Reflective Teaching Model (RTM) on building reflective teaching and learning communities. In an alternative teacher preparation program in the southern part of the United States, the RTM is incorporated in a series of mathematics methods courses. Beyond improving pedagogy, the RTM was instrumental in encouraging preservice teachers to build and continue as a community of reflective teachers who support each other throughout the program and thereafter. In particular, their collaboration at their schools generated interest among tenured teachers. This response to preservice teachers' innovations in the school environment is imperative.

Introduction

After the completion of alternative teacher preparation programs, newly certified teachers are separated from their peers as well as their mentors. Often, they never see or communicate with each other again. Alternative teacher preparation programs are usually condensed and intensive. What would normally be a nine-semester training program has been compacted into 4 semesters. The intensity of the program often increases the transitional challenges of the new professionals as they move from the role of students to being teachers in the classrooms. The condensed programs leave little room for reflection and considerations for the future.

New teachers are concerned about their effectiveness in classroom management and pedagogical issues. Once they enter the classroom in the school environment, new teachers are isolated from their peers and mentors of the university/college setting as well as their colleagues within the school itself. New teachers are expected to have all they would need to function effectively once assigned to the classroom. The nature of the school system has precluded them from immediate support. Instead, it demands that teachers should take those skills and strategies with them into the classroom. Transitioning from the *theory* learned in their "practicum" to the instructional *practice* in their classrooms is challenging.

> Unlike many other professions, which have a gradual and scaffolded progression from 'newcomer' to 'practitioner,' entry to the teaching profession can be abrupt, somewhat akin to 'cannon-balling' into the deep-end of a pool instead of wading in from the shallow-end. (Bowen & Roth, 2002, p. 22)

In response to these challenges facing teachers, the reflective teaching model (RTM), an inquiry approach, was introduced in an alternative preparation program of an urban university in the southeastern United States. Anecdotes drawn from experiences recorded in journals and reports of students, mentors, and supervisors of this program have emphasized the effectiveness of this approach. Graduates of this program credited their success to the RTM applied in the program. The notoriety gained by the program in the school system is demonstrated by the number of heads of Mathematics Departments in the region who would seek student teachers

from this program for teaching positions even before they completed the certification process. Thus, over the years, the frequency of these anecdotal reports have signified that there is need for formal investigations to determine the effects of the RTM on classroom management and pedagogy in the classroom. There was also need to determine the potential of the RTM in building learning communities within schools. With a new cohort of students entering the program, an opportunity was provided for research to answer the question: *What are the dynamics and effects of the Reflective Teaching Model on classroom management and pedagogical issues in the classroom?*

An Approach to Address Teachers' Concerns

In this alternative preparation program of secondary mathematics education under consideration, prospective and practicing teachers sought certification and a master's degree. The prospective or preservice teachers were full-time students. The practicing teachers were provisionally licensed to teach and were active in the classroom. Both groups of students gained entry into the program through demonstrated competency in mathematics. During the mathematics methods courses, the primary concerns voiced by these teachers were related to developing classroom management and pedagogical skills. In this teacher preparation program, the key approach used to address these concerns was reflective teaching practice applying the process of the RTM.

Reflective Practice Leading to Reflective Teaching

The term "reflective practice," coined by Schon (1987), focuses on the ways people think about their experiences and formulate responses as the experiences happen. This approach makes a clear distinction between "thinking on action" and "thinking in action." Thinking on action is the way of analyzing experiences as they happen while thinking in action determines how responses are formulated (Krause, 2004). This whole idea is considered as "thinking on your feet." Reflective practice occurs at all stages of the teaching process, in planning, action [execution], and evaluation. Reflection refers to thinking about teaching, which involves the thoughts teachers have before, during, and after the actual enactment of a lesson. This construct is parallel to the thinking processes identified by Polya (1945). In his conception of mathematical problem solving, there are three phases: (a) understanding, (b) planning, and (c) looking back. Teachers should engage in similar types of thinking before they teach a lesson. To achieve the desired results, teachers should reflect on their teaching goals and methods and how these interface with the demographics and abilities of their students. This process would allow them to clarify their knowledge base, the mathematics content, and their students' learning styles and to crystallize the pedagogy to be implemented. Teachers must consider the challenges that students may encounter and strategies to assist students in overcoming them. Polya's "looking back" phase is the reflective thinking that teachers engage in after they teach a lesson (Artzt & Armour-Thomas, 2002). At the end of the lessons, teachers evaluate the lesson goals and the actions of both themselves and their students as well as define the points at which difficulties emerged. They must consider the strategies employed and when necessary make modifications. This self-assessment helps identify what was not addressed and the unexpected challenges of the lesson. Failure to acknowledge these challenges could impede teachers' self-improvement and their students' achievements.

In the planning stage, reflection can help to guide the choices made. In the action stage, reflection can help the teacher to monitor the progress of the lesson, be flexible, and adapt his or her strategies to the current situation. In the evaluation stage, reflection can help the teacher to look back on the lesson and think about what worked or did not work and why. This form of reflection contributes to future planning and creates a cyclical action process (Krause, 2004). However, this reflection on the teaching experience goes much beyond simple descriptions. Such reflective teaching is *informed* teaching drawing on the immediate experience, theory, and research in other settings, research in the teachers' own classrooms (action research), discussion with colleagues, and feedback from students (Krause).

In addition, reflective teaching holds values that provide opportunities for teachers to inquire (into other teaching methods), further their learning, and use intuition, insight and artistry (Hinett, 2002). Teachers, who draw on their intuitions to complement their knowledge and what they understand as a subject, are [better] enabled to act in situations (Hinett). Again these situations assist in the "thinking on your feet" idea posed by Schon (1987). In education, using intuition to inform learning is referred to as developing metacognitive skills–a critical practice in the RTM. These skills are important in developing the ability to understand and make sense of experience, which are all integral processes of reflection. Hinett stated that encouraging students to acknowledge their intuitive capacity helps them to appreciate their strengths and weaknesses. The criteria for reflective practice and reflective teaching are all embedded in the reflective teaching model, which is employed in the alternative teacher preparation program for secondary mathematics.

The Reflective Teaching Model

The RTM is grounded in *constructivism* and *metacognition.* Constructivism is learning in an active situation through which new knowledge is acquired which builds on prior knowledge. Metacognition is the ability to analyze how we think about thinking. Also, the values of *modeling, sharing authority, reflecting,* and *heuristic teaching* are the assumptions on which the RTM is based. These assumptions guide the development of all activities and experiences in the RTM (Hart, Najee-ullah, & Schultz, 2004). Constructivism, metacognition, and their assumptions form the RTM's conceptual framework. The RTM concept is adapted in a series of mathematics methods courses where the facilitators organized a model-experience-reflect format as follows: At first, the facilitators model an exercise, such as planning, teaching, or problem solving. Next, the student teachers experience the activity. Finally, at the close of each activity, everyone reflects. Subsequently, the student teachers follow a plan-teach-debrief sequence, a form of cognitive coaching that is aligned with their classroom practices. During the mathematics methods courses, student teachers construct new knowledge about teaching and learning (constructivism) and monitor their thinking and behavior as they regulate what they do and think while having an experience in teaching (metacognition; Hart et al.). Student teachers have the opportunity to experience the Plan/Teach/Debrief sequence, while they observe how others think about and teach from a reform perspective (modeling). Then, they are given the opportunity to explore this concept in a classroom. Collaboratively, student teachers model the first phase of the RTM, such as planning, with their peers and university supervisor (sharing authority). As a result, they are exposed to learning experiences under the scrutiny of their peers and university supervisor, who critique their ideas.

In the process, student teachers develop strategies for future exercises in "solving" the teaching problem (heuristic teaching). The lessons are videotaped. During the lessons, student teachers also consider the feedback of their students. After the lessons, they engage in the reflection and self-assessment processes. Debriefing sessions are held with the university supervisor and their peers to close the three-phase cycle. This cycle is continuous throughout their practicum and student teaching. The framework of the RTM plays a major role in the conceptual framework of this study.

Conceptual Framework of the Study

This study seeks to understand the dynamics and effects of the Reflective Teaching Model on student teachers' concerns. It also seeks to determine the potential of the RTM in building reflective teaching and learning communities within their schools. An in-depth analysis of the experiences of a cohort of provisionally certified teachers was conducted to identify and describe the subjective experiences of the students who used the RTM. A phenomenological approach was chosen to study the human experiences (Blodgett-McDeavitt, 1997; Husserl, 1970; Schwandt, 2001). This approach provided the flexibility to take the rich descriptions (the students' own words) of their experiences to depict the phenomenon under investigation (Blodgett-McDeavitt; Moustakas, 1994). As Patton (2002, p. 106) described, the subjective experience incorporates the objective thing and becomes a person's reality. Thus, the focus is on meaning-making as the essence of human experience. The experiences of the student teachers were guided by the framework upon which their RTM activities were built within the program.

Research Methodology

This research focused on the experiences of the student teachers who held provisional teaching licensure and were seeking certification at the 9-12 grade level as they used the RTM. The design of the methods courses in the certification program was aligned with components of the RTM. These components were built upon ongoing and cyclical processes that patterned action research. In each cycle, the student identified and analyzed a problem, planned a course of action, implemented that action, evaluated the effects and followed-up with another plan of action (Tomal, 2003). Qualitative methods, such as interviews and journaling, provided knowledge of the subjective experiences of the student teachers (Mertens, 1998; Patton, 1990). To obtain a greater depth of information on the impact of the RTM, a framework for gathering qualitative data from students was designed. During a single semester, student teachers were required to (1) maintain daily logs, (2) submit bi-weekly reflection logs, (3) submit RTM reports from the mentors and cooperating teachers for three observations, and (4) participate in a one-hour interview at the end of the methods courses. A graduate research assistant conducted the interview after the student teachers' grades were submitted.

Participants

The study began with 10 participants, but owing to personal reasons, one student teacher declined the program. Five female and four male secondary mathematics student teachers from urban and suburban schools participated in the study. These student teachers were mid-career changers with mathematics backgrounds who previously functioned in the corporate world. They

held provisional certification to teach in schools in a metropolitan area of the southeastern United States. To continue in the teaching profession, however, they had to be fully certified. These students opted for the alternative teacher preparation program which aptly suited their needs for certification at the 9-12 grade level in mathematics. This group of students functioned as a cohort, being enrolled in the same series of mathematics methods courses throughout the program. These student teachers taught all day and attended the alternative teacher preparation program in the evening.

These mid-career changers, who were in the late 20s to early 40s age group, learned about and practiced with the RTM throughout the series of methods courses. Another interesting characteristic of this cohort was that there were two different instances of a pair of students drawn from the same school – one urban and the other suburban. It was not usual to have two students from the same school enrolled at the same time in the alternative preparation program. This unusual occurrence stimulated interest to add a further dimension to this study to research the effects of the RTM on the various relationships by pairing students in the cohort.

Student teachers were required to take six mathematics methods courses that were offered two per semester from summer through spring semester as outlined in Table 1:

Table 1

Semester and Course Alignment

Semester	Courses
Summer	Introduction to Secondary Teaching
	Principles of Mathematics Instruction
Fall	Theory and Pedagogy in Mathematics Instruction
	Practicum I [Observation/Teaching]
Spring	Practicum II [Student Teaching]
	Practicum III [Student Teaching]

The teams for the RTM experience consisted of the secondary mathematics student teachers, school mentor(s), and the university supervisors from the alternative teacher preparation program. Students sought out mentors within their schools. These were seasoned teachers with over 3 years as a certified teacher. In some cases mentors were provided by the school district in its effort to increase the number of qualified teachers. The university supervisors were one faculty and one part-time instructor who was a retired teacher from the school system.

Procedure

During the summer semester, each student teacher learned and modeled the RTM with another student teacher pairmate as part of a microteaching experience. In the debriefing sessions, the student teachers acknowledged their challenges and assessed their strengths in

teaching according to the National Council of Teachers of Mathematics (NCTM, 2000) and Interstate New Teacher Assessment and Support Consortium (INTASC) standards (http://www.intasc.org). During the fall semester, they continued to model the different phases of the RTM concept with their pairmates, mentors, and university supervisor to address the challenges identified in the initial phase.

In spring semester, they implemented the concept with more confidence, knowledge, and a greater sense of the need for self-assessment in the mathematics classroom (Artzt & Armour-Thomas, 2002). During each semester, the three-phase cycle of the RTM, that is, planning, teaching, and debriefing was repeated (see Figure 1). For the purpose of this paper, the analysis was based on data from the spring semester.

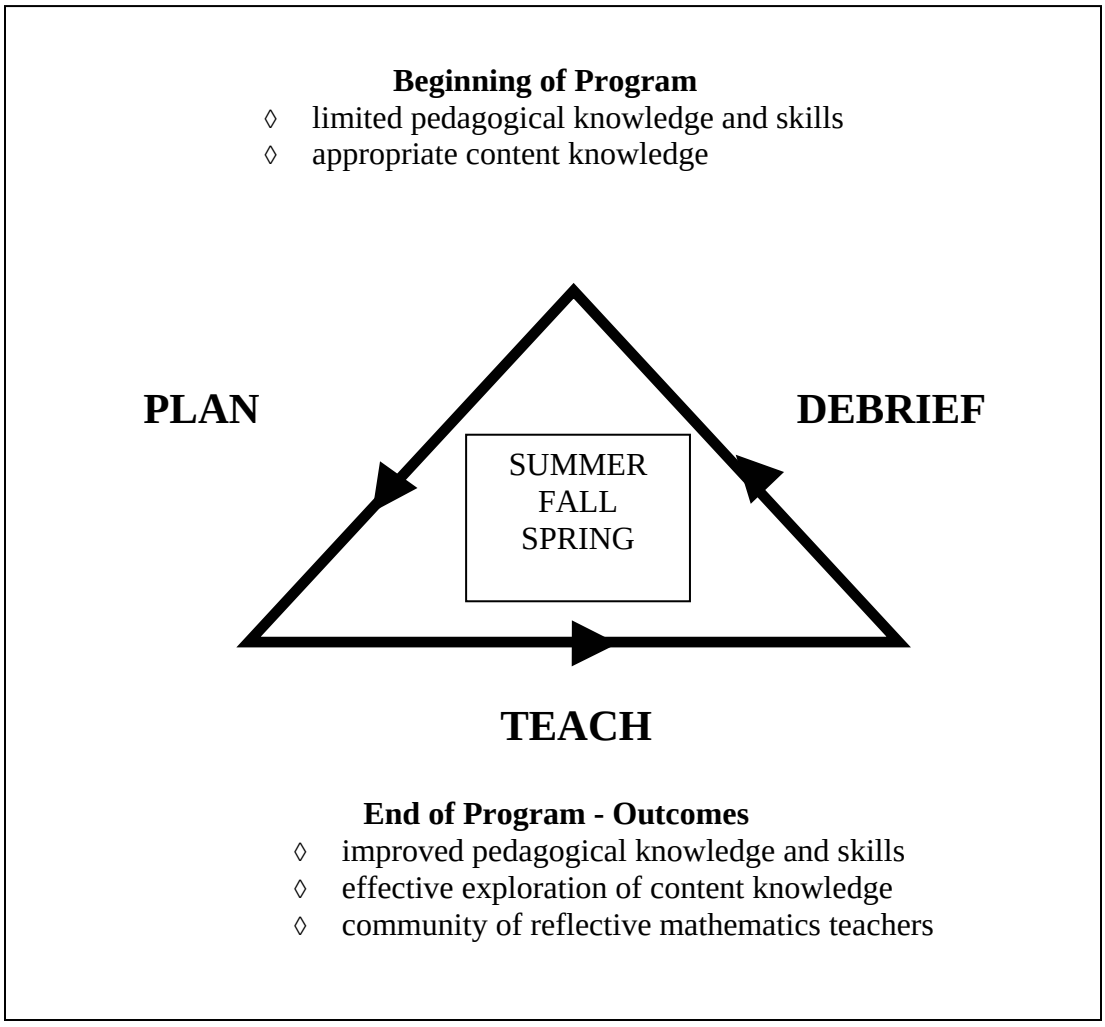

Figure 1. Action research approach of RTM

RTM in Context

Planning. In the *planning phase***,** each student teacher of the assigned RTM pair (see Table 2) developed a lesson plan. The pairs were numbered 1 through 5 and each member of the pair was lettered (a) or (b). Although student teachers may have had some experiences in writing lesson plans, the mentors and/or university supervisor must verify that the goals, objectives, motivational activity, teaching strategies, assessment, and extra activity were aligned with the INTASC and NCTM standards and principles. The lesson must use cooperative learning techniques, hands-on activities using manipulatives, Geometer's Sketchpad, and/or TI technology. In each planned lesson, students justified their instruction and supporting aids according to the INTASC and NCTM standards and principles, respectively. Provided with the lesson plan were a pre-lesson thought reflection that depicted the demographics of the school and classroom, the general attitude of their students, the atmosphere of the classroom, and the classroom management plan. The RTM pairs met out of class and on the course's Web-based Communication Technology (WebCT) homepage to discuss their plans and provide necessary feedback to each other. The university supervisor facilitated these online groups. After the RTM pairs reviewed and modified their lesson plans, each student sent the lesson plans to the university supervisor on the WebCT homepage for feedback at least 2 days prior to the scheduled visit.

Table 2

RTM Pairs - Gender, School Environment and Classes Taught

RTM Pairs	Student Teachers	School Environment	Classes Taught
RTM Pair 1	a. Female	Different Urban	Algebra I Course
	b. Male	Different Urban	Algebra II Course
RTM Pair 2	a. Male	Same Urban	Grade 10 Geometry
	b. Male	Same Urban	Algebra I and Algebra II
RTM Pair 3	a. Female	Different Urban	Algebra I Course
	b. Female	Different Urban	Grade 6 Mathematics
RTM Pair 4	a. Male	Different Suburban	Grade 6 Mathematics
	b. Male	*Different Suburban*	*Grade 11 AP Stats (declined to participate)*
RTM Pair 5	a. Female	Same Suburban	Algebra II Course
	b. Female	Same Suburban	Algebra II Course

Teaching. In the *teaching phase*, each student teacher was required to teach and videotape two full-class sessions in the spring semester. The mentor and/or university supervisor observed the lesson to determine if they were consistent with the lesson plan. Students were assessed against the performance criteria as follows: (a) content knowledge, (b) teaching and learning strategies employed, (c) the engagement of their students (level of cognitive demand), (d) questioning techniques, (e) "thinking on their feet" in a situation, (f) classroom management, and (g) assessments used during the lesson. The student teacher then reviewed the videotaped lesson in preparation for the debriefing sessions with the RTM pairmate, mentor, and university supervisor, which were conducted at different sessions with the various individuals. Following upon the review the teacher then entered the debriefing phase. In this phase, a series of meetings were planned with the RTM pairmate, mentor, and university supervisor.

Debriefing. In the *debriefing phase*, the student teacher discussed his or her self-assessment with the mentor and university supervisor. Prior to meeting with the mentor and university supervisor, the RTM pairs met and reviewed each other's videotaped lesson. During these debriefing sessions, the pairs further critiqued each other's lesson plan and classroom performance. The videotaped lessons were used to compare their performance across the semesters. This allowed them to measure growth in the various areas of planning and teaching. Student teachers began with the microteach videoed lessons in which they role-played as teachers with their peers in the university classroom. These were recorded during the summer session and later were compared with the videotaped lessons of fall and spring semesters. Once this process was completed, the student teachers further reviewed the feedback received and wrote analyses of their reflections of the RTM lesson.

Mentors

As mentioned earlier, the mentors for this cohort of student teachers (the participants of the study) were retired teachers from the education system who were selected by the school district while others were self-selected by the student teachers from their schools. The university supervisor contacted the mentors to discuss the RTM and the syllabus for the methods course that the student teachers would be expected to follow. Mentors were given guidelines on students' performance expectations and their role in the overall efforts to produce certified secondary mathematics teachers.

The mentors observed and evaluated the student teachers for four sessions during the spring semester. Brief reports were provided highlighting the strengths and weaknesses in the planning and teaching phases and a summary of their discussion in the debriefing phases.

Biweekly Reflection Logs

During the practicum, the student teachers maintained logs of their daily experiences and their reflections. Biweekly reflection logs submitted in WebCT provided material for the online discussions they had with their pairmates. The university supervisor monitored and facilitated their discussions periodically and collected the biweekly reflection logs for analysis. The purpose of this reflection practice was for the student teachers to analyze critically their performances in teaching mathematics and to determine the impact of these experiences on their development as classroom teachers. This reflection also helped them to assess their ability to address adequately the pedagogical concerns within the classroom.

Interview

Interviews captured the student teachers' views of the RTM. A research assistant conducted the one-hour interview on the university campus after the student teachers final grades were submitted by the university supervisor. The main requests in the interview were as follows:

1. Give me an account of your experiences with the RTM starting as far back as possible.

2. With your colleagues and/or mentor(s) during the planning and debriefing sessions, how did the RTM help you?
3. Describe the feedback you received from your students. What was responsible for the type of feedback you received or did not receive?
4. What were the effects of this model in your school(s)?
5. Would you recommend this model to another new teacher? Why / Why not?

Data Analysis

After course grades were submitted, the analysis of the data commenced. Data from the biweekly reflection logs of the course database, and the mentors' RTM reports were used to triangulate the student teachers' processes within the cycle of the RTM. The transcriptions of the one-hour interviews were analyzed thematically according to the conceptual framework and were the basis for the findings of the study.

Findings

This group of student teachers individually expressed that at the start of the program they thought that the RTM would simply make the program a lot harder, would be more time consuming, and would require extra work. As they continued to use the RTM, student teachers discovered that the RTM provided a structured approach that enabled them to add ideas and details to their lessons. For instance, student 1a wrote, "I dreaded it that it was going to be demanding. However, I received good background and preparation; it turned out to be a quite interesting, useful teaching aid." The next sections highlight challenges found in pairing and the pedagogical concerns that arose in classroom management during planning, teaching, and debriefing.

Planning

Student teachers spent more effort in writing lesson plans than they did before entering the alternative teacher preparation program. They realized the importance of keeping a record of their planned lessons, which allowed them to track what they had already done. The planning process gave greater emphasis to preparation and assisted them in conceptualizing and developing strategies for their lessons. The planning process gave security to the student teachers. They were able to predict questions that their students might have. In addition, by formulating possible questions in advance, student teachers were able to aid their students' reasoning in generating their own questions during the lesson.

> Especially from the lesson plan, I prepare it in a way that I have already considered the kinds of questions students are likely to come up with. I also provoke their thinking by bringing up these questions during the lesson. I have also used activities where students have to work in groups and figure out things. (Student 2b)

The data indicated that working in pairs helped the student teachers to be cooperative and collaborative in sharing strategies and methodologies during lesson planning. Pairmates were especially helpful when both were teaching similar classes. In such cases, they developed similar

lesson plans. Doing so saved them time and helped them to improve the overall quality of their lessons.

Collaborative efforts further allowed student teachers to compare notes and discuss students' reactions to similar situations. Indeed, student teachers emphasized the usefulness of collaborating with someone teaching similar classes: "My partner helped me with lesson plans and creating activities. I also received a lot of training in my course work and I have become better and better" (Student 4a).

Teaching

After the planning process, the student teachers taught lessons that were videotaped. They had been taught over the summer how to operate the video technology. When teaching, student teachers aimed at developing critical thinking environments. They provided activities where the students worked in groups to figure out procedures and answers. Student teachers strived to make their students think. This environment encouraged students to ask more questions. Videotaping the lessons gave student teachers the opportunity to observe both the positive and negative aspects of their teaching experience. The videotapes were used as self-reflective tools and instruments to generate feedback from other student teachers, mentors, and the university supervisor.

Debriefing

The debriefing process provided space for collaboration and critique. Debriefing helped student teachers to understand their strengths and weaknesses. Watching their own videotapes gave them a new window into their own teaching.

> When you watch yourself, there are things you are doing without realizing, like talk to only one side of class, not notice students who are not alert. But by watching your own video helps notice these things, not just criticize one but also get ideas from myself and someone else as to what to improve. (Student 1b)

Also, watching the videotaped lessons of other students allowed student teachers to garner ideas from other teachers. For example, when a student asked a question, most of the student teachers would attempt answering the questions. By watching the videotapes, student teachers realized that they had to give the students sufficient time to analyze and solve the problems, that is, the opportunity to think, which is often considered as "wait time."

Another important finding during the debriefing of the videotapes was that student teachers realized that their students were learning the content while enjoying the class. The videotapes provided the opportunity for student teachers to analyze not only their ways of teaching and discipline management but also the students' behavior and reactions to the student teacher's methodology. Student teachers noticed that during class there were times when they needed to slow down to ensure that every student was following the lesson, "The feedback [from students] shows improvement in terms of students wanting to be more engaged in class activities and feel proud when they are able to solve problems" (Student 2b). Student teachers could not implement all the ideas given to them during the debriefing sessions, but they tried to implement those they thought were most important.

Mentors' Reports

Reports from the debriefing sessions and the interviews revealed that some mentors were more effective in the debriefing sessions than in planning. Mentors were a *good* source of feedback for the student teachers. Help was more forthcoming from mentors in the areas of teaching methodology and strategies than in content and concepts. The fact that some mentors taught different classes or even subject areas might account for their greater effectiveness in the debriefing sessions than during the planning sessions. In general, mentors gave good advice about pedagogy and classroom management, but limited feedback on the content knowledge.

> My mentor couldn't help me much [with the mathematics] because she didn't teach mathematics but my partner really helped me. My mentor was very helpful [in the process]. She came in a lot to observe my lessons and kept regular contact through email. The only disadvantage was that my mentor was a social studies teacher and therefore could not help much with teaching mathematics (Student 1b)

Because some mentors were not familiar with the model that the student teachers were implementing, it was challenging for mentors to provide solid feedback on a holistic view of the model to student teachers. This was a limitation of the study.

> [Though] the mentor was in the school system, actually I felt like, in that particular instance, it wasn't the best situation, because you are introducing a new type of strategy for a new way of teaching to somebody who is not familiar with that. (Student 5a)

Student teachers noticed the importance of having mentors who (a) have knowledge about the RTM model and (b) have the adequate knowledge of the mathematics. The communication and productivity during the planning and debriefing sessions were maximized when both the student teacher and the mentor had knowledge of the RTM model and the subject being taught.

> My mentor teacher has never taught some of the higher level lessons and this made it hard. She had a hard time because she did not always understand the material. She would however look through and see that everything was professional. She helped me a lot with algebra I. She would make sure I simplified things and covered all the basics. (Student 3a)

Feedback from Students of Student Teachers

The impact on classroom management was evident in the feedback the student teachers received from their students. Listed below are unedited comments taken from the reports and interview of the student teachers:

Student 2b. Some students liked the whole idea and liked the challenge. [The] majority is yet to adjust to being able to think on their own and solve problems. The feedback shows improvement in terms of students wanting to be more engaged in class activities and feel proud when they are able to solve problems. They enjoy application of problems and relating them to real life situations.

Student 5a. Students showed positive response towards math. Without bragging or whatever, I would say that the students really just enjoyed coming to class. They used to say, 'oh no, not the work problem again' but in the end they say, 'we see how this is done. We see how come we need that.' Math is not exactly easy but they appreciated it. They were not used to writing in a math class. They were very uncomfortable with that. However, they were able to come to terms with it.

Student 5b. The students really liked the activities. For them it was really an opportunity to work in the classroom and some of them do not even have somebody to help them at home. So it was an opportunity to get help.

Student 3b. They don't seem to know what they want. They show no responsibility. I could not apply the kind of cognitive demand level I wanted. They were just not well prepared. Sometimes more than 10% of the class will not know the multiplication tables. They see school as a hang out joint.

Student 3a. Initially many students said they hate math. Now they say they have a desire to do well. They say they enjoy the course and that the class is relaxed. They feel the class is not rigid; it is not the same every day. They have activities, they joke, and laugh. They say they enjoy it and the environment is good. The environment is relaxed. My experience has grown and I do much better.

Student 4a. [On getting feedback] Not so much, maybe because students sometimes are not so serious and will not voluntarily come and discuss with the teacher.

Student 1b. [On getting feedback] Positive! Students have indicated they enjoy the lessons more. I will actually miss this class. I enjoyed very much seeing the students improve. More students wanted to be in my class. They said they enjoyed learning math more than ever before and this was largely because of the way that I taught. I would share my experiences with the students and they felt encouraged. They understood it was not math that they hated, but rather getting questions wrong and I talked to them about patience.

Student 1a. I guess it is positive feedback. I think I am very good [effective] with students who are not successful in math. I think they like my class because they feel I can explain well what they don't understand. Those students, the comments are, we really like your class, we now understand math.

> *Students 2a.* The good [more willing] students indicated that they enjoyed the lessons more. The weaker students also said the lessons were more interesting but did not express as much enthusiasm as the good [more willing] ones. The students enjoyed class warm-ups and activities.

Some student teachers' feedback provided evidence that there were positive changes in classroom management. They stated that they were more relaxed when engaged in the class activities, while there were others who did not come to grips with the change. There were also changes in the appreciation for mathematics owing to the change in the classroom environment. One student teacher (RTM Pair 1a) claimed that "RTM has improved my teaching skills. Using activities and real life examples have made lessons more interesting. Poor students say they feel more successful."

Building Community

The RTM model not only helped student teachers to enrich their teaching experience, but it also allowed them to build strong professional ties. Such ties were used as a mutual source of pedagogical resources, planning, and provided feedback to each other as well as other professionals. The student teachers had the opportunity to compare their teaching styles and teaching outcomes in the university classrooms. They were able to analyze what worked for one student teacher and not for the other. In particular, in the same school where the members of RTM Pair 5 were teaching similar classes, they drew the attention and curiosity of their colleagues at the school. They received positive feedbacks from their mentors and hence promoted the program largely because of their positive experience. Other student teachers, though not as fortunate, did express a positive attitude to the model and were seen by other teachers in their schools as exemplary in classroom management. One student teacher expressed that she realized the power of the RTM when she applied it to a real situation of mentoring a new teacher at her school.

The student teachers concluded that the reason for the RTM model generating interest and curiosity among other teachers in their schools was based on the engagement of their students in the classrooms. The other teachers asked about their activities. Teachers were receptive to the RTM model and showed special interest in viewing the student teachers' lesson plans, materials, and ideas. However, the tenured faculty in the schools showed some reservations about videotaping the classes.

> They [tenured faculty] were curious. They liked the idea. They may not call it RTM but they are moving to coordinated group planning and sharing of ideas. . . . Other teachers have commented that the style of teaching is great. They sometimes ask why we are always videotaping." (Student 3b)

Discussion and Interpretation

There were challenges in pairing the students. Two student teachers who realized they could not have a matching RTM pair within the same school identified partners who were close in proximity so that travel time was diminished and they could therefore collaborate, view

videotapes, and debrief more easily. The student teachers stressed the importance of having a pairmate with whom they had a sound working relationship. Hence, they focused on the value of collaborating with someone who was teaching similar classes. Those who created a bond and worked closely with their pairmates expressed that they had a valuable experience and benefited from the model.

Student teachers engaged their students in activities that required cooperative learning and group interactions. The RTM pairs and mentors reviewed the planned activities for appropriateness, engagement and level of cognitive demand so that students would participate meaningfully thus minimizing classroom management concerns.

Pedagogical concerns were addressed during the planning, teaching, and debriefing phases, and the student teachers were consistently engaged with their peers, mentors, and university supervisor to identify and resolve concerns and redesign strategies.

As mentioned earlier, some student teachers expressed frustration about the lack of expert advice from some mentor teachers. This made them more dependent on the university supervisor for additional support. In this study, the university supervisor had to fill the void where necessary to ensure that the student teachers' needs were met. In addition, using the WebCT discussion group as another resource of maintaining contact with the student teachers was helpful in making the university supervisor aware of any adverse situations that needed immediate action and communication.

The need to change RTM pairmates in the program, when the selected pairing was not beneficial for the student teachers, is a critical factor and should be taken into early consideration. Later in the semester, there was another situation of one student who had to decline the program owing to personal reasons. In this case, the university supervisor replaced the RTM pairmate. Consistent communication with the university supervisor assisted the student teachers tremendously. As the student teachers depended on each other in their planning, videotaping each other's class, and critiquing their videos, they became a reflective learning community as part of the methods courses. This mutual engagement among the student teachers is characteristic of a learning community (Wenger, 1999). They claimed that they had become a family and, as a result, they kept in touch and continually collaborated to complete their program of study. These student teachers transferred the collaborative practice of the RTM to assist them in their other courses within the program. This cohort of student teachers was known for their collaborative spirit at the university, where they were always seen in a group working on content and/or pedagogy. The student teachers who were in the same school found the RTM to be more effective for them because they were able to plan and collaborate readily and consistently. It proved to be even more effective when they taught similar classes.

The RTM helped the student teachers to focus and motivated them to continue the innovation. In keeping with the findings of Hinett (2002), the model served as an excellent self-reflection tool to detect opportunities for improvement and as an effective way to learn from the experiences of others as was stated:

> Actually my teaching improved so much that a teacher who was teaching next to me has decided to take [enroll in] the program. My experience has been very positive. (Student 1b)

> Overall, the model was very useful especially in terms of improving the effectiveness of teaching. Performance of students improved. It helps the teacher

> to pick what is going wrong early enough and correct it. It is a very resourceful model. (Student 2b)

The experiences of this cohort of students exemplified constructivism and meta-cognition as defined by Hart et al. (2004). The RTM approach allowed teachers to build on their knowledge base (constructivism) as well as reflect on and regulate their thinking and behavior as they taught in the classroom (meta-cognition; Hart et al.). The study demonstrated that the RTM is not only a good pedagogical tool, but it also has the potential to foster and strengthen learning communities in schools. Teachers got to know each other better, shared experiences, improved the quality of education, and built relationships in the schools. The student teachers viewed the RTM as a tool to improve the quality of their students' mathematics education. The model facilitated collaborative efforts among teachers that resulted in effective class preparation, appropriate delivery of performance-based tasks in the content area of mathematics, and stronger relationships among teachers and students.

Preparing student teachers for the teaching profession with this model provided them with the strategies to interact with tenured teachers who were willing to explore new ideas. It allowed student teachers to enter the school system using a pedagogical tool focused on quality of instruction, improvement in facilitating student learning, and meaningful collaboration or teamwork. From the experiences of this cohort of student teachers, the RTM approach was effective in bridging the gap between theory and practicum, identified and discussed by Bowen and Roth (2002). The use of the RTM in the school system can generate interest and curiosity among teachers. Tenured teachers realized the importance of using collaborative efforts, planning, and debriefing in order to maximize student learning in schools. "It was much what I expected because I felt like it made sense to me. The reflective teaching model just makes sense. It's what all teachers should be doing" (Student 5a).

Krause (2004) emphasized the importance of drawing on theory, experience, discussion with colleagues, and feedback from students in classroom education. In addition to the inquiries and comments from colleagues, feedback provided by their own students indicated that the student teachers took a different approach in the classrooms. This is particularly a result of the student teachers' application of the RTM, which provided the vehicle by which each of these aspects of teaching defined by Krause could be inculcated. However, other students' feedback indicated that some student teachers were unable to convince or motivate their students to engage in tasks with higher level of cognitive demand in mathematics. This may be indicative of insufficient time to see the changes in students' learning and/or the transition of the student teachers' pedagogical approach. In addition, change is not always evident at the onset and time can be an important factor to observe and measure the impact on students' achievement.

In their discussions, it was particularly noted that the student teachers did not identify gender-based differences among their RTM pairs. The student teachers worked well in all sets of pairing (male-female; male-male; and female-female). However, from an observer's perspective, the female pair at the same suburban school spent more focused time planning than their male counterparts in their common urban school settings. The male-male RTM pair 2 had different class preparations, which gave them different outcomes for their collaboration. Though they were at different schools and taught different classes, the male partner and female partner in RMT pair 1 put much effort in their planning and used WebCT as a tool for their collaboration.

The research study has many indications that the RTM could be an effective tool in teacher preparation. However, there are also indications that more time is needed to determine

the ultimate effectiveness of the model specifically on student learning. This study has not exhausted the evidence of the impact of the RTM as an effective tool, but it has demonstrated the potential to have an effect on the student teachers' delivery of the content. This study will be ongoing with each new cohort of students to develop a working model of implementation for maximum effectiveness while strengthening the implementation of the RTM in the program.

Implications

There will be structured follow-up of the ongoing process of the RTM as these student teachers enter their induction phase of the program, that is, the first year in their teaching career as fully certified teachers. The university supervisor has used the findings from this study to continue modifying the way the RTM is used to provide student teachers with optimum effectiveness. The full-time student teachers who do not hold a provisional licensure are now being placed in small groups of two or more at the same middle school for the internship and the same high school for the student teaching experiences. However, it is not always possible to have this combination with the second track of students. The combination was a coincidence, and so I took advantage to study the cases. It would be logical to have a team of at least three in case of unforeseen circumstances but there is also the concern of having available openings for the practicum at the middle schools and student teaching experiences at the high schools. Attention is also placed on the eligibility of mentor teachers in the fall and spring semesters for student teachers. In follow-up years, further studies would be conducted to determine the continued collaboration between teachers and the effects of the RTM on student learning.

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