AFFORDANCES OF THE CULTURAL INQUIRY PROCESS IN BUILDING SECONDARY MATHEMATICS TEACHERS' CAPACITY FOR CULTURAL RESPONSIVENESS

Frieda Parker
University of Northern Colorado
frieda.parker@unco.edu

Tonya Bartell
Michigan State University
tbartell@msu.edu

Jodie D. Novak
University of Northern Colorado
jodie.novak@unco.edu

Over the last couple of decades, there has been a growing call for teachers to become more responsive to the increasing cultural diversity of students as a means of improving students' experiences in school and their learning outcomes. Challenges exist in working with secondary mathematics teachers due to the common belief that math is culture-free and the lack of images of culturally responsive teaching in secondary mathematics classrooms. In this research, we explored the affordances of the Cultural Inquiry Process project in building inservice secondary mathematics teachers' capacity for cultural responsiveness.

Keywords: Equity and Diversity, Teacher Beliefs, Teacher Education-Inservice/Professional Development

Over the last couple of decades, there has been a growing call for teachers to become more responsive to the increasing cultural diversity of students as a means of improving students' experiences in school and their learning outcomes (Banks, 2001; Gay, 2010; Nieto, 2004). Studying culturally responsive teaching specifically within secondary mathematics education is important because mathematics education is its own cultural system (Nasir, Hand, & Taylor, 2008) and understanding that system is necessary for the types of awareness teachers need to be culturally responsive. In addition, supporting secondary mathematics teachers to be culturally responsive holds particular challenges. Mathematics is often seen as "culture-free" (Bishop, 1988), which can make the role of culture in the teaching and learning of mathematics more difficult to envision, especially as compared to language arts and social studies content. Related to this, there are few images of what culturally responsive teaching looks like in mathematics classrooms (Leonard, Napp, & Adeleke, 2009), which may contribute to the struggles mathematics teachers have in operationalizing cultural responsiveness in their practice (Morrison, Robbins, & Rose, 2008). Furthermore, secondary students often have particularly negative attitudes towards and low engagement with mathematics (Nardi & Steward, 2003), which can make it more challenging for teachers to interest students in the content.

In this study, we explored the nature of teachers' perspective changes that resulted from their completion of the Cultural Inquiry Process (Jacob, Johnson, Finley, Gurski, & Lavine 1996) project. The goals of the study were to describe teachers' perspective changes, relate these changes to how the teachers engaged with their CIP project, and analyze how this engagement may reflect a process of learning to be culturally responsive.

Rationale for Implementing the CIP Project

The purpose of the CIP project is "to broaden teachers' understanding of culturally diverse students and to maximize these students' success" (Jacob et al., 1996, p. 30). In the CIP project, teachers select a student whose behavior is puzzling, hypothesize potential cultural influences on the student, gather information about the student, design an intervention to support the student, and evaluate the intervention outcomes. Once the project is completed, the teacher turns in a report describing their work and reflecting on the experience.

We chose to use the CIP project with teachers because it is a form of action research. Action research has generally been established as a viable means of supporting teachers in improving their practice, understanding better themselves and their students, and developing dispositions to continue

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studying their practice (Zeichner, 1993). Also, because action research is situated in the teacher's setting, teachers can generate images of what a particular change looks like. Furthermore, action research can support teachers in co-developing their beliefs and practices. While debate exists whether to prioritize building teachers' beliefs or behaviors, Gay (2010) argues that, "The more important issue is that examining beliefs and attitudes about cultural diversity, *along with* developing cognitive knowledge and pedagogical skills, are included as essential elements of teacher education" (p. 151).

Besides being a form of action research, we valued the CIP focus on exploring cultural influences on students' engagement in school. Jacob suggests that teachers in the United States tend to develop tacit knowledge of students in terms of psychology, thus leaving teachers less equipped to understand students in terms of culture. The goal of the CIP project is to "provide teachers with new ideas and approaches they can use in the future in culturally diverse classrooms" (Jacob et al., 1996, p. 32). We also valued the CIP's focus on specific students, which as Jacob et al. (1996) argue, provides an opportunity for teachers to consider culture at a personal level rather than relying on cultural generalities. Lastly, we appreciated the CIP website (http://cehdclass.gmu.edu/cip/g/gs/gs-top.htm) created by Jacob to support teachers in conducting the CIP.

Theoretical Perspectives

We drew on two theoretical perspectives for our research.

Cultural Responsiveness

In order to analyze the degree to which teachers' perspective changes aligned with being culturally responsive, we used a framework we developed in related research (Parker, Bartell, & Novak, 2015). We view cultural responsiveness as dispositions grounded in cultural awareness to work to know, understand and support the engagement and learning of all students. Culturally responsive teachers, then, work to understand students' cultures and backgrounds and using such knowledge to support students' learning and cultural competence. Additionally, these teachers develop supportive student-teacher relationships based on culturally responsive care, have positive attitudes toward students' knowledge and experiences (i.e., reject deficit perspectives), and hold high expectations for student learning and achievement.

Critical Perspective

Another disposition scholars have identified as important to cultural responsiveness is being able and willing to employ a critical perspective to surface, question, and, when appropriate, change the normative beliefs and practices that may influence students' engagement and success in school (Bartolome, 2004; Valencia, 2010). Bartolome (2004) has described two aspects of this critical perspective: political clarity and ideological clarity. Political clarity includes being able to understand the influence of the broader culture, such as political, economic, and social variables, on subordinated students' academic performance. Ideological clarity includes being able to explore the ways in which one's own beliefs uncritically reflect those of the broader culture. With political and ideological clarity, teachers are able to understand the role of culture in creating a status quo and to make visible the beliefs and practices embedded in that status quo as a means of questioning how normative beliefs and practices may be limiting some students' access to school success.

In order to analyze how teachers' engagement with the CIP project might support teachers in developing cultural responsive dispositions, we analyzed the degree to which the teachers were able to surface, question, and ultimately change their beliefs and practices around normative practices when these practices appeared to be hindering students' success in school. We focused on examining how teachers critically examined the beliefs and practices related to their expectations for student behavior since perspective changes teachers described in their projects mostly related to their

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expectations of student behavior. This likely occurred because the project involved teachers selecting students about whom they were puzzled and this puzzlement invariably involved why students were not behaving in desirable ways, with "desirable" being a value embedded in school culture. Attending to student expectations is important because it is an aspect of school culture that commonly influence student success - particularly underserved students (Lane, Wehby, & Cooley, 2006; Valencia, 2010). To understand whether teachers were able to enact the process of exploring normative practices with respect to their influence on student success, our data analysis involved juxtaposing teachers' perspective changes with their self-described normative beliefs and practices related to their expectations for students' behavior. Finally, to understand the nature of the teachers' perspective changes, we analyzed the perspective changes against our framework for cultural responsiveness.

Data Collection and Analysis

The course that served as the context for this study was called *Culture in the Math Classroom* (CIMC). It was a required course that was part of a graduate program for practicing secondary mathematics teachers at a public doctoral-granting university in the Rocky Mountain region. The data we collected were 58 CIP projects submitted by teachers over four semesters of the CIMC course. The mathematics teaching experience of the teachers ranged from 2 to 22 years, with an average of 7 years. Almost all of the teachers identified as white. About 60% were women and 40% were men. The teachers taught in suburban or rural schools that typically had 27-35% minority students. Hispanic students were the largest minority group in most schools. The schools had 7-10% of students classified as English language learners and between 26-43% classified as low-socioeconomic status.

Our research questions were:

1. How did teachers' perspective shifts relate to their normative beliefs and practices about student expectations?
2. To what extent did the teachers' perspective shifts indicate a building of capacity to engage in culturally responsive pedagogy?

For data analysis, we drew on narrative inquiry, which is a set of tools and perspectives based on the idea that it is possible to explore how people make sense of their experiences through the stories they tell (Clandinin & Connelly, 2000). We chose narrative inquiry because 1) we wanted to understand teachers' perspective shifts in terms of their experiences conducting the CIP project and 2) the CIP project reports typically were written as stories.

The first step in analyzing the project was to identify projects with valid perspective changes. To do this, we included in the data analysis pool only those projects in which the teachers 1) followed the CIP project guidelines, 2) wrote reflections that appeared to align with their project activities, and 3) included in their reflections a description of a perspective change likely to influence their practice. Thirty of the 58 projects met all three of these criteria. The focus students in the 30 projects consisted of 12 girls and 18 boys. Four of the students were identified as white and in 12 cases, the student's race or ethnicity was not specified by the teacher, likely because the focus student was white. In 14 projects, the teachers identified their focus student as being of mixed race/ethnicity (N=3), Hispanic (N=8), African-American (N=1), or Native American (N=2).

The next step in the data analysis was to identify the student expectations the teachers' perspective changes related to. In 28 of the 30 projects, the teachers explored one or more of the following student expectations:

- Students should seek help if they are struggling (N=8).

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- Students should complete their homework (*N*=14).
- Students should engage in class discourse (*N*=8).
- Students should value learning mathematics (*N*=6).

For each student expectation, the set of projects involving this expectation were analyzed to discern the normative beliefs and practices the teachers associated with the expectation, the types of interventions the teachers implemented to address their focus student's behavior, and the nature of the perspective changes the teachers described.

Normative Beliefs and Practices about Student Expectations and Perspective Shifts

For each of the four normative student expectations we identified in the teachers' CIP projects, we illustrate the beliefs and practices associated with them by describing how the teachers identified the expectation, why they believed the expectation was important, and how they typically responded to students who did not comply with the expectation. We then describe the types of interventions the teachers implemented and the perspective shifts the teachers had with respect to the student expectation.

Students Should Seek Help if They Are Struggling

Eight projects focused on the expectation that students should seek help if they are struggling. Half of these teachers mentioned that they thought the struggling student should seek help because not seeking help was limiting the student's success. Seven of the teachers provided some indications of how they would normally respond to struggling students who did not actively seek help. Four teachers suggested they would have responded in a limited way. For example, one teacher said he would invite students in for assistance outside class, but if they did not take him up on his invitation, he would not pursue the issue further. Another teacher said she would help the student pass the course, but would not think more broadly in terms of getting the student support outside of class. Statements made by three teachers indicated they would not actively respond to the student. For example, one teacher wrote that initially he had assumed that his focus student did not care about learning. Another teacher wrote that at the outset of the project he did not know how to support shy, low-achieving students.

The intervention teachers often selected for their focus student involved additional tutoring outside class. Sometimes the teacher did the tutoring and sometimes another tutor was found. Another intervention was changing seating arrangements in class so the student was more comfortable talking to at least one classmate. Other interventions were particular to the focus student's needs. For example, one teacher wanted to build the focus student's confidence in discussing mathematics and arranged for the focus student to be a tutor.

Themes in the teachers' perspective shifts included 1) the teacher needed to be proactive in finding additional supports for the struggling student and 2) in order to provide appropriate supports, the teacher needed to communicate with the student to understand the student's perspectives, issues, and goals.

Students Should Complete their Homework

Students needing to complete their homework was addressed in almost half (*N*=14) of the analysis pool projects. Seven of these teachers focused exclusively on supporting their student to complete homework and another five teachers focused on homework as well as the student's participation in class discourse. Typically, homework completion, and sometimes correctness, was part of the course grade, so when students did not complete their homework, their course grade suffered. However, the teachers believed that doing homework improved a student's learning of the mathematics, and this in turn, affected how well students performed on assessments, which also

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affected the course grade. The majority of teachers (*N*=10) made statements suggesting they did not initially have a way of responding to students who do not complete their homework. Four of these teachers attributed a student not completing homework to characteristics of the student and/or their family.

Teachers created different types of interventions to support their focus student with completing homework. Six teachers focused on the student feeling more comfortable and successful in class, such as by interacting with the student more often. Four teachers focused on helping the student be more organized to know what the homework assignments were, when they were due, and what materials were needed. Two teachers found time for their student to start homework in school. Two teachers changed their homework policies to accommodate their students. One of these teachers decided to grade only the homework the student completed in class, as long as the student did well on assessments. The other teacher disallowed partial credit for late homework for the focus student as he admitted he postponed doing homework if he knew he had some leeway.

Teachers indicated that they learned that a student not completing homework was not necessarily because the student was lazy or did not value their learning, but instead may be due to psychological or logistical issues that could be addressed at school. One teacher found out his focus student had experienced a trauma the previous year for which she had kept silent and therefore had not received any support. Once that was addressed, her school engagement, including homework completion, improved. Besides the two teachers who elected to change their homework policy, two other teachers questioned how they were approaching what they assigned for homework and even the necessity of homework. While these teachers decided to retain homework in the short run, they indicated they thought that homework merited further consideration. Most of the other teachers indicated that they could influence a student's tendency to complete homework by building a better relationship with the student so that the student felt cared for by the teacher and so the teacher better understood the student's needs.

Students Should Engage in Classroom Discourse

Eight teachers expressed concern that their focus student did not engage appropriately in classroom discourse, such as contributing to whole class discussions or engaging productively with group members. Only one teacher focused exclusively on this normative expectation. Other teachers lumped this with one or more other behaviors, such as not completing homework. Two teachers described reasons for students to engage in classroom discourse other than it generally supporting student learning. One teacher explained that the curriculum she used included an expectation that students discuss their ideas with each other. The other teacher cited research that reported good social skills were valued by employers. The teacher believed that high school was a good time for students to develop these skills. None of the teachers indicated ways in which they would normally respond to students who did not engage in classroom discourse. One teacher noted, "As a staff we have focused on the students that are culturally different for more visual reasons (e.g., race, clothing, etc.) but we haven't focused on the other students who are culturally different for less obvious reasons such as beliefs about social interactions."

Teachers' interventions for addressing this normative expectation included redirecting off-task behavior, changing the student's seat assignment, assigning competence to the student (Horn, 2012), speaking directly with the student about what behavior is desired and why, providing positive reinforcement for the desired behavior, and developing a closer relationship with the student.

Teachers' reflections focused on what they had learned about their ability to influence the classroom culture, which in turn could influence student engagement.

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Students Should Value Learning Mathematics

Instead of focusing on the student's behaviors, six teachers ended up attempting to address their student's lack of interest in learning mathematics. In all but one case, the teachers' puzzlements were focused on their students' behaviors, but after speaking with their students during data collection, they decided to address their students' motivation to learn mathematics. These teachers did not provide much detail on why the students should value learning school mathematics, although, in the context of the project, there was an implicit assumption that students valuing learning mathematics would lead them to be more successful in class and even in completing high school. The teachers did not indicate they had particular ways of addressing their students' lack of interest in learning mathematics. One reason for this is captured in a teacher's question: "How do you reach a student who does not see value in mathematics?" which suggests readily available methods of approaching this issue were not known.

All of these teachers included as part or as the entirety of their intervention creating one or more lessons they believed incorporated context that would have more meaning for their focus student and possibly the class as a whole. In their project reflections, all six teachers indicated they felt more empowered to influence students' interest in mathematics by introducing context in their instruction that related better to students' lives.

Perspective Shifts and Cultural Responsiveness

The normative expectations teachers focused on in their projects were behaviors and attitudes teachers believed students should comply with to be successful in school. Teachers who reflected on their own beliefs and lived experiences found the normative expectations so obviously appropriate that they had a hard time imagining why someone would not follow them, except if the person were somehow "faulty," such as being lazy or not caring about their education. When the teachers attributed non-compliance to a student's inherent characteristics, the teachers typically did not feel able to address the mismatch between students' behaviors and what was expected of them.

While the teachers tended to focus on one, or at most two, of the four identified normative expectations of students, the teachers typically expressed perspective shifts in more general terms about how to approach supporting students. We found that overall, teachers' perspective shifts aligned with some aspect of the following narrative:

> I need to be proactive in knowing my students' backgrounds, perspectives on school, and goals. This process of knowing my students allows me to understand how to meet my students' needs and helps me to build better relationships with my students. Often, my assumptions about the student, such as that they do not care about their education or are lazy, are incorrect. Instead, school policies and the classroom culture can be negatively impacting students' engagement. Working on making the classroom a safe place, creating lessons that are meaningful to students, and implementing supports outside the classroom are within my power as a teacher.

No teacher expressed a perspective shift that encompassed the entirety of this narrative. However, most teachers emphasized one or two elements of the overall shift. This narrative contrasts with the teachers' normative beliefs and practices as it expresses:

- A stronger sense of responsibility for getting to know their students and responding to their needs
- An awareness that their assumptions about their students' perspectives and capabilities might not be accurate
- More self-confidence in their ability to design effective interventions for students

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- More open-mindedness in considering the need to change their practices or school policy to better support students

The perspective shifts indicated by the teachers suggest they built their capacity for being culturally responsive in that teachers were more willing to take up the work of understanding and supporting students, less likely to engage in deficit thinking, and more confident and open in their thinking about ways to support students' school engagement and achievement.

In terms of developing a critical perspective, the teachers in this study appeared to exhibit more ideological clarity than political clarity in that they questioned their personal normative beliefs and practices related to the expectations they held for students, but did not reflect on the influence of the broader school and societal cultures. This could be a function of the CIP project or the way it was facilitated. It could also be representative of the way in which people's cultural awareness evolves "from a self-centered state to identification with society and eventually to the larger global community" (McAllister & Irvine, p. 18, 2000).

Discussion

The nature of the perspective changes teachers expressed aligned with being culturally responsive in that teachers indicated an increased willingness and confidence in reaching out to, understanding, and supporting students they initially find puzzling. We cannot make definitive claims about what aspects of the CIP project might be responsible for the ways teachers engaged with and learned from the project, but we do believe that the project characteristics we identified in our rationale to implement the CIP are likely mechanisms. Another factor might have been teachers' propensity to be empathetic towards their students. Teachers sometimes wrote about their experiences with their students in moving and passionate ways. Goodman's (2000) research suggests that empathy is often one of the orientations that can move people from privileged groups to take action towards social justice. It is possible many of the teachers in the CIMC course had this orientation, which contributed to their engagement with and learning from the CIP project. Understanding what teachers may bring to the work of building cultural awareness can support teacher educators in conceptualizing teachers as "competent learners who bring rich resources to their learning" (Lowenstein, 2009, p. 187).

Additional factors may have influenced teacher engagement with the CIP project. First, during the project implementation, the instructors offered feedback to the teachers at several points, which may have also influenced teacher thinking. Second was their participation in the CIMC course. The course content and other activities may have supported the development of knowledge and skills that pre-disposed teachers to explore the role of culture more successfully than they would have otherwise. The beginning of the course delved into theoretical foundations by asking: What is culture? How can examining students' home culture influence their experiences at school? Is mathematics culture-free? What are the central tenets of culturally relevant pedagogy? The remainder of the course explored issues involving culture and student learning including student motivation, status and small group work, language in the classroom, the purpose of mathematics education, and teaching math for social justice. Teachers also completed projects analyzing case studies, exploring an aspect of their local community, and implementing a change in their instruction to improve student motivation.

A limitation of our work is that we did not follow the teachers into their schools and classrooms after they completed the course, so we cannot describe what teachers brought into their ongoing practice. An area of further exploration would be to explore the impacts on teachers' cultural awareness and cultural responsiveness in the projects where teachers did not indicate a perspective change. In half the projects, though, teachers' engagement with the CIP project indicated they created

experiences in their practice that modeled being culturally responsive and developed their own perceptions about how this would influence their practice going forward. The CIP project, then, appears to have affordances for building the capacity of secondary mathematics teachers for being culturally responsive.

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