Journal of Urban Mathematics Education
December 2012, Vol. 5, No. 2, pp. 28–43

PUBLIC STORIES OF MATHEMATICS EDUCATORS

Developing a Socio-Cultural Pragmatic Mathematics Methods Course

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Culturally responsive pedagogies that develop students' construction of mathematical knowledge, in conjunction with a mathematics curriculum that is student centered and promotes positive learning practices, are vital to the development of a skillful quantitatively thinking population (Mathematical Association of America Conference Board of the Mathematical Sciences, 2001; National Council of Teachers of Mathematics [NCTM], 2000). However, in spite of attempts by many mathematics teachers, mathematics teacher educators, and mathematics education researchers to provide all students with an "equitable," meaningful, and high-quality mathematics learning experience (NCTM, 2000), historically marginalized segments of the U.S. population continue to experience injustices in terms of learning opportunities and education resources (e.g., African American/Black and Latina/o students[1] and students of poverty).

While the potential systemic solutions to racial and economic inequity are complex, the issues that reproduce the injustices are foundational in nature: lack of local and state funding in school districts with a high percentage of minority students (Center for Understanding Race and Education, 2009; Stony Brook University Center for Survey Research, 2008), under-qualified content-specific teachers (Oakes, Joseph, & Muir, 2001), and a general marginalization of equity issues in mathematics education (Martin, 2003). In an attempt to explicitly confront these persistent inequities, a secondary mathematics education methods course was developed and taught with the explicit goal of bringing issues of race and eq-

[1] Throughout this public story, African American and Black are used interchangeably as well as Brown and Latina/o and/or Hispanic.

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uity in mathematics education to the forefront. During the methods course, the pre-service teachers were exposed to literature on culturally responsive pedagogy (among other things) and provided with the opportunity to teach a culturally responsive mathematics micro-lesson to Black and Brown students from a "high-needs" urban high school.

In this public story,[2] we—Paul W. Yu, the second author, and I, Danté A. Tawfeeq—a Black mathematics education professor and the first author—discuss how I instructed a small cohort (n = 5) of White pre-service secondary mathematics teachers. This public story occurred when I was an assistant professor of mathematics education at a small Liberal Arts university in suburban New York. This school is one of the largest producers of mathematics teachers in Metro New York City; the majority of the students in the mathematics education program are White. Many of these pre-service teachers have stated that they would prefer future teaching positions in schools that most resemble those which they attended: majority White and middle class schools. Despite their preference, many of the available teaching positions are in Metro New York City schools that serve majority Black and Brown student populations. I have observed that these pre-service teachers seem to have had limited life experiences with racial and cultural diversity. Furthermore, in class comments made by my pre-service teachers often reflect "stereotypes" about Black and Brown children and youth, and Black and Brown communities in general. As a Black professor, one of my course goals was to expose my students to research-based literature on race, culture, and mathematics education (e.g., Martin, 2003, 2009; Tate, 1997) to help these students grow in their understanding of how to engage students from diverse racial backgrounds.

Here, we first describe the theoretical foundation for the socio-cultural pragmatic mathematics (S-CPM) methods course as well as the course background, rationale, and students (i.e., participants). We then discuss the structure and implementation of the course curriculum and field-based experience. Next, we reflect on the course outcomes, and conclude with a brief discussion about both the limitations and implications of the course.

[2] The data for this public story were derived from teacher-researcher reflections, two post-course interviews with the course instructor, post-course student surveys administered one semester after the course, and post-course correspondences with some of the student participants. Because I, Danté (i.e., the course instructor), served as a facilitator and sense-maker of the student discussion of issues regarding race, culture, and mathematics instruction, the use of teacher-researcher reflections provided insight into both the classroom discussion and the post-course follow-up survey and correspondences (Ball, 2000; Confrey & Lachance, 2000; Simon, 2000). Additionally, the second author (i.e., Paul) conducted two semi-structured interviews with me. The interview protocols were based on the post-course student surveys; they were transcribed and coded.

Culturally Pragmatic Diversity: A Theoretical Framework

Issues related to facilitating the learning of mathematics in pre-K–12 mathematics curricula converge during pre-service mathematics methods courses (Hill, Rowan, & Ball, 2009; Shulman, 1986). One purpose of mathematics methods courses is to help pre-service teachers develop the means to facilitate the learning of mathematics. These methods courses and the programs supporting such courses vary among institutions in philosophy and structure; however, mathematics teacher education programs tend to emphasis the development of both mathematics content knowledge and pedagogical knowledge—what Shulman (1986) described as pedagogical content knowledge (PCK). Within mathematics education, PCK has been extended to include *mathematical knowledge for teaching* (MKT), which includes "explaining terms and concepts to students, interpreting students' statements and solutions, judging and correcting textbook treatments of particular topics, using representations accurately in the classroom, and providing students with examples of mathematical concepts, algorithms, or proof" (Hill, Rowan & Ball, 2005, p. 373). Responding to calls to weave culturally based knowledge throughout teacher education programs (see, e.g., Gay, 2000), the S-CPM course extended notions of MKT to explicitly consider knowledge of the socio-cultural factors that affect the teaching and learning of mathematics (Leonard, Brooks, Barnes-Johnson, & Berry, 2010). Our belief is that mathematics content courses and methods courses, when properly integrated with resources reflective of culturally diversity (e.g., culturally responsive teaching), provide pre-service teachers with a point of view that considers MKT issues within teaching experiences that reflect cultures other than their own.

Specifically, we framed the S-CPM course using Jia's (2007) concept of *culturally pragmatic diversity*, which refers to differences in values, norms, or social conventions from culture to culture and questions the tendency for people to judge or evaluate the behavior of others by their own cultural standards. These differences often shape the way one determines what is appropriate or inappropriate speech or behavior in a given situation. In the mathematics classroom, when the teacher and her or his students are from different socio-cultural backgrounds, it is an unawareness of this culturally pragmatic diversity that, we suggest, may lead to misunderstandings in the mathematics learning process. Two components of cultural pragmatism framed the S-CMP course.

- Culturally pragmatic diversities may lead to misunderstandings and communication breakdowns in the course of classroom communication. These misunderstandings have practical consequences.

- Pragmatic conventions or norms as to what is appropriate behavior and what is not in a given mathematics classroom may either have to do with cultural values, beliefs, or with situational factors (Jia, 2007).

The S-CPM course was designed to provide pre-service teachers with an experience in which exposure to culturally responsive teaching was supported by a field-based experience that reflected the diverse culture of their course readings and discussions. Furthermore, the S-CPM methods course content provided a socio-cultural perspective for which the pre-service teachers could consider how to navigate issues of MKT in a teaching context with students of color. This culturally pragmatic frame was used to clearly differentiate this course from more "traditional" mathematics education methods course—courses that too often present or discuss vignettes of pedagogical interest in a culturally free or neutral manner.

Developing and Implementing the Course

Course Background

The general purpose of the S-CPM methods course was to expose five (four female and one male) graduate pre-service secondary mathematics teachers to issues regarding instruction and assessment in mathematics education and, in particular, to issues regarding teaching racially and culturally diverse students in high-needs schools. This emphasis on issues pertaining to race and culture in teaching mathematics was important because all of the participants were raised in White, middle class communities and had limited experience working with racially and culturally diverse students in urban settings. However, their university required a portion of their student teaching to be completed in a "culturally diverse" school. While populations in certain Metro New York schools are, at times, weighted towards a particular racial and/or ethnic group, the culturally diversity among most racial groups is broad. Moreover, based on the university's most recent data regarding teaching positions acquired by recent graduates, these pre-service teachers would most likely find themselves teaching in a high-needs urban school. In essence, the S-CPM methods course was created to address the socio-cultural disconnect between White and middle-class pre-service teachers' past experiences and their current and future teaching contexts in diverse racial and cultural school settings.

The course was one of only two mathematics methods courses designed for secondary mathematics education majors. This upper-undergraduate and graduate-level methods course was part of the university's 5-year Bachelor of Science (BS)/Master of Arts (MA) teacher certification program, and was designed for students who had earned their BS in mathematics and were seeking an MA in

mathematics education. The five students in this course were required to take 25 field clinical hours as part of the 100 total field clinical hours required by the State of New York prior to student teaching. The 75 remaining hours were to be completed during the second mathematics methods course and other education courses.

Course Rationale

The development of the S-CPM methods course was both extrinsically and intrinsically motivated. Extrinsically, the motivation for this course was as a result of the class discussion during the first session: the pre-service teachers agreed that, while they learned a great deal of "potentially" useful material in all of their educational courses, they felt that the material was not presented to them in a way that would help them teach mathematics in the classroom. Furthermore, they felt they were unable to make connections between concepts investigated in their previous educational coursework and their experiences during the clinical field placements. On the first day of class, Roslyn (a pseudonym, as are all participant's names) commented:

> They [previous education courses] stuck me out there in my field observations [in an urban school] and I didn't even know what to look for [in field placements in high needs school]. How can I tell what is good or bad teaching? My professor said I should look for this or I should look for that…and if I see this, then that means there is a good teacher. That makes no sense. …Not worth my time.

Intrinsically, I, the first author, was motivated by my own racial experiences and academic upbringing. When asked directly about my motivation behind the course, I stated: "Because I'm a Black teacher that is concerned with Black and Hispanic students in urban environments…and that's where the jobs [in urban schools] will be for these kids [college students]." To address the critical sentiment of the students toward previous education courses and my desire to expose the students to issues of culturally responsive teaching in the mathematics classroom, certain curricular and practical structures were implemented to make the connections between the methods course and other education courses meaningful to their required field-based experience. Below are brief descriptions of the five students from the course and an account that illustrates the curricular structure and practical implementation of the S-CPM methods course that provides some cohesion between methods courses and field-based experiences.

Course Participants

Roslyn was a 23-year-old, White female raised in a middle-class, suburban area. She was in her fifth year of the BS/MA program. Demi was a 24-year-old,

White female also raised in a middle-class, suburban area. Unlike Roslyn, Demi had completed her degree in mathematics at another university and was enrolled in the graduate teaching certification program. Naomi was a 24-year-old, Indian American, yet considered herself to have been socialized into White, middle-class culture. She also received her degree in mathematics at another university and was enrolled in the graduate teaching certification program. Morrison was a 28-year-old, White male student raised in a middle-class, suburban area. While receiving a bachelor's degree at another university, Morrison worked in business for a few years prior to enrolling in the graduate teaching certificate program. Finally, Ruth was a 49-year-old, White woman raised in a middle-class, suburban context. She had a business degree, but worked in the home to raise her children; after such, she returned to school to pursue a teaching certificate.

Course Structure

On the first day of the course, students were asked to articulate what they thought should make up a quality mathematics teacher education program. After some negotiation and modification, the list was narrowed down to two experiences that this group of pre-service teachers desired: (a) teaching in a classroom environment with school-aged students and (b) reviewing collegiate mathematics that mirrors high school mathematics. These two student-generated objectives, in conjunction with my objective to include culturally responsive pedagogy, became the foundation for the S-CPM methods course.

The first goal of the course was to allow the pre-service teachers' to apply what they learned in the methods course in a classroom environment. I sought support from the Institute for Student Achievement (ISA), a New York-based, non-profit school improvement organization. This support allowed for transportation to the university for approximately twenty Black and Latina/o ninth- through eleventh-grade students from a high-needs high school in New York City that was 99% Black and Latina/o. The students came to the university weekly over 14 weeks after their regular school day for mathematics instruction and support during the first hour of the two-hour S-CPM methods course. The high school students understood that their participation in the afterschool mathematics program provided opportunities to supplement their high school mathematics coursework.

The second goal of the course was to allow the pre-service teachers to review collegiate mathematics as reflected in high school mathematics coursework. As many mathematics teacher education programs require coursework in calculus, abstract algebra, number theory, and applied mathematics, pre-service teachers are presumed to be highly knowledgeable in mathematics by the end of their undergraduate education. While these required courses would expose pre-service teachers to increasingly abstract notions of the mathematics they encountered in pre-K–12, this exposure alone does not necessarily make them better potential

mathematics teachers. According to Hill and colleagues (2005), specialized mathematical knowledge and skills used in teaching, or pedagogical content knowledge, positively impacts students' learning of mathematics. The abstraction of collegiate mathematics in such areas as advanced calculus, number theory, and abstract algebra can potentially move pre-service teachers away from high school mathematics. Such a claim does not mean that we object to pre-service teachers completing high-level mathematics; on the contrary, we encourage the infusion of rigorous mathematics courses in pre-service teachers of mathematics programs. Nevertheless, we also consider the possibility that procedures and concepts needed to successfully engage high school level mathematics become increasingly embedded in the concepts and procedures needed to successful engage collegiate mathematics.

For example, the simple procedure of factoring in order to better manage an integration problem in calculus is one of many examples of an embedded mathematics procedure within high-level mathematics. Furthermore, while factoring is extensively practiced in the average high school algebra class, this mathematics procedure may become so overly nuanced when doing mathematical problem-solving exercises in collegiate mathematics courses that the importance of reflecting on these procedures as *discrete bundle of pertinent strategy* (phrase used by in S-CPM methods course) is mitigated. These pre-service teachers begin to take simple procedures and concepts for granted because while they continuously move through more rigorous mathematics, many of these strategies become a second nature reaction during problem solving. In other words, some of these strategies become trivialized during the thought process of pre-service teachers in their mathematics courses they take as part of their program requirements. For this reason, the pre-service teachers wanted to revisit much of the lower division college mathematics to re-familiarize themselves with these strategies in the context of high school mathematics. The review of this lower-level collegiate mathematics parallels much of the mathematics found at the high school level (Lutzer, Maxwell, & Rodi, 2002).

Finally, the third goal, to expose the pre-service teachers to curricular, pedagogical, and assessment issues that address race and culture in the mathematics classroom was accommodated by assigning course readings that reflected a broad overview of some of the current equity research in mathematics education. For example, topics explored included teacher preparation and knowledge when teaching in high-needs schools (e.g., Oakes, Joseph, & Muir, 2001; Obidah & Howard, 2005), learning styles and support of racially diverse students (e.g., Berry, 2003; Walker, 2005), and issues of race, culture, and social justice in mathematics education (e.g., Burton, Whitman, Yepes-Baraya, Cline & Myun-in Kim, 2002; Martin, 2003, 2009; Moses & Cobb, 2001; Tate, 1997). The classroom dis-

cussion and implementation of ideas found in such readings were framed by the two components of cultural pragmatism previously outlined.

Course Implementation

The five pre-service teachers worked as a team when developing the teaching schedule and curriculum for the high school students. The class was held in a large stadium-seating classroom that could seat about eighty students. This arrangement allowed the five teachers and the instructor to view lessons from multiple points in the classroom without interfering with the learning process. The room had an LCD projector, a white board, and a chalkboard, which allowed the pre-service teachers latitude when presenting their lessons. Each pre-service teacher taught approximately three times during the semester and was required to follow the curriculum that they designed as a team. After the high school students left the classroom to return to their school, the pre-service teachers evaluated the performance of that day's instructor as a group. The discussion topics included, remediation, management of manipulatives, mathematical representation, inquiry learning of mathematics, and teaching techniques within a culturally diverse setting. Subsequently, the pre-service teachers, after critiquing the lesson, adjusted their instruction so as to better facilitate learning. The following five objectives guided the post-lesson discussions

- have open discussions about mathematical knowledge relative to teaching;
- have a free exchange of ideas, which provide an arena to explore personal beliefs about the learning of mathematics;
- have open debate about learning issues related to sociopolitical and socioeconomic aspects of teaching mathematics;
- provide a considerable amount of dialogue regarding techniques used during their lessons; and
- keep a journal that was comprised of the pre-service teachers feelings about their accomplishments and failures during their instruction.

As the methods course instructor, I associated the dialogue that occurred between the pre-service teachers and me with the Arabic word *haliqa*. This word loosely means an "intellectually intimate chat." Such dialogue engenders learning and a mutual appreciation for the sharing of ideas, which can only occur when there is conversation based on intellectual intimacy linking teacher to student, student to student, and student to self.

In general, the S-CPM methods course supported and encouraged the *Directional and Bidirectional Discourse model* (Yu & Tawfeeq, 2011) for classroom

dialogue, both within the context of the methods course and within the context of the pre-service teachers future classrooms. Before teaching the S-CPM methods course, 48 observations of pre-service teachers and their mentors in 12 high-needs middle and high schools in Metro New York City were conducted. Further observations of in-service mathematics teachers occurred as part of a larger professional development program funded by ISA in several small learning high school communities[3] in Atlanta, Georgia, and East Baton Rogue, Louisiana.[4]

As the observations in these culturally diverse settings continued, a model was developed based on discourse observed between students of color and their teachers, where the questioning sequence provided a means for inquiry-motivated dialogue among participants. Such inquiry-motivated discourse coupled with in-depth content knowledge enabled the mathematics teacher to effectively guide their students' efforts at learning through inquiry. Figure 1 provides a visual framework or model that we identify as the *Directional and Bidirectional Discourse Model* which depicts a desired shift in dialogue in which the discourse between the pre-service teachers and students are fluid and shift based on the role of the students and teachers in the conversation. This model denotes not only the participants in the discourse but also the direction of the discourse. The person that initiates the discourse as listed first in the model determines its direction. More specifically, there are four levels of discourse:

1. Teacher to Student – teacher starting and carrying the conversation with the student, the lowest level of discourse.
2. Teacher to Student [responsible] – teacher starting the conversation with student; student responsible for maintaining the conversation.
3. Student to Student – students conversing about mathematical ideas.
4. Student to Teacher – student starting conversation with teacher, both equally responsible for keeping the conversation going; the highest level of discourse.

Additionally, we view the student's role in the inner most circle (Teacher to Student) as the most passive role. As the circles move outward, the role of the student

[3] Small Learning Communities (SLC) are small schools inside a traditionally large school building. SLCs are often academically themed based (e.g., business, health, law/government, mathematics, or science) and serve a small population of students from the time they enter the high school until they graduate.

[4] A Hermeneutic Dialectic Process was used during the observation because it is interpretive and offers a comparison of contrasting and divergent ideas with the purpose of gaining a higher-level synthesis. The major purpose of this process is not to justify one's own construction or to attack the weaknesses of the construction offered by others but rather to form a connection between them and allow for a mutual exploration of all ideas (Guba & Lincoln, 1989).

in discourse becomes more active. We want teachers to ask open-ended questions; however, asking open-ended questions is not enough. We advocate a more structured and rigorous approach to asking open-ended questions. For example, we would encourage teachers to require their students to compare and contrast other student responses. Additionally, we would encourage students to verbally critique the questions of other students and the teacher, viewing such interaction as necessary and very important.

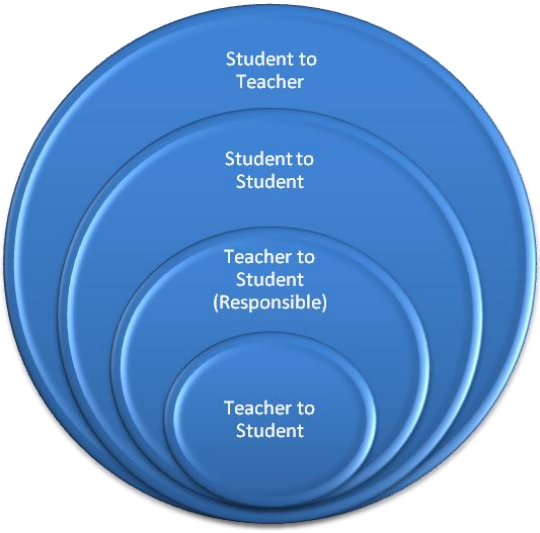

Figure 1. Directional and bidirectional discourse.

Outcomes of S-CPM Methods Course

In this section, we discuss outcomes of the S-CPM methods course, organized into two broad themes: (a) pre-service teachers' confrontation of issues of race and culture in mathematics education and (b) pre-service teachers' perception of the S-CPM methods course.

Confrontation of Issues of Race and Culture

One of the goals of the S-CPM methods course was to expose the pre-service teachers to current research in culturally responsive teaching in mathematics education. While all the readings led to meaningful class discussions, the articles by Martin (2003, 2009) were particularly challenging to the pre-service teachers' notions of race in mathematics education. Reading Martin, for many, was the first time that they had heard someone take something which is generalize

in a social justice platform such as racism and turn it into something that is mathematical. When the learning of mathematics is racialized, it is clear that there are some powerful and oft-repeated assumptions about students' abilities based on "race." Martin challenges not only the "mathematics for all" rhetoric but also what it means to learn and to assess learning within racialized learning environments.

During one classroom episode, in an attempt to provoke discussion based on Martin's (2003, 2009) articles, I posed the following questions: "Has mediocrity become the standard for Black students? A Black student getting a 'C' is the same as an Asian student getting an 'A?'" The students provided no direct response to the scenario. However, they redirect the conversation towards issues of academic resources of schools where Black and Brown students attend. Generally speaking, the pre-service teachers were reluctant to engage the issue of racial perceptions in the learning of mathematics. Rather, they deflected the issue to external circumstances such as lack of access to academic resources and other economic issues. The pre-service teachers seemed to be resolved to the idea that financial means primarily inhibited Black and Brown students' positive performance on mathematical assessments—not racism. In short, the pre-service teachers' position regarding financial means would appear to neutralize racialized learning experiences among diverse populations; it was easier for the pre-service teachers to engage issues of money (i.e., socioeconomic class) rather than issues of race and/or racism.

Nevertheless, in time, the pre-service teachers ability to confront racial issues in mathematics did begin to change. For example, Roselyn initially interpreted Martin's (2003, 2009) position as blaming White people for the poor performance of Black students on mathematics assessments. However, through class discussions and interactions with the high school students, Roselyn began to see issues of racism not as an issue of blame but as a part of the reality of the learning experiences of the Black and Latina/o students she worked with throughout the semester. By the end of the semester, while the pre-service teachers may not have agreed with Martin completely, they could not easily dismiss the possibilities of racialized mathematics learning experiences as they had in the beginning.

Perception of the S-CPM Methods Course

We now consider the pre-service teachers' reflections of the S-CPM methods course. The pre-service teachers were given a post-course, follow-up survey in the semester following their student teaching experience. Sample questions included: *During the course, in what ways did the issues learned in class seem relevant to your field-based experiences with the school aged students you worked with in the course? Did this course influence your perception of teaching students who are African American or Latina/o? If so, how?* Of the five students, only

Morrison, Ruth, and Naomi responded. In general, all three respondents were satisfied with what they learned about teaching mathematics and what they learned from teaching students in a high-needs school. Their responses showed that they were prepared with methods and experiences that would allow them to capitalize on time spent in schools during their field clinical and student teaching experiences. Also, the pre-service teachers felt that the other mathematics methods courses should be restructured in a similar manner.

In particular, the pre-service teachers indicated a variety of ways that the structure of the course provided a safe context that allowed them to make the issues in the course readings relevant in an actual teaching situation. Naomi wrote:

> Being able to apply the theories and issues that we had discussed to what we teach made it more practical. …Knowledge acquired from readings is remembered for a semester, but practicing such theories and knowledge is something in which future teachers can apply to practice.

Similarly, Morrison reflected:

> As teachers we understand and have an intended curriculum for our students. This includes lessons and unit plans produced by the teachers along with any projects or assessments. Though when the teacher is in front of the class this curriculum often changes and adapts. …The teaching of these [high school] students without worrying about classroom management allowed for us to understand the different curriculum and how adjustments were always needed in the classroom.

And Ruth reflected:

> The students that came to our class benefited from our prep time and we became more in tune with their needs as we got to know them better. Overall, I think we became better teachers and the students were able to obtain the help they needed.

Furthermore, Morrison described how the S-CPM methods course provided opportunities to develop his mathematical knowledge necessary to teach (Hill, Rowan, & Ball, 2005) as he reflected on ways to effectively present students with the mathematics content. For example, in a lesson on similarity in trigonometry he used manipulatives that modeled similar triangles. In preparing for and teaching this lesson to the high school students, Morrison had to think through and reflect on conceptual issues related to similarity. During a debriefing and discussion session that took place right after the lesson on similarity was taught, he shared what he had learned about similarity through teaching the lesson during the field experience. Morrison felt his strength in the lesson was

> knowing what to ask and how to transition from one topic to another with higher-level open-ended questions to students…understanding of student failure and student suc-

> cess. Pacing of teaching and [knowing] struggles students have when math becomes open to more than one method or more than one answer.

He continued:

> These students often came to us with less knowledge [regarding similar triangles] than needed for our intended material. As the teachers with our lessons we were forced to change our ways and adapt to the needs and understanding of the students. Student questions and verbal and written assessment by the teacher allowed for us as teachers to veer off into different needed directions to fill in the gaps of all students.

Regarding the pre-service teachers' perceptions of teaching Black and Latina/o high school students, the responses on the post-course survey were mixed. In response to the question, "Did this course influence your perception of teaching students who are Black or Latina/o?" Naomi reflected:

> This course had allowed me to see that urban students (such as the African American or Latino students that we had worked with) are more appreciative of teachers who care and take the time out to put work into their lessons. In fact, they had seemed more appreciative of suburban students who have a tendency to take things for granted.

Furthermore, Naomi commented on her professional willingness to someday teach in a similar setting:

> I originally was completely against teaching "at-risk" students. I thought I was not capable. But now I have become more open to the option after being exposed to a more urban setting.

This statement is significant because it suggests that her exposure to an urban teaching environment, while different from her own pre-K–12 school experiences, provided her with a positive experience that she would otherwise not have considered or pursued. Perhaps one way to aid in the recruitment of more qualified mathematics teachers to teach in urban schools is to provide pre-service teachers with authentic and meaningful teaching experiences with minority students in college courses with field-based teaching components. Furthermore, we suggest that these courses explicitly address issues of race and culture as they pertain the teaching of mathematics.

Contrarily, on the same question regarding perceptions of teaching students who are Black or Latina/o, Ruth responded:

> All the students seemed the same to me…students in need of extra help. There was really nothing different about these students from any other students that are slow in math. Math can be a difficult subject and some students *get it* more readily than oth-

> ers. …This course taught me how to assist students in need whether they are Latino, African American, or anything else does not matter.

This response suggests that Ruth did not seem to perceive a distinction between the culture of Black and Latina/o students and the culture of White students. Instead, the Black and Latina/o students' mathematics difficulties appear to be based on culturally neutral mathematical ability. This idea of neutrality is in contrast to the idea that mathematical difficulty may be related to a curriculum or pedagogy that lacks cultural relevance to students, as suggested in the course readings and class discussions.

Morrison, on the other hand, responded somewhat differently to the same question:

> More than influencing my perception of working with the African Americans or Latinos, I gained a higher respect of each of these students with their continued devotions each and every week.

This statement may suggestion that Morrison questioned Black and Latina/o students' fidelity towards academics prior to this course.

In the fall semester, after student teaching, Morrison began teaching middle school mathematics in Hawaii. In a telephone conversation, Morrison expressed his amazement of the educational "plight" of the indigenous Hawaiian students in comparison to their Chinese, Japanese, and White counterparts in the same school system and how the administration seemed to be apathetic about this situation. Because Morrison was "amazed" at the plight of native Hawaiians, we assume that until this realization, Morrison understood the concept of "at-risk" to be relative only to Black and Latino/a students. Based on this assumption about Morrison, we believe that other S-CPM methods courses should, through a broader list of required readings, extend the notion of educational disenfranchisement beyond Black and Latina/o students. Prospective teachers of mathematics need to see the system of educational disenfranchisement in a world perspective.

Discussion

An investigation of the use of a culturally pragmatic framework for mathematics education methods courses and field experiences is a multifaceted affair and has important implications regarding teaching mathematics at the middle and secondary levels. To maximize the learning experiences of pre-service teachers of mathematics in regards to sound mathematics content and culturally relevant pedagogy, the S-CPM methods course provided pre-service teachers with learning experiences that closely linked their course readings and discussions with actual teaching experiences. One limitation of this current discussion, however, is the

limited number of pre-service teachers; only three of the five completed the post-course survey. Of particular interest would have been the responses of Roslyn and Demi, both White females students in their early 20s, a common demographic of the pre-service teachers at the university.

Nevertheless, course readings with an explicit focus on issues pertaining to race and culture in mathematics education appeared to provided a perspective that allowed the pre-service teachers to critically consider issues of race and culture that exist outside of their own experiences. However, the manner in which the pre-service teachers applied this multi-cultural perspective in their field-based teaching experience was not as prominent as one would have hoped. As a point of improvement for a future S-CPM methods course, there needs to be a more explicit emphasis on the use of culturally relevant pedagogy. For example, one issue was that the pre-service teachers' preoccupation with teaching mathematics lessons took their focus off considerations regarding a better understanding of their high school students' cultures. One way to address this issue is to implement an activity in which the pre-service teachers interact with students in non-mathematical tasks. Rather than mathematics, this interaction would be focused on understanding exactly who the students are.

Generally speaking, mathematics teacher educators must explicitly confront issues of race and culture in mathematic methods courses. Regardless of their race and culture, or their own comfort level with such issues, they must recognize the need to expose pre-service teachers to critical literature to assists them in reflecting critically on their field experiences. Not only should pre-service teachers be exposed to the literature regarding race and culture but also, when possible, they should be given opportunities to teach student populations reflected in the equity literature. Given the increasing racial and cultural diversity in public schools, notions of mathematics pedagogical content knowledge as somehow culturally neutral knowledge should be confronted not only by expanding the literature base in mathematics methods courses but also by expanding the racial and cultural diversity of pre-service teachers' field experiences.

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