

Promoting Culturally Responsive Teaching through Action Research in a Mathematics Methods Course

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Abstract

Culturally responsive pedagogy is one way that teacher educators and teachers can address the unique sociocultural and cognitive needs of learners from diverse backgrounds while shifting away from traditional school practices and mathematics teaching methods. This article describes a teacher educator's inquiry project that aimed to encourage and enhance culturally responsive thoughts, discussions, understandings, and actions among pre-service mathematics teachers in a mathematics methods course for elementary school teachers. Results show that in constructing meaningful in and out of class experiences that focus explicitly on culture, pre-service teacher understandings of culturally responsive mathematics teaching are enhanced and deepened.

Introduction

As an educator, it is difficult and crystallizing to be objective about inequitable discrepancies that still exist in our schools and classrooms. It is undeniable, however, that students of color are experiencing continued struggles in instructive settings.

Overall, the number of students of color in American schools is rapidly increasing (NCES, 2009) while rates of achievement among these students have reached critically low levels (Lee, 2006).

Existing research signifies that student achievement can increase when teachers utilize critical knowledge about students' backgrounds in classroom instruction (Gay, 2010; Nieto, 2010; Sheets, 2005; Howard, 2006). This foundational theory that culture plays a significant role in teaching and learning is becoming increasingly important as the student body in America continues to diversify (currently over 40% of students are non-

white) while the teaching force continues to maintain homogeneity, hovering around 83%

white (National Center for Education Statistics [NCES], 2008). These statistics highlight cultural incongruities, which are evidenced by staggering achievement gaps that continue to exist between students of color and their white counterparts (NCES, 2009), that often exist between students and teachers, especially in mathematics.

Ultimately, statistics show that students who perform from a European frame of reference outperform students who do not in mathematics (NCES, 2009). Traditional practices, in fact, are so engrained in the everyday complexities of mathematics teaching that such systems become “normal”, keeping many teachers from recognizing the “critical connection between culture and schooling” (Sheets, 2005, p. 3) and the strong ties between culture and cognition. As mathematics teacher educators, it is imperative that we encourage educators to recognize these links while gaining new insights into their own beliefs and norms that might drive pedagogical decisions. Moreover, in allowing and encouraging our students to discuss uncomfortable realities that exist in today’s society and schools (Tatum, 1997), we arm them with ideas and tools that might help them to work equitably with different types of students.

Culturally responsive teaching (CRT; Gay, 2000) provides a framework within which such action can occur, as the needs of diverse groups of learners are at the forefront. Further, in the classroom, culturally responsive teachers provide a tangible (rather than theoretical) model for pre-service teachers, explicitly embracing diversity and using it as a means for growth and learning (Nieto, 2002). In providing pre-service teachers with such frameworks and models, mathematics teacher educators can more readily illustrate how to “[use] students' culture in order to maintain it and to transcend the negative effects of the dominant culture” (Ladson-Billings, 1994, p. 17). Thus, we

(two mathematics teacher educators) embarked on an inquiry of our mathematics methods course, hoping to increase our pre-service teachers' culturally responsive propensities in the context of mathematics.

Several working programs that aim to prepare teachers for diversity, such as the Center for Urban Learning/Teaching and Urban Research in Education and Schools (CULTURES; Irvine, 2003) and the Teach for Diversity Program (TFD; Ladson-Billings, 2001) have been discussed in the literature. These are exemplary examples of entire programs devoted to the preparation of culturally responsive teachers. We support these efforts and have readily gleaned ideas from these programs; however, similar programs do not exist at our institution. Therefore, this is a discussion of our first attempt to incorporate culturally responsive mathematics practices in our K-6 mathematics methods course (which exists within a largely traditional mathematics education program) to encourage culturally responsive thoughts, discussions, and actions among pre-service mathematics teachers. This inquiry into our own teaching methods provided great insights; we will note what worked, what did not work, and what we can do in the future to encourage cultural responsiveness in mathematics instruction. We feel that this discussion is important in learning about the beginnings of culturally based programs.

The Setting

At the time of this study, we (two white, middle class females) were beginning to explore issues of diversity and equity in our own teaching, and were becoming more critical of social structures that exist in schools and universities. We were seeing many inequitable institutional and systemic perceptions and practices among our pre-service teachers, and sought to change the discourse in our classroom to challenge such beliefs.

We also hoped to capitalize on the fact that the majority of our students each semester shared our cultural background. While this homogeneity is a drawback in that perspectives in the classroom are limited, we recognized that we could not immediately change our enrollment, and committed to use our shared cultural views as an opportunity to connect with students through uncomfortable conversations about histories, perceptions, and practice. Our desire was to use these connections to push students' thinking about diversity and equity in mathematics education, ultimately impacting their future practice as elementary school mathematics teachers.

We believe that mathematics teacher education is a challenging, complex, and fascinating field. Mathematics anxiety, negative feelings about mathematics, and resistance are common self-reported issues among the pre-service elementary school teachers with whom we work. These novice educators are required to take our mathematics methods course during their fourth year of undergraduate work. Often, their discomfort with mathematics content is obvious, and they report that they are not yet comfortable teaching mathematics content in pedagogically and developmentally sound ways. Further, our course is not coupled with a field placement, making in-class experiences the sole basis of the student experience.

When students come to us, they have already had several experiences with children of color and children in high poverty situations. For example, during a student's sophomore year, he or she is required to work with and mentor one student who lives in and attends school in a high-poverty area. This interaction is largely individual, with the pre-service teacher traveling to meet with the student for various activities. Further, prior coursework for pre-service teachers included aspects of social justice and CRT in a

general context, though such information is somewhat piecemeal. Moreover, most of our students had not yet had the opportunity to explore CRT in a mathematics or other classroom situation in the midst of teaching.

Over several semesters of teaching this course, we noticed that many students had general conceptions of CRT, but did not apply these understandings to lesson plans, peer teaching activities, or other written assignments. Rather, they viewed content and CRT separately from instructional planning and implementation, and would simply add culturally-based modifications onto traditional lesson plans. As such, we wanted to provide opportunities for students to integrate CRT into mathematics teaching while exploring issues of social justice. Ultimately, our inquiry was driven by this desire to change students' perspectives about equity and CRT in the context of mathematics over one semester.

Pre-service teachers at our institution report themselves to be largely female and white. This is certainly not a steadfast rule, but is the main population with whom we have worked. On average, our courses contain 25 – 30 students, about 85 - 90% of who fit this profile. While conducting this inquiry, each of us taught one section of the course. In section A, 93% of students were white females, and 7% of students were African American females. In section B, 96% of students were white females, 2% were white males, and 2% were African American females. Socioeconomically, 98% of our students reported that they identify as members of the middle class no matter what their race. With very few exceptions, our population of students is not diverse.

Integrating Culture into Mathematics Methods

We wanted to incorporate several different types of experiences into our course that

would build awareness of the need for CRT in mathematics, and simultaneously provide opportunities to explore pedagogical responses to such issues in the context of the mathematics classroom. Our research was guided by the following questions:

1. Do our students come to our mathematics methods course with prior knowledge of CRT and social justice?
2. Do the culturally based experiences that we have constructed affect this knowledge base in any way?
3. What, if any, changes in student discourse about CRT occur over the course of one semester in our mathematics methods course?

In an effort to answer these questions, we collaboratively designed a pre- and post-survey, and a series of ongoing experiences that we believed would require that students focus explicitly on equity issues in the context of mathematics. These experiences included critical journaling, video analyses, attendance at cultural events, in-class discussions, selected critical readings, and modeling. The pre- and post-surveys were used to gauge the extent to which individual student perspectives changed over the course of the semester.

In order to provide a clear picture of this process, each experience will be discussed separately (except for selected readings, as these are self-explanatory and occurred on a continuous basis). It is important to note, however, that these events were integrated holistically and overlapped continuously. For example, students may have been asked to journal about a video clip or to comment in class on a reading. Thus, students' engagement in these activities was not distinct; rather, it was integrated and intense.

Pre-survey

During the first week of the semester we wanted to ensure that our culturally based activities were situated appropriately, and we hoped to get a more specific idea of who our students were as a whole. In order to gain information about students' prior knowledge and experiences, we designed several written activities for the first day of class. First, we administered a pre-survey (see Appendix I) to gather information about students' perspectives on educational strategies, the influence of culture in the classroom, and student learning in general. Further, in a separate assignment, we asked students to write about their prior educational, mathematical, and cultural experiences. This gave us a good starting point from which to implement our culturally relevant strategies.

We found that student responses on the pre-survey showed a basic understanding CRT, but with a superficial overtone. For example, a common response to question two was, "teachers should acknowledge all students' cultures." While this may be true, there is little substance to the statement alone, and no implication that social action should be an integral part of teaching diverse learners. Another student said, "I plan to do a lesson each month on a different culture." While this shows awareness of the issue of culture in the classroom, the respondent fails to realize that by giving a culture a special month, he or she is further marginalizing the group in question. Overall, we got a sense that most of our students had an 'us - them' mentality; "others" should be acknowledged, but perhaps not fully integrated into a classroom.

Students also showed a disengagement from sociopolitical issues that surround CRT. Again, there was an awareness of school and home culture, but students did not see this as a tool through which to teach. Rather, they worried, that "certain practices in our culture...may not be welcome in other cultures that just send their kids to school and

expect the teachers to handle everything.” Further, “some families don’t value education so...the child doesn’t do well in school.” Our goal was to help these future teachers address these issues so that cultural diversity in the mathematics classroom is an asset instead of a burden.

Journaling

Students engaged in two overlapping levels of journaling – group and individual. Group journals were completed online on a weekly basis. Using a discussion board, each student was required to respond to a prompt posted by the teacher (see Appendix II for sample journal prompts). Since we incorporated cultural issues into our lessons throughout the semester, we mainly crafted prompts that required that students reflect on class discussions or readings that may have caused discomfort. We also encouraged students to use the discussion board collaboratively, thinking “aloud” about new ideas relating to CRT in an informal way.

In addition to posting a response each week, students were asked to log in before class and read other students’ replies and responses. In requiring this, we were able to discuss responses and conversations of note in class. We wish to note that responses were short and tentative at the beginning of the semester, yet over time students began to engage in substantive online discussions, and many students often became so engaged in the discussion that they began posting numerous times each week. Other students did not fully engage, viewing the online discussions simply as another weekly assignment, but most students seemed to benefit from group journaling.

Students were also asked to journal independently throughout the semester. In order to allow students freedom to express honest thoughts without judgment, the

instructors only read selected entries. Generally, students were asked to reflect on class discussions or readings during sessions that occurred at the end of the class period.

Overall, the individual journals proved to be fruitful data for the researchers, though some students did not choose to reflect unless the entry was being collected.

Class Discussions

Class discussions seemed to fuel and supplement the journaling process. Over time, these two activities became continuations of one another. While most in-class discussions were deliberate and structured, students were encouraged to speak freely and openly. To encourage discourse, the instructor would periodically interject an opinion or common perception to stir up the conversation. Over time, the instructors became less and less involved, allowing students to determine the tone and direction of the discussion.

Modeling and Video Analysis

For our purposes in this project, we modeled culturally responsive mathematics instruction in two ways. First, we showed videotape of a culturally responsive mathematics teacher who was well known in our geographical area. The videos were created through a research project involving a fifth grade elementary school teacher, Ms. Foster*, with whom we had been working for two years. During that time, our team of researchers videotaped her teaching at different points in the school year.

Ms. Foster worked with a largely African-American, high poverty population. Her students, despite “at risk” labels and previous failures on standardized tests, were extremely successful mathematicians as evidenced by state standardized tests, success rates in higher grades, and other qualitative analyses. Thus, we viewed her methods as a

* A pseudonym has been used
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model of exemplary culturally responsive mathematics instruction. In specific, Ms. Foster's instruction was guided largely by student interests. She consistently used chants, rhythm, repetition, storytelling, music, and movement in her classroom. Furthermore, her involvement in the community had an impact on the children she taught.

Ms. Foster truly embodied culturally responsive mathematics teaching.

As a class, we deconstructed Ms. Foster's methods, discussed ways in which her ideas could be used in elementary school classrooms, and why such instruction is important. Notably, the conversations that ensued among our students after a viewing of the video were extremely fruitful and profound. Secondly, we as the instructors of the course practiced what we preached. That is, we used the somewhat limited diversity in our own student population as a vehicle through which significant mathematics learning could take place.

Cultural Events

Another component of our course required each student to attend a cultural event of his or her choosing (see Appendix III for an outline of the assignment). The most important piece of this experience was the writing component. It was there that students were required to reflect on the event, compare it to their own cultural experiences, and discuss implications for their classroom. We found that many students gained insight into a culture other than their own through attending these events. We were impressed with the level of reflection that was evident in most student papers, and many of these reflections became topics of class discussion. The following are examples of events that students attended:

- Gay/Lesbian Pride Week Events

- Ramadan services at the Muslim student center
- Churches that are different from the one in which they were brought up
- A study abroad experience in South Africa
- Community picnics in high-poverty areas

Results

On the last day of class, we asked students to complete the same survey that was administered at the beginning of the semester. Overall, we saw some progressive thoughts emerge about teaching mathematics to diverse children and children living in poverty at the end of the semester. Using domain analysis, we grouped these responses into three major categories that are illustrative of students' depths of understanding about culture and mathematics: shared responsibility, a more sophisticated view of the role of culture, and continuous integration of culture into schools.

Shared Responsibility

The most common category of response related to views of community practice as an integral part of education. The "us-them" mentality we encountered at the beginning of the semester had morphed into an "us and them" attitude, with many students viewing cultural diversity and communication with the community as benefits (rather than struggles they had to overcome) in the classroom.

While some distinctive discourse was still present, most notably with respect to race and class, we considered the overall response pattern to be indicative of progress. For example, one student stated that "by having open communication teachers, students, and parents can all work together for the benefit of the child." Further, students saw their own role in a more progressive way, stating that "teachers must address their own

stereotypes and expectations for certain students before they can provide them with a quality education.” This ownership and sense of shared responsibility is in distinct opposition to the attitudes reported at the beginning of the semester.

Sophistication of Cultural Understandings

The discussions about culture in our classrooms grew more sophisticated as the semester came to a close. Students began to recognize that home culture and school culture are often incongruous. Moreover, we saw an increased awareness of sociopolitical issues surrounding culture and their impact on schools and classrooms. One student suggested that “[the achievement gap] exists because of the determining factors of each group. Limited English proficiency for Hispanic/Latino students, for instance, places these students at a disadvantage in school” and “students that live in poverty level neighborhoods are more likely to attend poor and under-funded-schools [sic] and thus are at a disadvantage as well.” This type of response puts more responsibility on the system that has wronged the student rather than on the student himself.

Continuous Integration of Culture in Academics

Our students seemed to gain a sense of the integration that is necessary when using culturally responsive techniques. For instance, “...it is important to have a multicultural curriculum, not just celebrations and foods.” Also, “it is important to use multicultural curricula and instruction practices... multicultural literature and awareness of social issues and concerns should be addressed as such.” Thus, students recognize that culture should be utilized as a tool in instruction through which tremendous multicultural growth is possible. Further, students indicated that cultural contexts should infuse and alter all

aspects of classroom practice, and should not be treated as supplementary material.

Discussion

We felt that significant progress was made in our classrooms with regards to culturally responsive mathematics instruction. It is important to note, however, that we treated this semester as a true inquiry and not a scientific experiment. In other words, we were not expecting to see a profound transformation that we could attribute to our course; rather, we wanted to make our pre-service teachers aware of cultural issues with which they will come in contact. The building of these experiences, then, was our first attempt at bringing these issues to the forefront of all that our students do.

There were several other limitations that should be noted. First, it was difficult for us to know if our pre-service teachers were truly thinking differently and critically about marginalized students or if they were simply saying and writing what they thought we wanted to hear. Further, it is impossible to determine if any of these experiences will transfer into the classroom and ultimately transform their teaching. This is especially relevant since we were providing these experiences in an academic setting rather than in a classroom or field experience; theory may not always translate easily into practice. It is possible that when these students begin teaching, learning to teach and survival will be so consuming, that cultural considerations will become less important. It would be helpful for our students to have a field placement as a part of our course so that some of these ideas could be tried out in a safe, supportive environment. Culturally responsive mentor teachers would also greatly benefit our students. Moreover, we believe that the transformations would be more profound if all teacher educators across our program adopted similar strategies.

Though we may not be able to solve any major social problems in one course in one semester, we did find that incorporating these experiences into our coursework was beneficial to our pre-service teachers. Further, we encourage other mathematics teacher educators to develop similar experiences with similar goals in mind. We believe that our students now have some ideas about the role that culture plays in the classroom, and have had some difficult, important discussions about sociopolitical issues in schools. In starting such conversations with our students, we can help them to be successful mathematics educators in diverse classrooms.

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Appendix I - Pre-survey

Please answer each question briefly on a separate sheet of paper.

This is for my information only. THERE ARE NO RIGHT OR WRONG ANSWERS.

- 1) Many student attributes contribute to student learning in the classroom. What do you feel are the most important of these things? How do they contribute to student learning? Briefly discuss your answer.
- 2) What role do you think that culture plays in the classroom? How might this affect student learning?
- 3) What types of specific practices can you use as a teacher to make sure that you are respecting and encouraging learning through student cultures in your classroom?

Appendix II - Sample Journal Prompts

1. Briefly discuss and describe the overall cultures of the schools that you attended (elementary, middle, high schools) before college. Include information pertaining to demographics, socioeconomic status, social cliques, and other influences that you feel were important in shaping your experience. What effect did the schools' cultures have on your own educational and social formation and development?
2. Using the internet and what you might already know, see what you can find out about culturally responsive teaching. What is it? How is it helpful/useful to educators and students? What ideas might you have for instruction that are culturally responsive?
3. Think about the positive and negative aspects of homogeneous grouping/tracking. Do you think that tracking is beneficial? Do you think that there is value in heterogeneous grouping? Why or why not? Defend your position.
4. Do short-term cultural celebrations (such as Black History Month) help or hinder the promotion of equity in schools? Defend your position.

Appendix III - Cultural Event Paper Assignment

Opening Your Cultural Eye

1. Attend a cultural event of your choosing. The event should be something that you would not normally experience in your own culture. For example, if you are Christian and go to a Jewish service (or vice versa), that would work. However, going to the Krishna lunch on campus might not be enough because of the very limited interaction that is required.
2. Write an essay (2-3 pages, double-spaced) in which you address the following points:
 - a. Describe the event you attended.
 - b. Describe a comparable event you have experienced in your own culture.
 - c. Compare and contrast the two events.
 - d. Discuss the educational value of this experience (e.g., as an educator, how do you feel that attending a cultural event will help your practice?)
 - e. Any other ideas of relevance that you feel are important.