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# Elementary Mathematics Teachers' Knowledge of Equity Pedagogy

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Currently, mathematics instruction in U.S. classrooms is far from achieving equity for African American students. This qualitative study reports the results of eight successful elementary mathematics teachers' knowledge of equity pedagogy, specifically their knowledge of culturally relevant pedagogy, cultural competence, and critical consciousness. Teachers' knowledge of equity pedagogy was examined using interview data. The results of this study revealed that successful mathematics teachers of African American students have knowledge of equity pedagogy. Implications for teacher preparation and professional development programs are discussed.

*Keywords*: equity pedagogy, African American students, elementary education

W. E. B. Du Bois, one of the founders of The National Association for the Advancement of Colored People (NAACP), envisioned that the education of African Americans would equip leaders to protect the political and social rights of the Black community. Furthermore, he wanted to make the "black people aware of the necessity of a constant struggle… [and] develop an Afro-American culture that would blend the African background of former slaves with American culture" (Spring, 2005, p. 226). Realizing Du Bois' vision requires more effective teacher education as well as support structures for teachers. Unfortunately, the majority of teachers are not fully equipped to educate a diverse population of students (Futrell, Gomez, & Bedden, 2003). Currently, in the best of circumstances we have mathematics teachers who have strong mathematical content knowledge and high levels of pedagogical content knowledge, yet African American students are still underperforming in mathematics (Martin, 2009). For example, according to the National Center for Education Statistics, 91% of eighth grade African American students perform below proficient in mathematics (Adams, 2008).

According to Irvine (2003), "Students fail in school not because their teachers do not know their content, but because their teachers cannot make connections between subject-area content and their students' existing mental schemes, prior knowledge, and cultural perspectives" (p. 47). Teaching with this level of sophistication requires specialized knowledge and skill in using instructional strategies. Further, Gay (2000) argues that, "decontextualizing teaching and learning from the ethnicities and cultures of students minimizes the chances that their achievement potential will ever be fully realized" (p. 23). Teachers have not had the opportunities to develop sufficient, specialized knowledge related to the ethnicities and cultures of students so that they are successful in mathematics.

Researchers have described different knowledge bases required for teaching including: knowledge of mathematics content, effective teaching strategies, the general characteristics of elementary students, typical student errors and misconceptions and how to deal with them (Ball, Hill, & Bass, 2005; Ma, 1999). Yet, limited research has involved understanding teacher knowledge related to equity in teaching mathematics to African American students.

The purpose of this article is to report the findings from a study of elementary teachers' knowledge as it relates to equity in the instruction of mathematics to African American students. The research question is:

What specific knowledge related to equity in teaching African American students do eight successful elementary mathematics teachers have?

I first discuss the review of literature and conceptual framework that guided the study. I then discuss the research methods and results. I conclude with a discussion and implications for teacher education and future research.

## Literature Review Related to Teaching African American Students

### Pedagogy Related to Equity

Malloy (2002) defines democratic education as a "process where teachers and students work collaboratively to reconstruct curriculum to include everyone" (p. 21). The democratic mathematics classroom incorporates problem-solving curricula, includes multiple instructional strategies that allow students access to engage in solving problems, provides students equal participation in decisions, and promotes equal encouragement for success. Malloy (2002) describes three benefits of democratic education in the mathematics classroom: inclusiveness, mathematics understanding, and application of mathematics to the problems in social justice and equity, where social justice involves developing sociopolitical consciousness, sense of agency, and positive social and cultural identities (Gutstein, 2003).

Bob Moses' Algebra Project (Moses & Cobb, 2001) addressed the need for mathematical literacy among African American students as a civil rights issue. In order to be effective and productive citizens in society, Moses believed that African Americans should have access and participate in Algebra. As a civil rights advocate, Moses expressed that by learning Algebra, African Americans would be able to take advantage of numerous opportunities. There is power in learning mathematics, and once students understand that power and how it can be applied to other situations outside the scope of "traditional mathematics" students are able to use their mathematical knowledge as a tool to help solve problems of the poor and powerless – for social justice and equity. Thus, in a democratic mathematics classroom students would think critically and use their mathematical knowledge to further understand and change society's social inequities.

Furthermore, Walker (1996) reports on the importance of teachers knowing their students' community and knowing how to talk to parents within the community to ensure success for all students. Not only were teachers instructed how to communicate with parents in the community, they were encouraged to become part of the community and make themselves known in the community. This made a positive difference in the lives of the African American students.

In addition, Ladson-Billings (1994) conducted a three-year, in-depth ethnographic study that examined the pedagogical practices of eight exemplary teachers. She asserted that teachers must engage in culturally relevant pedagogy that maintains and includes students' culture and moves beyond the negative effects of the dominant culture. Ladson-Billings does not offer a prescriptive list of instructional strategies teachers can use to become culturally relevant. Instead, she offers characteristics of teachers who practice culturally relevant methods.

However, some have argued that culturally relevant pedagogy seems like just "good teaching." But, situations arise in classrooms in which privileged students interact with African American students, (Esmonde, 2009), which affects teachers' pedagogical practices. For example, Malloy (2009) observed her student teacher teach a geometry honors class, which had 13 Caucasian, two Asian, one African American, and one student who was mixed race. The student teacher instructed the students to work in groups of two or three to complete the assigned activity. Everyone in the class had groups to work with, except the African American student. The teachers nor his classmates interacted with the African American student. After the lesson, Malloy asked the teachers about the African American student. They informed her that he was not on the same level as the other students in the honors class. Malloy immediately pointed out that the other students were working together, but the African American student had no one to help and support his learning, and they did not approach him to offer their support. The teachers were both shocked and embarrassed that they allowed this to happen. If we want African American students to succeed in mathematics, we need to better understand the necessary knowledge base related to equity in teaching African American students. Teachers must have knowledge about equity pedagogy specifically related to teaching African American students.

### Instructional Strategies

Typically, in "mixed populated schools" students are educated under a Eurocentric paradigm, in which teachers privilege white students and reprimand African American students, negatively affecting the educational experiences and resulting achievement of African American students (Parsons, 2005). Some instructional strategies implemented with African American students are based on direct instruction. For example, after the school board adopted the Discovering Mathematics curriculum in Seattle, WA, community members brought a lawsuit against the school district claiming that students of color do not learn mathematics best with inquiry-based curricula (Porter, McClaren, & Mass v. Seattle School District No. 1. Board of Directors of Seattle School District No. 1, & Maria Goodloe-Johnson, 2010). Instead, they can only learn and excel with a direct approach to instruction. They believed inquiry-based curriculum privileges a select few (i.e., the mathematically gifted). The judge ruled that there was insufficient evidence for a

board member to approve the Discovering Mathematics curriculum. However, direct instruction can deter African American students from high-level thinking and becoming effective problem solvers because the processes are explicitly explained to them. Society will continue to encourage African American students to be followers, rather than leaders, consequently, disempowering African American students. Haberman (1991) denotes this as "pedagogy of poverty." This pedagogy includes: "giving information, asking questions, giving directions, making assignments, monitoring seatwork, reviewing assignments, giving tests, reviewing tests, assigning homework, reviewing homework, settling disputes, punishing noncompliance, marking papers, and giving grades" (p. 291). This pedagogy of poverty is typical in schools with large populations of African American students. Although Evertson, Anderson, Anderson, and Brophy (1980) have shown that gains in urban students' achievement and attitudes toward mathematics were positively correlated with the time their junior high mathematics teachers spent lecturing/demonstrating, having class discussion, assigning a limited amount of seatwork, and asking both fact related questions (mostly fact) and higher cognitive questions that created opportunities for students to respond, Ladson-Billings (1994) argues effective teachers of African American students involves more than just these instructional practices.

Although direct instruction has been used to teach mathematics to African American students, Malloy (2009) investigates other instructional strategies that are effective in increasing African American students' mathematical understanding. In her study, Malloy uses both interviews and classroom observations to determine what instructional strategies and teachers' dispositions help middle grade African American students gain conceptual understanding in mathematics. Malloy argues African American students must be visible in the mathematics classroom, which is accomplished by grounding instructional strategies in the learning preferences of African American students and connecting cultural experiences and social justice in African American communities with opportunities to learn. Malloy reports that teachers' instructional practices include: reflecting on practice, building communities of learners, and giving students voice, which all highly correlate with Ladson-Billings' (1994) characteristics of culturally-relevant teachers. Successful teachers of African American students promote academic excellence and recognize students' cultural heritage.

## Conceptual Framework

Teachers must develop and draw from numerous knowledge bases to effectively teach mathematics to all their students. Several mathematics education researchers have studied knowledge for teaching over the past two decades (e.g., Carpenter, Fennema, Peterson, & Carey, 1988; Hill, Ball, & Schilling, 2008; Ma, 1999). Currently, the conceptualization and research related to the knowledge of equity has not been pursued. As a result, I developed a conceptual framework related to teachers' knowledge of equity issues, beliefs, and teacher's knowledge of equity pedagogy (Jackson, in review) based on a review of the literature (see Figure 1).

The conceptual framework outlines the critical components of teachers' knowledge of equity in teaching. It guided the design and implementation of a larger study (Jackson, 2010). In this article, I report the findings related to one component of the framework, teachers' knowledge of equity pedagogy.

On the left-hand side of the conceptual framework, I include three components within knowledge of equity pedagogy: culturally relevant teaching, cultural competence, and critical consciousness. Ladson-Billings (1994) defines culturally relevant teaching as a "pedagogy that empowers students intellectually, socially, emotionally, and politically by using cultural referents to impart knowledge, skills, and attitudes" (p. 17). Gay (2000) extends this definition by stating culturally responsive teaching is "using the culture knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning outcomes more relevant and effective for them" (p. 29). Culturally relevant/responsive teaching is designed to teach the "whole" child through acknowledging and addressing the child's race, language, ethnicity, and class through teaching. Students' "identities" are not ignored or subsumed in the deficit model of teaching and learning, but are contributors to the teaching and learning of students.

Cultural competence includes teachers' knowledge about their own culture and the role it has in their lives; knowledge of students' cultures; the necessity to study their students (Ladson-Billings, 2001); and the ability to communicate (both verbal and nonverbal), understand, and interact with people from different cultures. For example, a teacher of African American students may give a class a certain "look" to quiet them down. In the African American culture, adults generally use facial expressions and eye contact to discipline their children. However, this form of "discipline" is not effective with all African American children. Thus, it is important for the teacher to know the students and their background and not overgeneralize the use of specific approaches.

Critical consciousness engages both teachers and students to critically question, reflect, participate in meaning making, and act in their sociopolitical environment. Ladson-Billings (2001) suggests teachers who promote critical consciousness: (a) have knowledge of the larger sociopolitical context; (b) invest in students and understand students are important for who they are and who they can become; (c) plan and implement

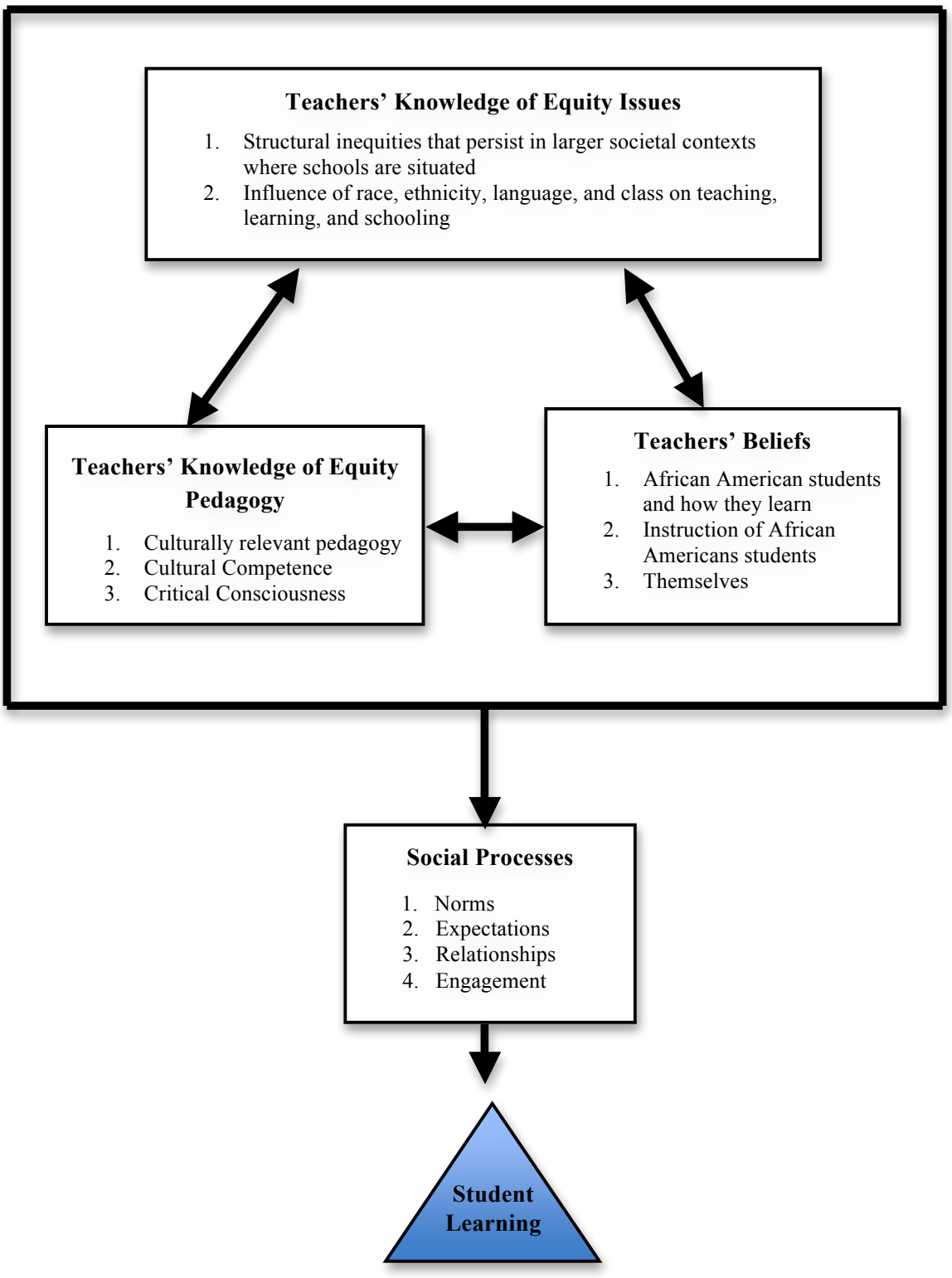


*Figure 1*. Knowledge of equity in teaching framework.

academic experiences that connect students to the larger social context; and (d) believe the success of students has consequences for their quality of life.

## Research Methods

### Participants

Eight successful elementary mathematics teachers from the Midwest participated in the study. I contacted school district administrators in three districts, Webster Public Schools, Khanna Public Schools, and Hartville Public Schools (all names of districts and people are pseudonyms) to identify participants who met the following criteria:

a. They teach mathematics in elementary school (grades 3-6).
b. Their mathematics class is composed of at least 20% African American students.
c. They have a minimum of 4 years of teaching experience.
d. They are recommended based on continuous gains in mathematics achievement of African American students over a three-year period on district and/or state assessments.
e. They are recommended by knowledgeable mathematics educators.

I met with district mathematics coordinators and superintendents to identify teachers whose African American students had high average achievement scores on district assessment (75% and above) and state tests. Once the pool of teachers were identified, they confirmed along with the building principals and a mathematics teacher educator who had experience facilitating professional development in the district that these teachers had a positive rapport with their African American students. Through their recommendations eight teachers agreed to participate. I provide more descriptive information about each participant in Table 1.

### Data Collection and Analysis

The primary data sources for all participants included two semi-structured interviews (Merriam, 1988), which allowed me to probe for additional ideas and/or clarification to establish a shared understanding of the

Table 1
*Participants*

| Teacher | Ethnicity | Grade Level Taught during Study | School District Context | Percent of African American Students Enrolled in District | Years Teaching Experience |
|---|---|---|---|---|---|
| Mrs. Lewis | Caucasian | Fifth | Webster School District, Public, Small City | 22.6% | 4 |
| Ms. Jenkins | Caucasian | Third | Webster School District, Public, Small City | 22.6% | 6 |
| Ms. Hale | Caucasian | Fourth | Webster School District, Public, Small City | 22.6% | 4 |
| Mrs. Knox | African American | Third | Khanna School District, Public, Urban | 99.2% | 11 |
| Mrs. Mitchell | African American | Sixth | Khanna School District, Public, Urban | 99.2% | 20 plus |
| Mrs. Savage | Caucasian | Fourth | Khanna School District, Public, Urban | 99.2% | 28 |
| Mrs. Jones | Caucasian | Third | Hartville School District, Public, Suburban | 68.1% | 12 |
| Mrs. Thomas | African American | Third | Hartville School District, Public, Suburban | 68.1% | 13 |

interview established a foundational understanding of the teachers' knowledge of equity pedagogy. After the first interview I recorded field notes to inform the design of my second interview, with the goal of gaining a deeper understanding of the teachers' knowledge of equity pedagogy (Strauss & Corbin, 1998). Sample interview questions include: (a) How would you describe an effective mathematics teacher of African American students? (b) You have been asked to give a presentation to your colleagues on what facilitates and hinders the success of African American students. What would you discuss? The time lapse between interviews was approximately 2 months. Each interview lasted approximately one hour.

After conducting audio-recorded interviews, I transcribed the data. The transcripts were coded using a microanalysis approach with nodes related to knowledge of equity pedagogy from the Knowledge of Equity in Teaching Framework. I analyzed the data using a data reduction approach (Miles & Huberman, 1994) along with a constant comparative method (Glaser, 1965). Using a constant comparative approach to data analysis, I compared incident to incident analyzing the data for similarities and differences (Charmaz, 2006). I used the coding categories shown in Table 2.

After the initial coding, other themes emerged. I then conducted a second layer of coding with these emerging themes. Two doctoral students each coded an interview transcript using the coding dictionary. All discrepancies were resolved and clarified.

I mapped out the teachers' knowledge of equity pedagogy. At this point, I looked for saturation in the data as I categorized the quotes. I then free coded the data to identify themes as the final stage of analysis. Reliability was confirmed with another faculty member.

## Results

The underlying theme of the Equity Principle in the Principles and Standards for School Mathematics (NCTM, 2000) is all students can learn mathematics. Unfortunately, many African American students are consistently demonstrating low mathematical achievement. Mathematics educators constantly discuss equity in the classroom, but do we know what knowledge teachers need to teach mathematics equitably to African American students? In this study, I report on eight successful elementary teachers' knowledge of equity

Table 2
*Coding Categories for Teachers' Knowledge of Equity Pedagogy*

| | |
|---|---|
| **Teachers' Knowledge of Equity Pedagogy** | • Culturally relevant pedagogy<br>  • View themselves as part of a community<br>  • Help students to make connections between their racial, Cultural, local, national, and global identities<br>  • Establish relationships with students that extend beyond the Classroom environment<br>  • Establish a community of learners<br>  • Believe knowledge is constantly recycled, re-created, and shared by students and themselves – it is not static<br>  • View teaching as students developing their knowledge<br>  • Use a variety of instructional strategies<br>• Cultural competence<br>  • Knowledge about their own culture and the role it has in their lives<br>  • Knowledge of students' cultures<br>  • Understand the necessity to *study their students*<br>  • Ability to communicate (both verbal and nonverbal), understands, and interacts with people from different cultures.<br>• Critical consciousness<br>  • Knowledge of the larger sociopolitical context<br>  • Invest in students and understand students are important for who they are and who they can become<br>  • Plan and implement academic experiences that connect students to the larger social context<br>  • Believe the success of students has consequences for their quality of life |

Table 3
*Teachers' Knowledge of Equity Pedagogy: Themes*

| Teachers' Knowledge of Equity Pedagogy | Themes |
|---|---|
| Culturally relevant pedagogy | Mathematics lessons must relate to African American students' lives and experiences. |
| | Teachers use a variety of instructional strategies |
| | Teachers establish a positive classroom community. |
| | Teachers establish relationships that extend beyond the classroom. |
| Cultural competence | Teachers adapt mathematics instruction to meet the cultural needs of African American students. |
| | Teachers identify with African American students. |
| Critical consciousness | Not only do teachers invest in African American students and have high expectations of them in the classroom, they have high expectations that extend beyond the classroom that influence their quality of life. |

pedagogy as it relates to teaching mathematics to African teachers' knowledge of equity pedagogy related to: (1) culturally relevant pedagogy, (2) cultural competence, and (3) critical consciousness. I summarize the themes for teachers' knowledge of equity pedagogy in Table 3.

**Culturally Relevant Pedagogy**

After analyzing the data for teachers' knowledge of culturally relevant pedagogy, the themes that emerged across participants were similar to the themes in Ladson-Billings (1994) study.

**Theme 1: Mathematics lessons must relate to African American students' lives and experiences.** Teachers must have knowledge of students' culture, lives, and experiences to make mathematical learning relevant (Malloy, 2009). Participants understand that relationships must precede instruction. If they do not take the time to establish positive relationships with their students, learning will not occur (Kunjufu, 2002). When establishing relationships, teachers cannot merely go through the motions because students know when teachers are genuine and really care about them. African American students must relate to the teacher and the teacher must relate to them. The teachers realize they must have a relationship before they can make mathematics lessons relevant to the students. They take the opportunity to know their students and discover their motivations and interests. They tailor their instruction with this knowledge.

During mathematics instruction, Mrs. Mitchell focuses on introducing the material to the students' on their level, and then takes them to the next level by connecting the mathematics to students' experiences. For example, Mrs. Mitchell has her students create a cookbook to help them develop an understanding of fractions. The students have to locate recipes to include in the cookbook and explain what they must do if their recipe indicates it will serve six, and they wanted to invite 18 people over for dinner. By having students complete activities that are relevant to them, Mrs. Mitchell knows her students will experience success. She comments, "If you come in as a low achiever, you'll go out as a high achiever, or believing that you can do it" (2nd Interview, 2009).

**Theme 2: Teachers use a variety of instructional strategies.** All the teachers stated they use a variety of instructional strategies to meet the needs of their students. Their pedagogy does not consist of a watered down curriculum and treating everyone the same because each of their students have different needs and skills. They implement strategies to improve and broaden students' mathematical knowledge. It would not be effective to use the same approach with all students, so the teachers implement different strategies so all students succeed and build their mathematical understanding. Mrs. Thomas remarks, "Sometimes, unfortunately, you can't get the students to learn the way that you want them to learn, but you have to find a way to make them successful" (2nd Interview, 2010). For example, Mrs. Jones asked her students to solve a mathematics word problem that involved Wanda and Jose, but her students had no idea how to work the problem. Mrs. Jones realized that Wanda and Jose meant nothing to her students, so she simply changed the names to the names of her students. As soon as she inserted her students' names, they were interested and were able to solve the problem. Mrs. Jones asserts teachers have to make it real for the students and change some of the items in the textbook.

Mrs. Mitchell recalls having a couple of students

In her mathematics class where no matter what she tried she could not get through to them. But, she did not give up. She eventually discovered that one of the boys was interested in aviation. So, instead of trying to instruct him from the textbook, Mrs. Mitchell focused several of her mathematics lessons around airplanes and aviation material. This made a dramatic difference in the little boy's understanding. From that point, the little boy was able to share his mathematical thinking from an aviation point of view. Mrs. Thomas understands that when she builds on her students' strengths and makes the mathematical content relevant, her students are successful. But, to accomplish this, she must know her students. Mrs. Thomas clarifies:

> I need to figure out you know what do they excel in? What do they do great in? I do that for every student. And so for the African American students, I need to figure out what gets them excited? Is it music, clapping, pictures, a funny joke, a story?...What can I do to make sure that Jayden is successful while I'm planning this lesson? What can I do to make sure that my Derrick is successful? He doesn't understand subtraction. So how will he understand this? So, in order for them to be successful, I have to see what they can do. You think of the child in mind. (2nd Interview, 2010)

When designing mathematics lessons with the child in mind, teachers continuously encourage all their students to become active learners. Students participate in hands-on activities and math workshops, play mathematical games, solve mathematical problems in at least two different ways, and explain their mathematical thinking.

Communication is important. Mrs. Mitchell sometimes has to direct good communication in her mathematics classroom. She emphasizes that her students use the correct mathematical language when they share their thinking. Mrs. Mitchell explains, "The mathematical language is very important. Sometimes we'll say you're using a five-dollar word. I need a 100-dollar word" (2nd Interview, 2009). For example, in a lesson on fractions Mrs. Mitchell emphasized she did not want her students saying the "top or bottom number." Instead, she wanted them to use numerator and denominator – the "100-dollar words." Additionally, Mrs. Thomas wants her students to feel comfortable enough to communicate their misunderstandings so she is able to help them.

All the teachers intentionally solve problems incorrectly and have students critically examine them and determine what was and was not correct. Mrs. Jones also uses this approach to help her students understand it is okay to make a mistake. They are in it together to help each other. When students share an incorrect answer, Ms. Hale lets them know she values their responses and appreciates their willingness to explain their thinking. She does not embarrass them in front of the class for their wrong answers, but she takes the time to inform them that they "missed this little part" in the problem. She wants them all to be successful.

**Theme 3: Teachers establish a positive classroom community.** All the teachers establish a community of learners in the classroom, and many see themselves as part of that community of building mathematical knowledge.

> We are a team, and with every team you have a coach and you have players. You are the players, and I am the coach. I am coming up with the plays that we are going to have and it's important for you to try to implement them to the best of your ability. (Mrs. Mitchell, 1st Interview, 2009)

The teachers see themselves and their students as a team working together. Consequently, during mathematics lessons the teachers allow students to work either in pairs or small groups. Students rarely work in isolation. If they understand a mathematical concept and their peers do not, they teach their peers the concept so they understand. All students are responsible for ensuring the success of other members in the classroom. African American students have a responsibility to themselves and the class. The teachers realize by having students work with others extends and deepens their mathematical knowledge and understanding.

Of course, all the teachers recognize creating a community of learners is based on their ability to establish relationships with their students. Mrs. Jones recalls having an African American boy whom she had a special relationship. She reports, "Everybody in the building did not like this kid" (2nd Interview, 2009). He was so negative. Whenever he was mad at the world, Mrs. Jones would just look at him, and he would start laughing. Her student teacher tried to treat him the same way, but it did not work. Her student teacher did not understand why this approach was not working. Mrs. Jones recalls her saying, "I don't understand what's going on? How come he does that to you, but he treats me like crap?" (2nd Interview, 2009) Mrs. Jones explained that you have to honestly build relationships with students. She further elaborated, "It's hard to build a good relationship if you're saying things that are making them shut down" (2nd Interview, 2009). Ms. Jenkins feels she has really gotten to know her African American students. She communicates and shows them that she is caring, interested, and supportive.

If students "fumble the ball," the teachers are careful not to embarrass students or make them look dumb in front of their peers. Instead, they take the time to pull students aside and have private conversations with them. Mrs. Mitchell notes she does not do this as a formality. She listens to her students because sometimes

students feel like people do not understand them. She then uses this information to help determine the child's strengths. She does not give up on the child because she says, "That person may be your best group leader" (1st Interview, 2009).

When the mathematics lessons do not go as anticipated, many of the teachers go home and reflect over the lesson. They contemplate, "Well, they probably didn't get it because I said it this way, so maybe I should try explaining it a different way" (Ms. Hale, 1st Interview, 2009). The teachers never "blame" the students. And when they are tempted to do so, they always refocus it back on themselves.

**Theme 4: Teachers establish relationships that extend beyond the classroom.** Many teachers have extended the relationships with their students beyond the classroom, and they acknowledge it makes a difference. For example, Mrs. Jones remembers an African American student she had who would not speak for about two years to anyone about anything of value. He noticed one of his peers handing Mrs. Jones a schedule of her ice-skating performances. As a result, he asked Mrs. Jones to attend one of his football games. Mrs. Jones went, and from that point the boy opened up and started communicating. Mrs. Knox tries to attend every event her students invite her to. She realizes it makes a difference. Mrs. Mitchell describes:

> There's nothing more exciting then to have a child, and I am just in sweat pants on a Saturday in the rain watching the game, and the child walk up and introduce me as his teacher to the coach…You know like I said, it's been fortunate that I've been able to attend some of the kid's games. They're so happy to see Ms. [Mitchell] there on a Saturday morning at 8:00, you know, out there with one eye open, one eye closed, but I'm there. And that makes a big difference because they then come back to school and say Ms. [Mitchell] came to my game, you know, it's okay. (1st Interview, 2009)

Similar to Stinson's (2009) results, teachers establish relationships with their African American students outside the classroom. Teachers invest quality time with their African American students, and they realize this makes a difference in the lives of their students, both emotionally and academically. As a result, when they are invited to one of their students' events, they make every effort to attend.

**Cultural Competence**

After analyzing the data for teachers' knowledge of cultural competence the following themes emerged across the participants:

**Theme 5: Teachers adapt mathematics instruction to meet the cultural needs of African American students.** African American students must be visible in the mathematics classroom (Malloy, 2009). The teachers pay attention to how African American students learn. They understand that some African American students are generally loud and like to talk. Thus, during mathematics instruction the teachers capitalize on the African American students' strengths by assigning them leadership roles. Additionally, teachers incorporate clapping, rhythm, and movement in their mathematics lessons because they understand African American students' culture. Mrs. Thomas allows her students to freely move around during instruction. These instructional approaches are similar to the ones reported by Peterek and Adams (2009) of a successful fifth grade mathematics teacher of African American students. The teachers understand educators cannot be so rigid in instruction and impose the Eurocentric style of teaching (i.e., stay in your seats, do not talk unless called upon) on African American students. Instead of the teachers imposing Eurocentric cultural values on African American students, they allow African American students to impose their cultural norms on them. For example, Mrs. Thomas contends that her African American students have "unique learning styles" (2nd Interview, 2010). She describes a student who constantly hears music when none is playing, and he likes to move. Mrs. Thomas realizes that if this boy is seated while she explains a mathematical concept, she loses him. As a result, she incorporates movement during her mathematics lessons. She describes:

> I try to incorporate, you know having the kids move around a lot and do a lot of clapping so they can try to remember the song or do something with rhythms to help them. I think that African American students, they participate more. They say, 'ooh this is fun.' They don't say, 'this is boring.'…So I think that one of the things that I know is they like to move around because I know I like it. (1st Interview, 2009)

Mrs. Thomas recalled teaching a multiplication lesson designed for students to sit at their desks and write items that come in twos, threes, fours, and all the way to twelve. Mrs. Thomas believed her students would have been bored and unmotivated completing this activity. As a result, she adapted the lesson so the students moved around from group to group identifying items that come in twos, threes, etc. She knew her students would be more engaged in the lesson with this change. She achieved the same goal as the original lesson, and she was able to get her students moving and they were more engaged as a result.

Many African American students like to stand, wiggle, move, shout out answers, and participate in call and response during mathematics lessons. The teachers adapted these characteristics in their instruction and have found that it positively facilitates the participation of their

African American students.

**Theme 6: Teachers identify with African American students.** Many of the African American teachers identify with their African American students. They adjust instruction for students because they personally relate to students. Mrs. Mitchell identifies with her students. As a result, she adjusts her instruction to capitalize on their strengths and personalities. She explains:

> I think as an African American I'm kind of able to understand my students a little bit more. Because sometimes we get loud, sometimes we like to talk, sometimes we like to move. And one of the things that I try to do is I try to focus in on that strength. Okay, you like to talk. Okay, you are going to be the reporter…or I give them those leadership roles…Depending on what their strength is, I try to key accordingly. (1st Interview, 2009)

Mrs. Thomas does not want her students to fail. She identifies with her African American students and seeks to find why they are not performing well in mathematics. She explains:

> African American students I look at it, I can't help it because I'm black. But, you know, I do look at the kids that are not doing well on tests. And if they are African American, then I need to know why they're not doing well because I look at them as if they're my kids also. If it's a situation where the African American students aren't doing well and the Caucasian students are doing well, then I have to think okay why is that…So, I look at it and then I see okay, is it because they're African American or is it because of other factors? (1st Interview, 2009)

Not only do the African American teachers identify with their African American students, Ms. Jenkins, a Caucasian teacher, experienced what it is like to be a minority to help her relate and understand her African American students. She explains:

> For me, as a Caucasian, I had to go into some situations where I was the minority. And it was so interesting for me because I have never felt that. You know you walk into a room, and I guess I didn't realize that you know because that's the way it always was for me growing up. In my elementary classes we had one or two African American students. That's how it always was for me, but to flip it and put it on the other side was an awesome experience. I think I like more of that because you know I felt like I didn't want to say anything. I just wanted to sit back. I was looking for someone else who looks like me. Instead of just getting to know someone. You know when I was put in a large group with me being the only Caucasian it's hard. I mean that's why I think I try, I try to think about, you know, how did I feel in that situation? Is that child feeling like that everyday? What can I do to help them feel like they fit in and you know just as much a part of this as everybody else who might look the same. (1st Interview, 2009)

Ms. Jenkins understands the difficulty some African Americans may have adjusting when there are not many people who look like them. In her classroom, she is cognizant of this fact. She helps her African American students feel comfortable by initially assigning them partners to work on mathematical tasks. She believes this builds confidence. Some teachers emphasize the importance of acknowledging African American students in the mathematics classroom, particularly when they are in the minority. Not only do they recognize them, they purposefully plan opportunities for them to contribute and become leaders during mathematical discussions.

**Critical Consciousness**

Critical consciousness focuses on having students think critically and take action against oppressive elements in society (Freire, 1986). Although none of the teachers explicitly alluded to how they instruct their African American students to empower them to make a difference, many of them have knowledge of necessary components of critical consciousness. I discuss the theme that emerged below:

**Theme 7: Not only do teachers invest in African American students and have high expectations of them in the classroom, they have high expectations that extend beyond classroom that influence their quality of life.** All the teachers expect students to reach their highest potential and be successful. They want to instill in them the confidence and the realization they can achieve. Mrs. Mitchell wants her students to be able to problem solve no matter what type of problem they encounter. She informs her students they cannot give A work on Monday and C work on Tuesday. All the teachers expect excellence every day. For example, if Mrs. Mitchell notices her students are struggling with square numbers, she continuously integrates that idea with other mathematical content she is teaching until her students understand. She not only wants her students to do well in her class, she also expects them to do well and succeed in life.

> My ultimate goal for all of my students is yes I want them to do good on the [state] test. Yes, I want you to do good on the indicator fives, and the unit tests and all of the things that we assess out here in the district, but ultimately I want to see you 10, 20 years from now and you say you own your own business, you're a doctor, you're working on

> your PhD, and you are able to count your change, you know. That's my ultimate goal. (1st Interview, 2009)

Many teachers understand they are not just preparing their African American students for success at the next grade level. Therefore, they give students the support they need, and seek out additional support for students so they are successful in mathematics. Mrs. Lewis comes in before school, spends her lunchtime, and stays after school with students to help them develop their mathematical knowledge. Ms. Jenkins continually reflects and asks herself, "What other things can I pull? What resources do I have?" (2nd Interview, 2009) The teachers want their students to succeed, and they are willing to do whatever is necessary to make it happen. All the teachers want their African American students to successfully compete in today's global economy.

## Conclusion

Researchers in mathematics education have explored and studied a variety of methods to raise the mathematics achievement of African American students using what they term as equitable practices. In this study, I chose not to advocate yet another approach for teachers to use in the classroom. Instead, I qualitatively investigated successful elementary mathematics teachers' knowledge of equity in teaching mathematics to African American students. I found that teachers who have been successful in teaching mathematics to African American students have knowledge of equity pedagogy. An equity-centered paradigm in mathematics education requires teachers who have specific knowledge about equity and teaching African American students specifically. The participants in this study shared a strong knowledge base related to equity in teaching mathematics to African American students.

Researchers (Ladson-Billings, 1994; Malloy 2002; 2009; Matthews, 2005) argue that teachers who practice equity pedagogy build relationships with African American students, have high expectations for them, and help African American students maintain their identities. The findings from this study build upon their work by examining teachers' knowledge of equity pedagogy, which goes beyond the characteristics of "good teaching." The teachers acknowledged the presence of African American students in their mathematics classroom. With this realization, the teachers used the culture and interests of African American students in their instructional decisions. They truly believe all students can learn and be successful. These beliefs were valued and apparent in their knowledge of equity pedagogy.

While focusing on a smaller sample size gives a detailed and meaningful representation of personalized experiences, I realize the sample size, time, and resources limit the study. I interviewed a small sample of teachers, and relied on self-reported data. I did not have the opportunity to observe their teaching practices to determine how they enacted their knowledge of equity pedagogy in their mathematics classroom. Thus, I was not able to directly link teachers' teaching practices with African American student achievement for the teachers in my study. As a result, further research is needed to observe teachers in the classroom to further determine their enacted knowledge of equity pedagogy in teaching mathematics to African American students. Yet, this descriptive study provides a glimpse of what specific knowledge related to equity in teaching mathematics to African American students encompasses. If mathematics teachers are unaware of this knowledge base, they potentially run the risk of not fully establishing an equitable mathematics classroom environment for African American students. In other words, they cannot teach what they do not know. Thus, it is important for mathematics teacher educators to have this knowledge and use it to positively influence the knowledge base of both pre-service and in-service mathematics teachers.

We need to consider improving mathematics teacher education programs and professional development opportunities to address the knowledge base needed for teaching mathematics to African American students. Currently, pre-service teachers are required to enroll in a multicultural course in some preparation programs. However, these efforts have been insufficient, as they do not address how to develop knowledge of equity pedagogy in teaching mathematics or other content areas (Chval & Pinnow, 2010). Mathematics teacher education programs should address the needs of African American students specifically. This effort will require new materials such as videos and written cases to facilitate this knowledge development. This study informs the design of teacher preparation and professional development programs, which in turn influences the development of teacher knowledge related to equity in teaching.

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