Middle school mathematics teachers' understanding of culturally relevant and responsive teaching practices: a qualitative study

Winnifred Namatovu

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A Dissertation
entitled
Middle School Mathematics Teachers’ Understanding of Culturally Relevant and Responsive Teaching Practices: A Qualitative Study
by
Winnifred Namatovu
Submitted to the Graduate Faculty as partial fulfillment of the requirements for the Doctor of Philosophy Degree in Foundations of Education

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The University of Toledo
December 2015
An Abstract of

Middle School Mathematics Teachers’ Understanding of Culturally Relevant and Responsive Teaching Practices: A Qualitative Study

by

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The purpose of this study was to examine how middle school mathematics teachers understand culturally relevant and responsive teaching practices as well as how their conceptualization of those practices impacts their teaching practices. Four middle school mathematics teachers from an urban school district in the Midwest of the United States participated in the study. The data that was collected included a survey and in-depth interview from each participant. Interviews were audio recorded and analyzed using Ladson-Billings’ (1995) culturally relevant pedagogy framework and Gay’s (2002) culturally responsive teaching framework. Each tool focuses on practices that are critical for effectively connecting students’ cultural backgrounds to the learning experience. An analysis of survey and interview responses revealed that teachers had a limited understanding of culturally relevant and responsive teaching practices. As a result, teachers didn’t implement some of the practices that are key to meeting the goals of culturally relevant and responsive teaching. Implications of the results, recommendations for future research, limitations of the study, and concluding remarks are included.
Dedication

I dedicate my dissertation work to my family. To my parents, Dr. James Kiwanuka-Tondo, Ph.D. and Mrs. Dorothy Kiwanuka, who were the first to instill in me a passion for education. Thank you for your inspiration and encouragement throughout my schooling experience, teaching career, and personal life. To my brothers, Peter, Paul and Philip, who continue to show their love and support in every new adventure in my life. Thank you for never leaving my side.
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Thank you to my pastor, Rev. Dr. Staccato Powell, who constantly pointed me to the Word and prayed with me through this process. Thank you to my extended family and friends. Your thoughtful words of support have been tremendous in getting me through this process.

Lastly, I would like to thank my teacher participants for your willingness to participate in this study and your openness throughout the entire process. I couldn’t have gotten through this process without your participation.
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List of Abbreviations

CRP...............................Culturally Relevant Pedagogy
CRT...............................Culturally Responsive Teaching
CRTSE.........................Culturally Responsive Teaching Self-Efficacy
CRTOE.........................Culturally Responsive Teaching Outcome Expectancy
Chapter One

Introduction

Teachers in the current education system are tasked with educating an increasingly diverse student population (Ladson-Billings, 2005). While these teachers may be knowledgeable in their content area, many may not prepared to work with culturally diverse student populations. Many preservice education programs do not prepare teachers to effectively work with culturally diverse student populations. Thus, while the teachers are prepared to teach their subject content, they are often not prepared to adjust the content to fit the learning needs and interests of all students. In the mathematics classroom, mathematics educators grapple with how to ensure that the content that is being taught supports the diverse learning needs and interests of all students in their classrooms.

In 2009, the National Center for Education Statistics reported “White students at grade 12 scored 30 points higher in mathematics than Black students and 23 points higher than Hispanic students” (p. 1). All students have “immeasurable talents and innumerable strengths” and the fact that “they do not do well in school in general and in mathematics in particular does not add up” (Ladson-Billings, 1997, p. 707). If the goal of education is to provide a fair and equitable mathematics education to all students, it is no longer acceptable to implement practices that exclude, whether implicitly or explicitly, some students from mathematics.

In order to close the achievement gap between students of color and their peers, the emphasis has been on raising standards and implementing more standardized testing. Such reform movements continue to ignore the “social realities in schools for many
marginalized communities and students” (Hand and Taylor, 2008, p. 209). In order to address the inequities that exist in the mathematics classroom, there must be a reevaluation of current mathematics curriculum and practices.

Although there are “a common set of sociohistorical experiences that connect students of particular backgrounds together, neither the students nor their needs remain the same over time” (Leonard et al., 2010, p. 267). Teachers must be willing to learn about the lived experiences of their students in order to better understand how to meet the learning needs interests of all students. Leonard et al. (2010) suggest that teachers should use “students’ cultural capital and practices” in order to “examine students’ individual identities and subcultures” (Leonard et al., 2010, p. 267). By understanding the rich social and cultural experiences that students bring with them to the classroom, teachers can begin to view students’ backgrounds as strengths rather than weaknesses.

Oakes (1990) contends that if schools are to “make greater science and mathematics learning opportunities accessible to diverse groups of students, they will also need to redesign science and mathematics curriculum and instruction” (p. 15). This includes creating learning environments that understand and value the lived experiences of students from culturally diverse backgrounds and using those experiences to guide the teaching that goes on in the mathematics classroom. Mathematics teachers can’t continue to overlook the effect that culture has on students’ learning experiences; they must find ways to implement instructional practices that are culturally relevant and responsive for all students. Through such teaching practices, teachers are able to use that which is familiar to students as a frame of reference and connect it to mathematical knowledge.
Malloy et al. (1998) argue that because “educators have not fully examined the role of culture on cognition and thus the use of a culturally based pedagogy,” it has prevented them from contextualizing “instruction to their students’ learning preferences” (p. 248). Whether students come from cultures that encourage collaboration or creative expression through various manners or families that speak multiple languages, it is imperative that teachers use that information to implement instructional practices and policies that fit those learning needs. Similar to all other “forms of knowledge” the subject of mathematics “is situated within a cultural context” (Leonard et al., 2010, p. 262). Hence, it is imperative that we reevaluate the manner in which we are teaching students from all backgrounds. Such a reevaluation requires us to accept that culture and the outside experiences that students bring to the classroom influence students’ learning. We can no longer continue to look at students’ backgrounds as deficiencies and use them to blame children for their failure.

Research Question

The values, beliefs, expectations, and attitudes that one holds are strongly influenced by his or her culture. As individuals move from one environment to another, they carry their cultural identity with them. Smith and Smith (2009) assert that culture “is the very basis of social life; yet so many aspects of these students’ cultures are perceived by teachers as negative and harmful, as disruptive to the educational process” (p. 350). As students enter the classroom, they shouldn’t be expected or required to leave their social and cultural backgrounds at the door. For that reason, culturally relevant pedagogy and culturally responsive teaching practices have been suggested as approaches for
incorporating students’ cultural backgrounds into classroom learning experiences (Ladson-Billings, 1995; Gay, 2002).

While these approaches have been recommended as effective approaches for better meeting the diverse learning needs of students, there is a lack of concrete examples of what this looks like in the mathematics classroom. It is the researcher’s belief that the scarcity in concrete examples in mathematics classroom could be for the following reasons: (a) mathematics teachers don’t know understand culturally relevant and responsive teaching practices are, (b) teachers don’t think that culture influences teaching and learning of mathematics, and (c) teachers aren’t provided with the proper tools to meet the diverse learning needs and interests of students. In this study, the researcher will focus on teachers’ understanding of culturally relevant pedagogy and culturally responsive teaching.

In this study, the researcher strives to focus on how teachers’ understanding of culturally relevant and responsive teaching practices can provide insight into how to support mathematics teachers to implement these practices. By gaining insight into what teachers know, the researcher hopes to uncover what is needed in order to increase the number of concrete examples of mathematics teachers implementing culturally relevant and responsive teaching practices.

In this study, I propose to explore the following research questions:

- In what ways do math teachers understand culturally relevant pedagogy and culturally responsive teaching?
- In what ways do their understandings impact the conceptualization of their teaching strategies?
Summary of Study

As the demographics of the students in mathematics classrooms continue to change, it is critical for mathematics teachers to make the subject of mathematics more inclusive. Oakes (1990) warned, “if the educational achievement and participation of minorities do not increase substantially, the nation will not be able to meet its scientific and technological needs” (p. 23). It is the responsibility of mathematics teachers to develop and implement instructional practices that support all students to see themselves as successful mathematics students. Such a task is difficult to accomplish when students aren’t able to meaningfully relate to the mathematical content that is taught in the classroom. The experiences that students bring with them to the classroom are important tools in that process.

In this study, a qualitative approach will be used to explore the research questions listed above. Creswell (2012) asserts that the central focus of qualitative research is to “learn about the problem or issue from participants and engage in the best practices to obtain that information” (p. 47). In this particular study, the participants are all middle school mathematics teachers who teach culturally diverse student populations. The objective is to uncover and share how they understand culturally relevant pedagogy and culturally responsive teaching. Moreover, the researcher would like to reveal how the teachers’ understandings impact their teaching practices.

Questionnaire and interview data will be used to collect data during the research study. Groulx and Silva (2010) offer that the manner in which belief statements appear on a survey “may appear benign and easy to affirm because they lack context and do not confront or challenge a respondent to take action” (p. 8). Participants will be asked to
participate in an in-depth follow-up interview to expand upon their questionnaire responses. This step is crucial in this study because ultimately the researcher strives to present an overview of participants’ understanding of culturally relevant pedagogy and culturally responsive teaching. It is believed that the interviews will allow the researcher to delve deeper into participants’ survey responses.

**Significance of Study**

Various organizations such as the National Council for Teachers of Mathematics (NCTM) and the National Science Foundation (NSF) have put forth ambitious goals that advocate for high excellence for all students regardless of their backgrounds. However, looking at the achievement gap between students of color (African American, Hispanic, and Native American) and their peers in mathematics and science, it appears that these goals are not being met. This is a concern given that future groups of “workers will comprise increasing proportions of non-Asian minorities – groups that traditionally have not entered scientific and technological fields” (Oakes, 1990, p. 23). In order to better meet the diverse learning needs and interests of students, teachers must know and understand how to effectively do so.

Information collected from this study has the potential to contribute to the development and implementation of tools for supporting in-service mathematics teachers to effectively incorporate culturally relevant and responsive teaching practices in their classrooms. The part on professional development is crucial because many teachers enter the field with little to no preparation for working with culturally diverse student populations. By gaining perspective on how this group of mathematics teachers understands culturally relevant pedagogy and culturally responsive teaching, the
researcher hopes to begin to uncover what is needed to increase the use of these teaching practices in the mathematics classroom.

Although not every child may have interest or the aptitude to become a mathematician or scientist, the inequalities for students of color are “so great that considerable science and mathematics talent is undoubtedly being lost” (Oakes, 1990, p. 24). In order for these students to be able to compete in an “increasingly technological society” they must be provided with a high quality mathematics education. Such an education requires access to learning opportunities that build on what students know when they enter the classroom and encourages them to make meaningful mathematical connections. This requires the implementation of teaching practices that are culturally relevant and responsive.
Chapter Two

Literature Review

The purpose of this chapter is to present a review of the literature on culturally relevant pedagogy and culturally responsive teaching. My goal is to provide background information on culturally relevant and responsive teaching as well as its relevance to the mathematics classroom. In the final part of this section I discuss what’s currently missing in the research as well as justification for my study.

What is Culture?

Trumbull and Rothstein-Fisch (2011) define culture as “a dynamic system of values, expectations, and associated practices that help organize people’s daily lives and mediate their thoughts and actions” (p. 26). It is through lived experiences that individuals become socialized to accept and practice certain values, beliefs, and norms. While cultural expectations and practices are passed down from generation to generation, they may be modified to meet societal needs. For that reason, culture is “something that is both fixed and fluid, both situated and mobile” (Oysermann and Lee, 2008, p. 237). While some parts remain stable and are shared over generations, other parts are fluid so they evolve and change as the environment changes.

Culture is both the “outside” of the person and the “inside” of the person. In other words, it is the “set of practices shared by the group” which exist before the individual as well as the characteristics that influence an individual’s behavior (Triandis, 2007). On the outside, we are able to see an individual’s culture through things like their behaviors, attitudes, food, language, and clothing. On the inside, the individual is influenced by their culture in the way that they think about different situations or how they relate to those
around them. In both cases, the individual’s daily-lived experiences are influenced by their cultural values, practices, and attitudes.

An individual’s cognitive development involves the manner in which the individual is able to change the manner in which they understand, perceive, notice, think, remember, classify, reflect, problem set and solve, as well as plan when faced with different situations (Rogoff, 2003). Culture is inherently interwoven with who we are and how we view the world; culture impacts our cognition. It influences how we think, communicate, process, and interact with the world around us. As human beings we all have a dialogical self. That means that as human beings, we all have different voices in our head and they are influenced by our culture. When faced with a situation, these voices drive the beliefs and understandings that we formulate about the situation.

As individuals are met with new experiences, they use existing knowledge from their previous experiences to make sense of the new experiences. DiMaggio (1997) explains that it is through schemata that we are able to “simplify” our cognition because we are able to make connections among the different forms of knowledge that exist in our mind. The forms of knowledge are based on our lived experiences, which are influenced by our culture. We choose to accept or reject the various forms of knowledge based on whether they match or support our cultural values, beliefs, norms, and practices.

A person’s cultural experiences impact the manner in which they are motivated when faced with new experiences or situations. Heine (2007) explains, human motivations “are rooted in people’s values, their beliefs about what can be easily accomplished, their expectations of the consequences associated with their actions, and the ways that they understand their behaviors – all of which are importantly shaped by
cultural context” (p. 714). Since individuals vary in their values, norms, and beliefs, then motivations across different cultures should vary as well. For Westerners, motivation is to “aspire for consistency within themselves” while Easterners aspire to be “consistent with their behaviors in the context of others” (Heine, 2007, p. 719).

Our learning identity formation as we move from one environment to another isn’t merely a transmission of knowledge from one context to another; rather we look to see how our various lived experiences are related. In fact, when individuals are placed in different contexts, “they not only step into a dialogical relationship with other persons, but also with the whole sociocultural environment in which the interactional situations take place” (Silseth and Arnseth, 2011, p. 69). A person’s interactions with others as well as their occupation in various environments or contexts influence how the individual comes to develop his or her learning self. Through our learning selves, we develop an understanding of how various experiences are related as well as develop appropriate strategies for calling on the help of others.

Historically, cultural differences have been viewed as deficiencies and used as excuses for why students of color don’t perform as well as their White peers. Schmeichel (2012) offers, “cultural deprivation or disadvantage was the frame used to describe children of colour within the literature in the years immediately following the Brown decision” (p. 214). Rather than valuing the rich cultural experiences that existed among students, the differences that existed between “mainstream culture” and students of color were perceived as “a gap” that needed to be filled (Schmeichel, 2012).

All students negotiate between their home culture and school culture. For some students, this is an easier process than for other students. When teachers view students’
cultural differences as deficits then they ignore the strengths that students bring with them to the classroom. Teachers need to treat students’ cultural differences as strengths rather than deficits that need to be remedied. Araujo (2009) argues that the continual approach to students’ cultural differences with a deficit perspective has resulted in an overwhelming placement of students of color in remedial and special education programs.

**Why Should Culture Be Considered In the Mathematics Classroom?**

While many mathematics teachers are adequately prepared to teach mathematics content, many are not prepared to work with culturally diverse student populations. Many teachers grapple with how to ensure that the content that is being taught supports the diverse learning needs and interests of the students in their classrooms. Ladson-Billings (1997) points out that the subject of mathematics has functioned as “a feared and revered subject in our culture” (p. 698). She explains that it is feared in our society because “we believe that it is too hard, and we revere it because we believe that it signals advanced thinking reserved only for the intelligentsia” (p. 698). The subject of mathematics continues to serve as a “gatekeeper” by promoting the idea that only a select few can do mathematics.

Matthews (2008) argues that the teaching of mathematics continues to be viewed as merely the “teaching of content and distinctly separate from teaching as a broader cultural endeavor” (p. 118-119). Therefore, changes that are made to the manner in which mathematics is taught are “surface level modifications” that do very little to change the manner in which mathematics is taught. The continued view of mathematics as “context-free” and “culture-free” ignores the lived experiences of students of color as well as how
these experiences influence the manner in which these students learn mathematics (Martin, 2006). There needs to be consideration of how students’ cultural experiences affect how they view themselves as mathematics learners as well as how that identity as a mathematics learner can influence how students participate in the mathematics classroom.

The National Council of Teachers of Mathematics’ equity principle (2000) asserts that teachers should set high expectations for all students and support students to meet those expectations. In order for mathematics teachers to be able to effectively support all students to be academically successful in the mathematics classroom, teachers must link mathematics content to students’ lived experiences. Teachers authentically link what students already know and have experienced in their everyday lives to the mathematical goals they have. By linking students’ language and culture to the mathematics content, teachers are able to provide all students with a quality mathematics education. Students’ cultural experiences influence how they think, act, and respond in learning experiences. For that reason, the subject of mathematics, like all other subjects “is situated within a cultural context” (Leonard et al., 2010, p. 262). Students’ cultural experiences are a part of their identity and shouldn’t be separated from the learning that takes place in the mathematics classroom. Lipka et al (2005) declare that students use their prior knowledge “to make connections and inferences, draw conclusions, and assimilate new ideas, thus making the curriculum more accessible” (p. 369). For that reason, it is important to draw upon students’ lived cultural experiences when creating and implementing classroom activities.
Since the subject of mathematics has a history of being a “gendered and racialized experience” (Leonard et al., 2010, p. 262), it is important for all students to develop a positive identity as a mathematics learner. For students from historically marginalized groups, they have a difficult time determining what it means for someone with their background to be a mathematics learner. In the mathematics classroom, the teacher’s role should be on supporting all students to positively identify with the learning environment as well as the subject matter.

Brenner (1998) observed that students possessed “basic skills, practical knowledge, and linguistically encoded knowledge about mathematics” (p. 236) but it was not connected to the material that was taught in the classroom. Brenner and the teachers used this information to create activities that were culturally relevant for the teachers. These activities incorporated students’ outside school experiences into the content taught in the classroom. For example, they incorporated activities like the school store, opportunities for peer collaboration, and reordered the sequencing of topics so that they began with information that students were most familiar with. They found that students “made larger cognitive gains” and were more positive toward learning the new content.

Stinson (2011) suggests, “it is much easier to fix blame on the cultural heritage of a group of students or students themselves rather than on the structure of public schools, a structure that was intended (philosophically) to embody the ideals of an egalitarian and just democratic republic” (p. 62). Instead of using students’ cultural experiences as an excuse for their lack of success in the mathematics classroom, we need to reevaluate whether the current mathematics practices are appropriate for the learning needs of all students. The rich diversity that exists among students should supplement the learning
that goes on in the classroom. Students’ cultural experiences should be viewed as strengths that serve as a guide for what is taught in the classroom.

**How Can Culturally Relevant Pedagogy and Culturally Responsive Teaching Support Mathematics Education?**

Villegas and Lucas (2002) contend that when teachers respect the cultural differences that exist among students, they are “more apt to believe that students from non-dominant groups are capable learners, even when these children enter school with ways of thinking, talking, and behaving that differ from the dominant cultural norms” (p. 23). These teachers strive to implement instructional practices and learning experiences that cater to the diverse learning needs and interests of all students. Ladson-Billings (1997) and Gay (2002) each offer a framework for implementing teaching practices that recognize and affirm the cultural experiences of students. Taken together, these frameworks can serve as tools to make mathematics education more equitable for all students.

The creation of mathematics learning environments has become a matter of justice because the subject of mathematics continues to exclude some students. In order to meet NCTM’s principle of equity, there must be attention to how the teaching of mathematics continues to isolate from the “realities” of some children (Brenner, 1998). The inclusion of students’ daily lived experiences in mathematics lessons does not devalue traditional mathematics content, rather they serve as tools to create rich mathematical learning experiences for all students. A continued ignorance of the learning needs of some students in the mathematics continues to produce students who are
mathematically illiterate. Waddell (2014) maintains that “if children are not math literate they will be doomed to second-class economic status” (p. 3).

Creating mathematics learning environments that are more conducive to the diverse cultural and linguistic backgrounds of the students in mathematics classrooms requires teachers to understand mathematics the influence of lived experiences on students’ learning. Hand and Taylor (2008) assert that “a great deal of what goes on in a mathematics classroom is that students from different backgrounds are determining for themselves, in relation to the classroom community, what it looks like for someone like them to learn and do mathematics” (p. 200). Therefore, for many students, there is a struggle to see themselves as mathematicians or successful mathematics students. It is imperative for mathematics educators to understand this struggle in order to implement practices that are culturally relevant and responsive to the students in their classrooms.

Mathematics educators who create classrooms that are culturally relevant and responsive demonstrate the following: “a belief that children can be competent regardless of race or social class,” a commitment to providing “students with scaffolding between what they know and what they do not know,” “focus on instruction during class rather than busy-work or behavior management,” a dedication to “extend students’ thinking beyond what they already know” and an “in-depth knowledge of students as well as subject matter” (Stinson, 2004, p. 14). Teachers must understand that students enter the classroom with diverse lived experiences and should use those experiences to supplement the learning that takes place in the classroom. Even when the experiences are different from the teacher, the teacher must find an effective manner to create a “culturally relevant” classroom for all students.
Rubel and Chu (2012) present the following as elements of culturally relevant mathematics teaching: “teaching mathematics for understanding, centering instruction on students’ experiences, developing students’ critical consciousness about and with mathematics” (p. 41). In order to center instruction on students’ experiences, teachers must “draw on students’ ‘funds of knowledge’ and utilize relevant or meaningful real-world contexts as a regular aspect of instruction” (Rubel and Chu, 2012, p. 41). For this to happen, teachers must create a learning environment that encourages the active participation of all students in the developing of mathematical thinking and understanding. Teachers can implement learning opportunities that promote critical thinking about mathematics by encouraging “multiple approaches to solving a problem” (Rubel and Chu, 2012, p. 41). Through discussion, students explore “how or why one mathematical approach” is more valuable than another.

**What is Culturally Relevant Pedagogy?**

The implementation of culturally relevant pedagogy has been offered as an approach for meeting the academic as well as social needs of students from culturally diverse backgrounds. Through the implementation of culturally relevant pedagogy, teachers are able to promote academic achievement, cultural competence, and critical consciousness for all students. Academic achievement is promoted through high but attainable expectations for all students. Each student is “expected to work hard” and inspired to take responsibility for his or her learning. Cultural competence is fostered through the acknowledgement that children’s home and community experiences are valuable so that they can be used to serve as a “bridge” to the learning that goes on in the classroom (Ladson-Billings, 2000). Teachers in culturally relevant learning environments
also provide students opportunities to question and challenge social inequities that exist in society. It is through such experiences that students are able to recognize “the ways that social structures and practices help reproduce inequities” (Ladson-Billings, 2000, p. 210). Each of the above elements (academic achievement, cultural competence, and critical consciousness) is essential for creating culturally relevant learning environments.

In order to meet the goals of academic excellence under culturally relevant pedagogy, teachers must understand that there is a need for students to experience “multiple opportunities to learn new materials, review areas of academic weakness, and grapple with challenging ideas while developing perseverance and dedication for their academic endeavors” (Waddell, 2014, p. 7). Learning doesn’t merely depend on passing a test; rather it is focused on individual growth as well as meaningful learning experiences. The teacher provides students with multiple opportunities to build on their prior mathematical knowledge as well as explore mathematical ideas in a manner that is meaningful to them.

Learning environments that reflect cultural competence empower students to be “self-reflective about their multiple identities and how those identities can be used to create a positive life path” (Waddell, 2014, p. 7). The teacher sees the cultural diversity that exists among students as an asset and acts as a “cultural mediator” to create learning environments that involve and motivate all students. Students are encouraged to use and share learning tools that are culturally familiar to them. The teacher goes beyond using mathematical examples that are reflective of the dominant culture and incorporates examples that are culturally familiar to the students in the classroom.
In order to support students to develop and maintain cultural competence, teachers must understand students’ behaviors by getting to know each student academically, socially, and personally. While some student behaviors can be detrimental to the learning experience, teachers must also understand that other behaviors that are judged as unacceptable may be parts of the students’ cultural habits and histories. It is the teacher’s responsibility to support students in their development of cultural competence by “critiquing their responses to behaviors and determining the detriment and/or benefit to learning each behavior represents and then responding accordingly” (Waddell, 2014, p. 8). Thus, teachers support students in being who they are in a manner that is supportive and encouraging.

Teachers who support culturally relevant teaching practices must develop a social consciousness. Villegas and Lucas (2007) define social consciousness as “the awareness that a person’s worldview is not universal but is profoundly influenced by life experiences, as mediated by a variety of factors, including race, ethnicity, gender, and social class” (p. 4). Therefore, teachers must realize there are multiple sources of knowledge. Students bring a rich knowledge to the classroom that is influenced by their lived experiences. This knowledge should serve as a foundation for the curriculum and practices that are implemented in the classroom.

Through critical and social consciousness, students are able to critique and question situations through various points of view. In the mathematics classroom, students are able to take algorithms and apply them to societal issues. Specifically, students are able to question whose point of view is supported or rejected by the information that they gather. It also empowers students to take the knowledge that they
gather in the classroom and apply it in a manner that is meaningful to them in their everyday lives. Critical inquiry shouldn’t be limited to the classroom; rather it should be something that students take with them outside of school. In order for students to be able to effectively carry this out, teachers must equip students with the “skill of critical inquiry” for exploring and understanding issues inside and outside of the school.

Culturally relevant classrooms allow both teachers and students to participate in choosing mathematics topics, lesson foci, and instructional strategies that are based on what the students know and what they are aiming to know. Patchen and Cox-Peterson (2008) note that in culturally relevant classrooms, “teachers not only rebalance authority, but they shift into a more systematic and structural redistribution and sharing of actual decision-making processes” (p. 997). In order to develop culturally relevant pedagogy in a mathematics classroom, teachers must address cultural competence by building on students’ prior knowledge, encourage academic achievement by developing students’ inquiry skills, and infuse critical conscious through the implementation of lessons that bridge mathematics with the inequities that exist in society. This requires that teachers reflect on how their teaching practices impact the learning of all of their students.

What is Culturally Responsive Teaching?

Martin (2006) states that there is a belief that all “children are valued equally” and mathematics activities in all classrooms “unfold in a color-blind manner” (p. 204). However, it is clear that not all students experience mathematics learning in a fair and equitable manner. The diverse cultural and linguistic backgrounds of some students continue to be ignored. In order to better meet the diverse learning needs and interests of all students, culturally responsive teaching has been offered as an approach.
Gay (2002) defines culturally responsive teaching as the use of “cultural characteristics, experiences, and perspectives of ethnically diverse students as conduits for teaching them more effectively” (p. 106). She explains that when teachers use the lived experiences or frames of reference of students to teach, learning becomes more personally meaningful to students. Students’ interest in the material increases and the learning process becomes a bit easier for students because they are able to learn through “their own cultural and experiential filters” (Gay, 2002, p. 106).

The first component of culturally responsive teaching is the development of a knowledge base about cultural diversity. This goes beyond simply being aware of and respecting cultural differences. Gay (2002) states that teachers must also acquire “detailed factual information about the cultural particularities of specific ethnic groups” (p. 107). Through this process, the teacher is able to expand on their knowledge about other groups. Rather than having a surface image or understanding about the culture of a certain group, the teacher is able to gain a deeper understanding about the group.

Villegas and Lucas (2002) argue, “the knowledge children bring to school, derived from personal and cultural experiences, is central to their learning” (p. 25). When students’ lived experiences are ignored instead of used as resources for the teaching that goes on in the classroom, then students continue to serve as objects that are to be filled up. Students must be provided with learning experiences that allow them to make meaningful connections between what they already know and are familiar with and that which is new. This is an important process because our mind is constructed so that we are active beings rather than passive receptors who are constantly going through a process of doing and undoing (Dewey, 1900). Through the process of doing and undoing
we are able to go through a reconstruction process that allows us to reorganize meanings from our prior experiences to connect with present experiences. We then use those meanings to inform and transform our thinking in the present experiences in order to further capacity for future experiences.

The second component of culturally responsive teaching is the implementation of culturally relevant curricula. For teachers to be able to meet this principle, they must be willing to overcome the idea that “their subjects (particularly math and science) and cultural diversity are incompatible, or that combining them is too much of a conceptual and substantive stretch for their subjects to maintain disciplinary integrity” (Gay, 2002, p. 107). Making curricula culturally relevant doesn’t devalue the content that is taught in the classroom; rather it connects content to students’ cultural experiences in order to allow for a meaningful learning experience.

The third component of culturally responsive teaching is the creation of a learning environment that is conducive to the diverse learning needs and interests of students. Culturally responsive teachers are able to “determine the multicultural strengths and weaknesses of curriculum designs and instructional materials and make the changes necessary to improve their overall quality” (Gay, 2002, p. 108). By doing so, teachers are able to include instructional materials and resources that are representative of the diversity that exists within and across cultural groups. When teachers are able to critically analyze the biases that exist in the instructional resources that they are currently using, they are not only able to make appropriate changes in their classroom but they can also teach students how to “be discerning consumers of and resisters to ethnic information disseminated through the societal curriculum” (Gay, 2002, p. 109).
The fourth component of culturally responsive teaching is awareness and attention to the diverse communication styles of students. The manner in which students express themselves is strongly influenced by the manner in which the student was culturally socialized. Gay (2002) remarks, “cultural markers and nuances embedded in the communicative behaviors of highly ethnically affiliated Latino, Native, Asian, and African Americans are difficult to recognize, understand, accept, and respond to without corresponding cultural knowledge of these ethnic groups” (p. 111). Culturally responsive teachers must be cognizant of differences in communication styles among students as well as implement practices that are supportive of these differences.

Attention to communication styles is important because the behaviors and habits that students learn at home can impact the learning that takes place in the classroom. What is acceptable in “mainstream schooling and culture” might not match the cultural background of some students. Gay (2002) notes, “the communicative styles of most ethnic groups of color in the United States are more active, participatory, dialectic, and multi-modal” which is in sharp contrast with the “passive receptive style of communication” which predominates American classrooms (p. 111). Culturally responsive teachers create learning environments that appreciate and support students’ communicative styles so as to not intellectually silence students.

Villegas and Lucas (2002) suggest that a culturally responsive teacher “recognizes that there are multiple ways of perceiving reality and that these ways are influences by one’s location in social order” (p. 21). The teacher affirms the diversity that exists among students by creating learning experiences that support students to connect that which is
familiar to them with new content. Students’ cultural differences are seen as strengths that should be used to drive the teaching and learning that goes on in the classroom.

The fifth component of culturally responsive teaching is the implementation of instructional practices that reflect the diverse learning styles of students. In order to effectively apply instructional strategies that meet the diverse learning styles of students, teachers must understand that “learning styles are how individuals engage in the process of learning, not their intellectual abilities” (Gay, 2002, p. 113). Students’ differences in learning styles shouldn’t be viewed as deficiencies. In fact, teachers dedicated to the educational success of all their students must “challenge the prevailing perception that differences among students are problems rather than resources” (Villegas and Lucas, 2002, p. 24).

In order to effectively meet the diverse learning needs and interests of all students, they must actively work to interrogate and modify their current instructional practices. Gay (2002) offers instructional practices such as the use of cooperative learning groups, peer coaching, autobiographical case studies and fiction, motion, and movement. Such practices are culturally responsive because they serve as tools to match students’ communication styles to the learning that takes place in the classroom and foster students’ ethnic identity development in order to improve student academic performance.

With the rapidly changing demographics of students in United States classrooms, it is unsettling that there has not been much change toward culturally responsive curricula and instructional practices. Students from ethnically diverse backgrounds “have been expected to divorce themselves from their cultures and learn according to European American cultural norms” which has placed these students “in double jeopardy—having
to master the academic tasks while functioning under cultural conditions unnatural (and often unfamiliar) to them” (Gay, 2002, p. 114). In order to move toward a curriculum that is more inclusive of all students, there must be changes in the manner that content is currently taught. This requires attention to the diverse cultural backgrounds of students as well as how this impacts the teaching and learning that goes on in the classroom.

**What Is the Purpose of Education According to Dewey?**

Children enter classrooms with thoughts, ideas, and impulsions that need to explored and acted upon. Dewey (1900) offers, “the child always has something in his mind to talk about, he has something to say; he has a thought to express, and a thought is not a thought unless it is one’s own” (Dewey, 1900, p. 66-67). The continued implementation of practices that restrict and limit students denies students the opportunity to explore, investigate, and experience their own ideas. Such practices treat students like “empty-vessels” who are to merely regurgitate the information that is given to them. In order to foster growth and development in students’ learning, children shouldn’t be limited to only repeat that which they have been taught; they should be encouraged to openly share their ideas and thoughts in the classroom.

According to Dewey (1900), the goal of education should be to have each child “come to school with a whole mind and a whole body and leave school with a fuller mind and an even healthier body” (p. 97). This process can take place effectively through learning opportunities that encourage reflective inquiry. Dewey (1900) suggests that the learning experience should be an “organic relation of theory and practice” (p. 100). That means that children are not “simply doing things” but are developing an understanding of what they are doing. The child is learning “how” to do something as well as “why” he or
she is doing something. In the mathematics classroom children should be encouraged to make meaningful connections as well as understand “why” and “how” they are doing mathematics. Through authentic learning experiences, students are able to take their prior experiences and connect them to their present learning experiences. Rather than students “doing” activities, they are encouraged to explore, investigate, and think about how their prior knowledge and experiences can be connected to their present learning experiences and knowledge.

The process of growth includes experiences, habits of mind, and aims. It should not be abstracted from students’ social life. The child’s knowledge develops based on his or her connection to society through social experiences. As the child is exposed to new learning experiences, he or she develops habits of mind to adjust to the new experiences. The habits of mind are then used to inform the child’s actions and behaviors in new aims. In order for habits to be effective in the new experiences and aims, they must be “involve thought, invention, and initiative” (Dewey, 2012, p. 36). Thus, growth is not something that is done to the child, it is something that child does. The child is able to use their experiences to formulate habits that develop the capacity for future experiences. For growth to take place in the classroom, children must be provided with learning experiences that are engaging and meaningful.

Habits of mind become powers of learning. Students’ mental dispositions exist in the student’s mind to later be activated in subsequent experiences. As a result, the goal of learning is not the acquisition of artifacts, it is the student’s development to act, learn, and achieve. Education should not simply serve as a transmitter of knowledge or information; it should serve as an opportunity to form new knowledge through active experience.
Dewey (2012) defines education as the “reconstruction or reorganization of experience which adds to the meaning of experience, and which increases ability to direct the course of subsequent experience” (p. 50). It is important for teachers to remember that learning is active, operative, and continual. It is a process in which the learner is continuously growing in their thinking and understanding of the world around them. Thus, the teacher’s role in the learning process is to serve as a facilitator in the student’s construction of new knowledge. The teacher scaffolds and supports students as they make meaningful connections between their prior experiences and their current as well as future experiences.

**What’s Missing in the Mathematics Classrooms?**

Past mathematics education reform movements have “situated many learners in an *a priori* deficit position relative to disembodied mathematical knowledge” (Ellis and Berry, 2005, p. 10). The subject of mathematics has been viewed as a subject that is easier for some groups because of their backgrounds or innate abilities. For that reason, mathematics practices continue to gear toward some student populations rather than including all students. Mathematics learning must be shifted from looking at “mathematics as *apart from* human experience to mathematics as *a part of* human experience and interaction” (Ellis and Berry, 2005, p. 12). Thus, the vision for teaching mathematics should be on getting students into the subject of mathematics rather than simply forcing the subject of mathematics into students. The learning process in mathematics must emphasize authentic and meaningful connections between the mathematics content and the everyday lives of students.
If growth is the goal of education then mathematics learning shouldn’t be treated as a process that is “fixed” and “final” but rather be a process in which the focus is on the development of skills as well as knowledge. Teachers must inspire students to question, debate, critique, and explore how as well as why they are doing and learning mathematics content. Mathematics learning that focuses on the growth of students provides students with opportunities to reconstruct and reorganize their prior mathematics experiences in order to develop the capacity to direct subsequent mathematics experiences. In order for that to happen, mathematics teachers should create lessons that begin with “students’ ethno or informal mathematics” in order to build their “critical thinking skills” (Stinson, 2004, p. 14). Students must be provided opportunities in which they are able to take prior knowledge and experiences and meaningfully connect them to new knowledge and experiences. When this happens then growth takes place and learning occurs in a manner that is meaningful so that students are able to develop the capacity to self-direct, be dynamic, and continuous.

Students need opportunities to study their own procedures for doing mathematics so that they can gain an appreciation for “doing” mathematics as well as understand the use of different methods doesn’t equate to “deficiency.” Teachers who encourage students to explore, share, and question different mathematics approaches create mathematics learning environments that support and respect diverse ways of engaging in mathematical thinking. Mathematics learning shouldn’t focus simply on how to regurgitate information in order to pass a test; it should focus on how to apply information to various experiences. Currently, this is not being done in many mathematics classrooms.
As the achievement gap between students of color and their White peers persists, it is crucial to consider as well as assess the manner in which mathematics is currently taught rather than using students’ backgrounds as the reason for their failure. Math education reform movements in the past have “developed within a common perspective toward mathematical knowledge and mathematical learning that led to inherently inequitable practices and outcomes” (Ellis and Berry, 2005, p. 14). The implementation of the National Council of Teachers of Mathematics curriculum and evaluation standards in 1989 refocused the teaching of mathematics to address “ways in which students experienced mathematical ideas and concepts and how this was connected to their own lived experiences came to be seen as critical to the learning process” (Ellis and Berry, 2005, p. 12). Rather than looking at mathematics instruction as simply the transmission of mathematics topics and procedures, the move was towards teaching mathematics in a meaningful manner.

In 2000, NCTM published the *Principles and Standards for School Mathematics*. In the document, the authors outline the intended goals for improving mathematics teaching, curriculum, and assessment. According to Schoenfeld (2002), the principles and standards that are outlined in the document rest on the following “social and intellectual commitments”: equity, coherent curricula, teacher professionalism, and successful implementation of assessment and technology tools. While the document clearly outlines the goals of each principle and standard, teachers aren’t provided with clear details on how to accomplish the goals. Thus, teachers are tasked with the responsibility to fulfill the goals of the document without clear direction on how to do so.
The first principle in NCTM’s *Principles and Standards for School Mathematics* is the principle of equity. The principle states, “Excellence in mathematics education require equity – high expectations and strong support for all students” (NCTM, 2000, p.11). While the *Principles and Standards for School Mathematics* promotes the principle of equity in the mathematics classroom, mathematics educators are not provided with explicit examples on how to meet the goals of the principle of equity. Therefore, math teachers continue to implement instructional practices that fail to include all students. As the demographics continue to change rapidly, it should no longer be acceptable to create and implement a curriculum that is geared toward a select few.

Efforts to reform mathematics education continue to ignore the cultural and linguistic needs of some children (Brenner, 1998). In order to create mathematics learning environments that ensure comfort and inclusion of all students, mathematics educators and policymakers must address the diverse learning needs and interests that exist among students. The National Council of Teachers of Mathematics (1991) suggests the incorporation of meaningful tasks that: are based on “knowledge of students’ understandings, interests, experiences”, “knowledge of the range of ways that diverse students learn mathematics” and “display sensitivity to, and draw on, students’ diverse background experiences and dispositions” (p. 25). Mathematics education reform movements committed to the principles of equity and excellence must address the diverse learning needs and interests that exist in the classroom.

Whether intentionally or not, some students have been excluded from mathematics because of a lack of attention to policies and practices that meet their individual needs and interests (Faulkner, Crossland, and Stiff, 2013; Stiff, Johnson, and
Akos, 2011; Ladson-Billings, 1997). For that reason, the subject of mathematics continues to serve as a gatekeeper to access to certain courses in high school, success beyond high school, and career choices. In order to “move away from a view of mathematics as a sieve that filters out the less able and toward mathematics as a ‘net that gathers more and more students’” (Allexsaht-Snider and Hart, 2001, p. 96), there must be an implementation of curriculum and materials that are inclusive of the learning needs and interests of all students.

Discourse on how to improve mathematics education for all students needs to focus on the “discontinuity that exists between students’ home language and the perceived ‘precision’ of mathematics and mathematical language” and how the “content of schools mathematics is so divorced from students’ everyday experiences” (Ladson-Billings, 1997, p. 697). When students’ outside experiences are not connected to their learning experiences in the school, students struggle to relate to the material as well as to make meaningful connections with the content. Ladson-Billings (1997) reminds us that culture “informs all human thought and activity and cannot be suspended as human beings interact with particular subject matters or domains of learning” (Ladson-Billings, 1997, p. 700). For students to be able to negotiate between their home culture and the classroom culture, mathematics educators must create learning environments that are supportive of such action.

Currently, the curriculum and resources that are used in the mathematics don’t reflect the cultural diversity that exists among the student population in American schools (Nasir et al., 2008; Brown, 2007). Wiest (2001) points out that in some schools and classrooms, materials are chosen based on the ethnic group that “predominates” the
learning environment. It is important to create a learning environment that encourages cultural diversity regardless of the racial and ethnic “make-up” of the students in the classroom or school environment. Such a change requires attention to the individual learning needs and interests of all students rather than a select few.

Many of the teachers in the American public school system do not share the same cultural, social, or linguistic background as many of the students that they work with daily. As a result of the mismatch between the teachers’ background experiences and those of their students, it can be challenging for the some teachers to recognize that their racial identity and socioeconomic status may be “associated with unnamed privileges” (Price-Dennis and Souto-Manning, 2011, p. 224). Teachers must be willing to interrogate how their lived experiences might be similar to or different from those of their students as well as how the lived experiences of their students might differ among each other. Such awareness should lead teachers to design and implement practices that include all students.

Even when policies and practices are created with the intention of being “race-neutral” or “color-blind”, this often does more harm than good because they ignore the lived experiences of the students. Martin (2006) explains that when the racial or cultural background of a student is ignored then it is assuming that all students start off in the same place. Rather than being supportive of the learning needs of the students, this actually keeps some students behind because their individual needs, interests, and experiences are ignored. Stinson (2004) suggests that teachers should design and implement mathematics lessons that begin with “students’ ethno or informal mathematics” (p. 14). Teachers should use examples that are culturally familiar to
students in order to help students make connections between their knowledge and the formal mathematics knowledge.

If mathematics educators and policymakers are to see the “educative steadily and as a whole” (Dewey, 1902, p. 5), students and their lived experiences can’t continue to be seen as separate from the mathematics curriculum. Mathematics learning should not be only about passing a test. Students must be provided with learning experiences that empower them to apply mathematics concepts to experiences outside the classroom.

What is taught in the mathematics classroom must be connected to each individual child and his or her lived experiences. Additionally, there is a need for students to share their ways of doing mathematics in order for them to understand that the use “different” methods doesn’t equate to “deficiency” (Weist, 2001). Mathematics instruction shouldn’t rest on one or two ways of doing mathematics, rather it should encourage the use of multiple methods and approaches for doing and thinking about mathematics.

In order to overcome the reputation of serving as a sieve, the subject of mathematics must strive to be more inclusionary. Teachers must provide learning environments that provide students with opportunities to “gain the interests, resources, skills, confidences, and values that are needed to identify with the domain” (Steele, 1997, p. 624). When students don’t see those things in the learning environment, it is difficult for them to positively identify with the learning environment, which can lead students to struggle academically and socially in the environment. Student achievement increases when their identification seems favorable and decreases when their identification seems unfavorable (Steele, 1997). In other words, when students feel like their learning needs and interests are supported in the learning environment, they are able to do well academically and
socially. In order to support all students to develop a positive domain identification in the mathematics classroom, teachers must foster positive relationships with their students, provide rigorous instruction for all students, encourage incremental theory of self, reinforce a sense of belongingness, and create a learning environment that appreciates multiple perspectives.

**What are the Implications for Mathematics Education?**

Dahl (2000) asserts, “cultural diversity in the older democratic countries was magnified by an increased number of immigrants, who were usually marked by ethnic, linguistic, religious and cultural difference that made them distinguishable from the dominant population” (p. 183). With the rapidly changing demographics of the students in schools all over the United States, it is imperative that teachers create and implement practices that acknowledge and appreciate the diverse needs and interests rather than those that force students to adhere to “mainstream culture”.

In order to create mathematics learning environments that are culturally relevant and responsive to students, teachers must be willing to share the role of being a source of knowledge with students. The teachers must understand that they are “not the owners of all truths nor viewed as the sole authorities of knowledge” (Patchen and Cox-Petersen, 2008, p. 997). The outside knowledge that students bring to the classroom is valued and incorporated into the teaching that goes on in the classroom. Teachers and students both need to be able to consider how they fit into the learning environment. This includes being able to reflect on their cultural beliefs, values, and habits as well as how they impact the teaching and learning that goes in the classroom. Additionally, mathematics teachers need to be able to think about how the formal mathematics knowledge that they
intend to teach is impacted by the diverse learning needs, interests, values, and beliefs of their students.

Teachers who create culturally relevant learning environments “re-center” silenced student voices by encouraging students to explore, debate, and critically analyze issues that matter to them (Price-Dennis and Souto-Manning, 2011). While this can be overwhelming and uncomfortable for both the teacher and students, it is empowering for all participants in the classroom because each individual is forced to step out of their comfort zone. Patchen and Cox-Peterson (2008) suggest that culturally relevant teachers “move away from the more static traditional teacher-directed modes of instruction (e.g., following consistent patterns of instruction, day after day), building on constructivist practices toward a student-exploratory continuum in which tacit classroom discourses are made explicit and power is identified and addressed” (p. 1004).

Xu, Coats, and Davidson (2012) declare that recent research on the implementation of culturally relevant pedagogy in the mathematics classroom has shown that students are “eager to engage in mathematical tasks when relevant and meaningful connections are made to their cultural practices” (p. 128). By acknowledging the lived experiences of students and incorporating into the learning experience, culturally relevant pedagogy “can serve as a ‘humanizing pedagogy’” (Fitchett, Starker, and Salyers, 2012, p. 601). Teachers are able to see their students as individuals who bring rich experiences to the classroom that serve to supplement the learning that goes on in the classroom. Culturally relevant pedagogy recognizes and appreciates the diverse learning needs and interests of students. The cultural differences that exist among students are seen as strengths rather than deficiencies.
When teachers continue to look at students through a “mainstream lens” then they ignore the rich cultural diversity that exists among students. The cultural experiences and knowledge that students bring to the classroom is overlooked. It is important to recognize and appreciate that students enter the classroom with practices that are culturally familiar to them. These practices may include movement, figurative language, and modes of expression. Typically, mathematics is taught in an “authoritative, technical, and depersonalized form” so the use of these practices in the classroom may create a cultural dissonance because they don’t adhere to the traditional way of teaching mathematics (Xu, Coats, and Davidson, 2012, p. 126). Teachers who effectively implement culturally relevant and culturally responsive teaching practices are able to support all students be academically successful while still honoring the individual cultural, racial, and community identities of the students (Matthews, 2008).

Although the use of culturally familiar examples or manipulatives might pique the interest of some students more than others, it is a valuable learning experience for all students. The use of a variety of cultural tools to teach mathematics exposes students to multiple perspectives of thinking about and doing mathematics. Through the incorporation of mathematics tools and examples from different cultural groups, teachers are able to bring to light the contributions of members from various cultural groups to the field of mathematics. By doing this, teachers can help students “gain confidence, self-esteem, and a sense of belonging, as well as respect for the mathematical thinking of all cultures” (Wiest, 2001, p. 22). Exposure to the contributions from various cultural groups can also provide students with role models as well as cultivate students’ identity as mathematicians. Students are able to develop a positive view of the diverse contributions
to the field of mathematics as well as view the doing of mathematics as something that can be done by “real people” like them.

Teachers who are open to using the “experiences of poor and minority students” are more likely to experience more success with these students than teachers who only use “the lens of achievement” and ignore the lived experiences of these students (Leonard, Napp, and Adeleke, 2009, p. 6). By connecting students’ lived experiences to the mathematical content that is being taught students are able to take ownership of their mathematical learning. Teachers support student learning by encouraging students to use that which is familiar to them as a frame of reference as students explore new mathematical content. Students view themselves and the knowledge that they bring to the classroom as valuable and teachers are able to effectively support students in making meaningful connections between lived experiences and formal mathematical knowledge. Thus, the implementation of culturally relevant and responsive teaching practices is empowering to both students and teachers.

What’s Missing in the Research?

An achievement gap exists between students of color and their White peers. While various reform movements have enacted policies such NCLB, there continues to be inequities in the mathematics classroom. Although mathematics education reform movements have been with the best intentions for students, they continue to fail to include the learning needs and interests of all students in the classroom. Even with the incorporation of principles focused on equity, there is still a lack of attention to “the role of culture in mathematical knowledge construction and the political climate in which schooling and mathematics teaching practices are situated” (Matthews, 2008, p. 118-
The policies and practices that continue to be implemented in the classroom ignore the “social realities” of some students. Thus, some students continue to excel in the mathematics classroom while others continue to be left behind.

Malloy et al (1998) contend that mathematics educators must “consider cultural influences on learning” in order to effectively “restructure their pedagogy-accommodate for their students” (p. 248). Simply implementing instructional practices such as tracking, standardized testing, higher curriculum standards fail to address the issue in the mathematics classroom. Brand et al (2006) points out that when minority students cross “borders into the subculture of school science and mathematics, minority students often confront societal-induced barriers that may be difficult to negotiate” (p. 228). Therefore, mathematics educators must create learning environments that support the learning of all students regardless of their family background. In order to effectively do so mathematics educators must consider the influence of students’ culture on students’ thinking and learning of mathematics. A continued ignorance of the impact that culture has on mathematics learning when addressing the inequalities that exist in the mathematics classroom is no longer acceptable.

Lopez (2011) offers that while there are several studies on implementing culturally relevant pedagogy in “homogeneous, or nearly homogeneous” classrooms (i.e. all African American, all Hispanic), there is a lack of research on the implementation of culturally relevant pedagogy in diverse classroom settings. In order to be able to be able to understand the teaching practices that work and those that don’t work with students, there needs to be more research that focuses on the use of culturally relevant pedagogy in a diverse classroom setting. A lack of understanding of culturally relevant pedagogy
contributes to: a “simplistic conception” of culturally relevant pedagogy, lack of connection between culturally relevant pedagogy and student achievement, and few concrete examples of the implementation of culturally relevant pedagogy (Waddell, 2014).

The implementation of teaching practices that are culturally responsive and relevant for students in the mathematics classroom is about more than the inauthentic practices such as word problems that include student names and cultural celebrations. Ellis and Berry (2005) point out that mathematics learning should be considered in relation to the lived cultural experiences of an individual. They explain that mathematics should be considered as “a set of logically organized and interconnected concepts that come out of human experience, thought, and interaction—and that are, therefore, accessible to all (p. 12).

Although preservice and in-service education programs encourage teachers to take multicultural education or diversity courses, mathematics teachers struggle to effectively implement culturally relevant teaching practices into the classroom (Rubel and Chu, 2012). Brenner (1998) contends that the incorporation of culturally relevant mathematics teaching “goes beyond diversifying the role models represented in textbooks or adding footnotes to the non-European roots of many mathematical concepts” (p. 238). Culturally relevant mathematics recognizes the rich knowledge that students bring to the classroom and uses that to drive classroom instruction. It re-centers the authority of knowledge by valuing students’ knowledge and incorporating it in classroom activities. Furthermore, it encourages students to realize the applicability of mathematical knowledge in their daily lives.
The implementation of mathematics teaching practices that cater to the diverse learning needs and interests of students is crucial because of the major influence mathematics has on the future lives of students (i.e. career choices, higher education success, high school graduation). Learning environments that connect mathematics content “with students’ cultural practices enable students to capitalize on their experiences as intellectual resources” for mathematics learning “and to construct meaning in ways that relate” mathematics “to their cultural identities” (Xu, Coats, and Davidson, 2012, p. 127)

The implementation of culturally relevant pedagogy isn’t an easy task. Lopez (2011) states that the process “can be a stormy journey for teachers in schools” (p. 90). Without many concrete examples of how to implement culturally relevant pedagogy and culturally responsive teaching practices, it has become challenging for teachers to effectively implement culturally relevant and responsive teaching practices (Leonard, Napp, and Adeleke, 2009). In order to better understand the conditions that are necessary to create mathematics learning environments that are just and equitable, there has to be more research on culturally relevant pedagogy. Such studies will “reveal the nuances of enacting culturally relevant pedagogy with diverse ethnic and language minorities” (Leonard, Napp, and Adeleke, 2009, p. 5).

As students of color continue to perform poorly in the classroom, it is imperative to implement practices that meet their academic needs. Culturally relevant pedagogy and culturally responsive teaching are effective approaches to “centering the cultures, languages, and experiences that diverse students bring to classrooms so as to increase their engagement and academic achievement” (Lopez, 2011, p. 77). A learning
environment that reflects the principles of culturally relevant and responsive teaching practices provides students with learning opportunities to critically analyze problems, take risks and make mistakes, and engage in discussions that include a variety of perspectives. It also requires the teacher to create a space in which students feel valued and cared for so that they are comfortable sharing, exploring, and critiquing various mathematical ideas.

The implementation of curriculum that is culturally relevant requires teachers to look beyond “the traditional myopic canon” in order to draw from “sources, histories, and ways of thinking that characterize diverse learners” (Fitchett, Starker, and Salyers, 2012, p. 588). Such action is difficult because it requires teachers to step out of their comfort zone and that which is familiar to them.

**Research Questions**

There is an extensive amount of research on culturally relevant pedagogy and culturally responsive teaching but there seems to be a “missing link” in the literature between the frameworks and how to apply them in specific content areas (Mensah, 2011). Mathematics education is an appropriate area to explore and operationalize culturally relevant pedagogy because of the lack of research with concrete examples on how to implement culturally relevant pedagogy as well as relation between student achievement and culturally relevant pedagogy. There is a need to clearly define culturally relevant pedagogy as well as what it looks like in the mathematics classroom.

In this study, the researcher would like to explore the following questions:

- Researcher Question 1: In what ways do math teachers understand culturally relevant pedagogy and culturally responsive teaching?
Research Question 2: In what ways do teachers’ understanding of culturally relevant pedagogy and culturally responsive teaching impact the conceptualization of their teaching strategies?

The information gathered from this study will provide insight into what culturally relevant and responsive teaching practices look like in the mathematics classroom.

Summary

This chapter offered insight into the current literature on culturally relevant pedagogy and culturally responsive teaching. While both practices have been suggested as strategies for meeting the diverse learning needs and interests of students, the research shows that is not much information on how to effectively implement the practices in the mathematics classroom. For that reason, the literature review served as the basis for conducting research with mathematics teaching in order to gain insight into how they understand culturally relevant pedagogy and culturally responsive teaching. Furthermore, I wanted to understand how their conceptualization of the practices informed their teaching practices. The research questions for this study were designed with the intention of furthering research on culturally relevant and responsive teaching practices in the mathematics classroom.
Chapter Three

Methodology

This study was a qualitative study designed to investigate how middle school math teachers understand culturally relevant and responsive teaching practices as well as how their understanding impacts their teaching practices. The purpose of this chapter is to describe the methodology that was employed in this study including: research design, rationale, setting, participants, sources of data, analysis of data, and subjectivity. Each is detailed in the sections that follow.

Research Design

The research study focused on middle school math teachers in an urban school district in the Midwest region of the United States. The methodology that was used was qualitative. Qualitative research aims to “make sense of actions, narratives, and the ways in which they intersect” (Glesne, 2011, p. 1). This study strived to make sense of the teachers’ actions in mathematics classroom through the implementation of various methods: a survey, in-depth interviews, and document collection. Through description, analysis, and interpretation, the researcher strived to share how teachers’ understanding of culturally relevant pedagogy and culturally responsive teaching intersect with their teaching practices.

According to Creswell (2012), qualitative research is conducted when “a problem or issue needs to be explored” (p. 47). In this study, the problem that was explored is how middle school math teachers understand culturally relevant pedagogy and culturally responsive teaching. The main focus of the research was to uncover whether the lack of concrete examples of math teachers implementing culturally relevant and responsive
teaching practices is due to a lack of understanding about these practices or a deliberate disregard for the importance of implementing culturally relevant and responsive teaching practices. Furthermore, I wanted to gain insight into how teachers’ understanding of culturally relevant and responsive teaching impacts their overall teaching strategies. The following research questions guided this study:

- Researcher Question 1: In what ways do math teachers understand culturally relevant pedagogy and culturally responsive teaching?
- Research Question 2: In what ways do teachers’ understanding of culturally relevant pedagogy and culturally responsive teaching impact the conceptualization of their teaching strategies?

**Rationale**

Creswell (2012) observed that qualitative research allows for a detailed and deep understanding of an issue, which can only be accomplished by “talking directly with people, going to their homes or places of work, and allowing them to tell the stories unencumbered by what we expect to find or what we have read in the literature” (p. 48). In this study, the researcher surveyed and interviewed each participant in order to gain insight into how they understand culturally relevant pedagogy and culturally responsive teaching.

Qualitative researchers go through an “inductive-deductive logic process” when analyzing data. The inductive process is when researchers “build their patterns, categories, and themes from the ‘bottom up,’ by organizing the data inductively into increasingly more abstract units of information” (Creswell, 2012, p. 45). I used interview transcripts to develop categories and themes within and across interviews. The deductive
process is when researchers “build themes that are constantly being checked against the data” (Creswell, 2012, p. 45). Once categories and themes were developed, I referred back to interview transcripts to make sure that there was evidence to support the findings. Ultimately, the inductive and deductive logic process led me to compose an account of the participants’ understanding of culturally relevant pedagogy and culturally responsive teaching.

Waddell (2014) points out that research on mathematics teaching practices has focused mostly on how preservice teachers “learn high level and critical mathematical practices” (p. 4). While information gathered from such studies is important for the field of mathematics education, there is also a need for research that looks at the teaching practices of in-service teachers (Waddell, 2014). Consequently, I focused on how current practicing teachers understand culturally relevant pedagogy and culturally responsive teaching. Furthermore, I wanted to uncover how the teachers’ understanding impacts the teachers’ practices. Information gathered from this study could be used to inform preservice and in-service providers of professional development on how to support mathematics teachers to implement practices that are culturally relevant and responsive.

Setting

Creswell (2012) describes the process of data collection in qualitative researcher as a “‘circle’ of interrelated activities” (p. 145). One of these activities is locating a site for the study. The study was conducted in an urban school district in Northwest Ohio. I chose to conduct my study in that school district because the school district is culturally diverse. As of 2013, the student population was 22,277 with 59% of those students being minority students (Ohio Department of Education, 2014).
According to Oakes (1990), during the elementary years many students of color “differ in small, but important ways from those of their more advantaged or white peers” (p. 25). These differences include lack of access to appropriate resources, high-quality mathematics instruction, and highly qualified teachers. When students reach the secondary level, the differences between these groups of students are even more significant. There is a need to understand why this change occurs between students’ elementary and secondary years of schooling. In order to do so, there needs be an exploration of how students, especially those from culturally diverse backgrounds, experience mathematics learning in middle school. Oakes (1990) explains that the manner in which students experience learning “is determined largely” by the following: the teacher’s learning goals, the resources that the teacher uses, the teaching background and training of the teacher, and the support available for the teacher.

In this study, I wanted to focus on the resources and practices that teachers use in order to support the learning of students from culturally diverse backgrounds. Specifically, how mathematics teachers incorporate the cultural backgrounds and lived experiences of their students into the teaching that goes on in the classroom. For that reason, this research study focused on how middle school math teachers conceptualize culturally relevant and responsive teaching practices as well as how that impacts their teaching practices. The school district in which this study was conducted has 41 K-8 schools.

**Participants**

Once the researcher has selected a site to conduct his or her research, the researcher must then decide the type of sampling that will be used (Creswell, 2012).
While there are several forms of sampling that are utilized in qualitative research, I used “snowball sampling” to identify four participants. Snowball sampling is used when the researcher seeks to obtain “knowledge of particular cases from people who know people who meet research interests” (p. 45). Since the goal of this study was to obtain information from middle school mathematics teachers who teach culturally diverse student populations, I asked professors and colleagues to identify potential participants for the study. The following criteria were used to identify participants: (a) current middle school mathematics, (b) at least two years of teaching experience in the same school, and (c) currently teaching in a culturally diverse school. I asked for potential participant contact information and used that to follow-up with interested participants. In the table 1 is an overview of teacher and school demographics from the study.

Table 1.

**Teacher and School Demographics**

<table>
<thead>
<tr>
<th>Teacher Name</th>
<th>Grade Level</th>
<th>Number of Years Teaching</th>
<th>Asian</th>
<th>Black</th>
<th>White</th>
<th>Native American</th>
<th>Latino</th>
<th>Multiracial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kristie</td>
<td>6</td>
<td>2</td>
<td>&lt;10</td>
<td>7%</td>
<td>57%</td>
<td>0%</td>
<td>27%</td>
<td>8%</td>
</tr>
<tr>
<td>Michelle</td>
<td>7 &amp; 8</td>
<td>39</td>
<td>&lt;10</td>
<td>7%</td>
<td>57%</td>
<td>0%</td>
<td>27%</td>
<td>8%</td>
</tr>
<tr>
<td>Angela</td>
<td>7 &amp; 8</td>
<td>11</td>
<td>3%</td>
<td>35%</td>
<td>48%</td>
<td>0%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Elizabeth</td>
<td>7 &amp; 8</td>
<td>2</td>
<td>0%</td>
<td>58%</td>
<td>22%</td>
<td>0%</td>
<td>9%</td>
<td>11%</td>
</tr>
</tbody>
</table>

**Sources of Data**

I began collecting data on May 4, 2015 and ended on June 4, 2015. During that time, I met with each participant to discuss the informed consent form, administered the survey with each participant, and conducted an in-depth interview with each participant.
Initially, each participant completed a survey about culturally relevant pedagogy and culturally responsive teaching practices. I then reviewed the participants’ survey responses and used that to create an interview protocol for use during the in-depth interviews. Each participant was asked to sign an IRB-approved informed consent form that detailed the goals of the study as well as information about how participant confidentiality would be maintained. The informed consent form also included a statement that participants could withdraw from the study at any time without any penalty. Each participant was given a pseudonym prior to completing the survey.

Typically qualitative researchers collect “multiple forms of data, such as interviews, observations, and documents, rather than rely on a single data source” (Creswell, 2012, p. 45). In this study, the researcher administered a survey and conducted an in-depth interview. Each source of data served as “one piece of the ‘puzzle,’ with each piece contributing to the researchers’ understanding of the whole phenomenon” (Baxter and Jack, 2008, p. 554). The survey identified how participants understand culturally relevant and responsive teaching practices while the interview served as evidence of how the teachers’ understanding impacts their teaching practices.

Surveys were administered one-on-one. Participants were first asked to respond to questions about their demographics such as racial background, degrees attained, years of teaching experience, and gender. The remainder of the survey focused on teachers’ current use of culturally relevant and responsive teaching practices. Questions on the survey were developed using Siwatu’s (2007) Culturally Responsive Teaching Self-Efficacy (CRTSE) and Culturally Responsive Teaching Outcome Expectancy (CRTOE) scales as well as information gathered during the literature review. Siwatu developed the
two scales using his work with culturally responsive teaching competencies from 2006 and Bandura’s work with self-efficacy construct from 1997 (Siwatu, 2007). The scales developed by Siwatu also reflect Ladson-Billings’ framework on culturally relevant pedagogy and Gay’s framework on culturally responsive teaching.

In order develop the CRTSE and CRTOE scales, Siwatu (2007) began by conducting an in-depth literature review to identify competencies that reflect culturally responsive teaching practices. An example of a competency that he identified is:

Culturally responsive teachers understand the cultural contributions of the cultures represented in the classroom. These contributions include those made to civilization, history, science, math, literature, arts, and technology. Culturally responsive teachers use this knowledge to design culturally relevant curricula and instructional activities (p. 1090).

Siwatu (2007) used face validity to identify 27 competencies and then wrote self-efficacy and outcome expectancy beliefs that represented each of the 27 competencies. Using the previous competency, Siwatu (2007), wrote the following belief statements (p. 1090):

1.) I am able to teach students about their cultures’ contributions to science.

2.) I am able to design a lesson that shows how other cultural groups have made use of mathematics.

After writing the belief statements, Siwatu (2007) then administered the scales with 275 preservice teachers. All participants were enrolled at teacher education programs at two universities in the Midwest. After administering the scales and completing a (descriptive analysis and?) factor analysis, Siwatu (2007) found that there was 0.96 internal reliability
on the CRTSE scale and 0.95 internal reliability on the CRTOE scale. Both reliability scores were based on Cronbach alpha.

Prior to the implementation of this study, the survey and interview protocol were piloted with a sample of middle and high school teachers. The survey from the pilot study (see survey in Appendix A) included belief statements that were modified from Siwatu’s (2007) CRTSE and CRTOE scales (see appendix A). One way that the belief statements were modified was that they were worded to focus on the mathematics classroom by including the statement “As a mathematics teacher” before each statement. Another way that the belief statements were modified was that some statements from the CRTSE scale were combined with a statement from the CRTOE to create a new belief statement. Participants were asked to rate 15 belief statements using the following ratings: Agree, Disagree, or Unsure. After administering the survey, I conducted an in-depth interview with each participant. I entered each interview with an interview protocol (see interview protocol in Appendix B).

After administering the survey and conducting an in-depth interview with each participant in the pilot study, I reviewed each survey to identify how many times each participant marked Agree, Disagree, or Unsure. I then reviewed interview responses for each participant to identify overall themes and patterns that emerged within each case and across cases. Overall, I found that when asked to identify culturally relevant and responsive teaching practices, some participants weren’t able to give me concrete examples. However, when I looked at their survey responses, participants marked that they are able to “model culturally responsive practices for my students.” I also found that most participants indicated that they “provide learning opportunities that empower all my
students”. When asked to provide examples on how they do that in the classroom, participants weren’t able to give me concrete examples.

Based on the results from the pilot study and conversations with my committee members, I modified the survey and interview protocol in several ways. First, I added a section that collected background information on each participant. Second, I changed the original survey questions to be more specific to culturally responsive pedagogy rather than attitudes about culturally responsive pedagogy. In that section, I also changed the ratings to be on a 4-point Likert scale. Third, I added a section in which teachers were presented with a scenario and they identified or provided an answer of how they would respond in that scenario. Fourth, I added a section in which teachers were provided with 14 teaching practices and they were to identify practices that they believe to be culturally relevant and responsive teaching practices. In that same section, teachers were also asked to provide an example of how they have implemented culturally relevant and responsive teaching practices. Lastly, I modified the interview protocol to include questions that asked teachers to explain their understanding of culturally relevant and responsive teaching practices as well as share examples of how they have implemented those teaching practices in their classroom. The survey and interview protocol that was used in this study are in Appendix C and Appendix D.

The purpose of the demographic and academic background information section was to obtain general information about each participant. Questions included in this section asked participants for information about their racial or ethnic background, gender, educational degrees, and teaching experience. Some questions were close-ended. An example of a close-ended question that was included in this section is: “Have you had
experience teaching math at other grade levels?” Other questions were open-ended. An example of an open-ended question that was included in this section is: “How do you racially or ethnically identify yourself?”

After completing the section on demographic and academic background information, participants were asked to respond to 16 close-ended questions. Those questions asked participants to respond to questions regarding their current use of culturally responsive teaching strategies on a scale of 1-4 with 1 being strongly disagree and 4 being strongly agree. A 4-point Likert scale was chosen so that participants were forced to lean one way or another on the scale. Examples of questions found on the Likert questionnaire are: “I value the lived experiences and prior knowledge that students bring to the classroom” and “I adapt instruction to meet the learning needs of my students.”

After answering the 16 close-ended questions, participants then responded to 9 multiple-choice questions. Each question focused on one of the three tenets of Ladson-Billings framework for culturally relevant pedagogy: academic achievement, cultural competence, and social consciousness. An example of a multiple-choice question on the survey is: “Students in your class don’t seem to understand the examples that you are using to explain a mathematical concept”. Participants chose one of three answer choices or filled in an answer of their choice on how they would respond in that situation. One of the three answer choices in each question is a culturally responsive teaching practice as defined by Ladson-Billings (1995) and Gay’s (2002) frameworks. As previously stated, teachers who implement culturally responsive teaching practices aim to meet the goals of culturally relevant pedagogy. For that reason, the frameworks of Ladson-Billings and Gay were both used to create the multiple-choice portion of the survey.
In the final section of the survey, participants were presented with a list of 14 teaching practices and were asked to identify the practices that are culturally relevant and responsive. These practices are taken from literature about culturally relevant and responsive teaching practices. In that same section, participants were also asked to give an example of how they have used a teaching practice that is culturally relevant and responsive.

Since the objective of this research study was to generate a detailed description of middle school mathematics teachers’ understanding of culturally relevant pedagogy and culturally responsive teaching, the researcher conducted an in-depth follow-up interview with each participant. Bailey (2013) states, that interviews are a “two-way interaction inherent in the methodology provides a non-threatening environment where researcher and participants can share and explore the issues more extensively and openly” (p. 236). When setting up a time to conduct interviews I made sure that it wouldn’t disrupt the participant’s daily routine but that it was at a time that was convenient for the participant. I conducted interviews one-on-one during participant’s planning time, after school or teacher workday. I also made sure that interviews were conducted in an environment that was comfortable for the participant. All interviews were conducted in participants’ classrooms.

Interviews are an important aspect of a qualitative research because they provide insight into the participant’s experience. The participant is able to share his or her story but the interviewer must create a comfortable and open space for the participant to do so. According to Chan et al. (2013) when the interviewer doesn’t create the proper space or ask the right questions then it can prevent the collection of rich data. Through the use of
semi-structured interviews, the researcher listens to the participant and asks questions that are “focused” but not “leading” about their experience.

Glesne (2011) states that researchers who use semi-structured interviews enter the interview with a set of questions but that the researcher leaves room for questions to “emerge” during the interview process. Furthermore, the researcher “may add to or replace pre-established” questions (p. 102). In this study, I entered each interview with a set of questions for each participant to answer. For example, “What is your understanding of culturally relevant pedagogy?” However, I allowed for the development of other questions during the interview that provided opportunity for participants to elaborate on their responses. While I realized that the focus should remain on obtaining information related to the research questions, I also realized prior to the interviews that there is unexpected information that may be uncovered during the interview.

Chan et al. (2013) suggest the use of probing questions when there is a need for “clarification or elaboration of what participants are saying or when the participant might forget or not think of some important information” (p. 5). An example of a probing question in this study is: “What are some examples of how you implement culturally relevant pedagogy?” By preparing an interview protocol, I ensured that questions regarding the research goals were covered during the interview but that participants were allowed to bring up ideas that I may not have thought about.

Bailey (2013) proposes the use of in-depth interviewing as a way to “gather the participants’ experiences through their personal stories and reflections” (p. 237). In addition to asking probing questions for elaboration on participants’ responses, participants were also asked to share concrete examples to support their responses. Thus,
the interviews conducted during this study were semi-structured. The interviews should lasted between 45-60 minutes.

In order to capture a true representation of the participants’ interview responses, each interview was audio-recorded using a digital voice recorder. Once all interviews were conducted, each interview was transcribed for use during the data analysis process. In addition to the audio recordings, I also recorded field notes of the participants during the interview. These field notes included information about participants’ body language, level of comfort, and facial expressions.

**Analysis of Data**

The process of data analysis in qualitative research isn’t linear or fixed. The researcher begins the process with a set of data (i.e. text or images) and ends with an overall description of the data. However, during the process, the researcher “touches on several facets of analysis and circles around and around” (Creswell, 2012, p. 182). Throughout the process, the researcher is going back and forth between the emerging themes or interpretations and data.

Creswell (2012) recommends that a qualitative researcher begin the data analysis process by organizing his or her data. This step includes the conversion of files into “appropriate text files (e.g., a word, a sentence, an entire story) for analysis by hand or by computer” (p. 182). In this study, I began by transcribing each audio-recorded interview into a word document. While creating each transcript, if a segment was inaudible I replayed the segment three times to try to determine what was said. If the audio was still inaudible, I made a note of that in the transcript.
Once data has been organized, the researcher then explores the entire database. The purpose of this step is for the researcher to “identify major organizing ideas” (Creswell, 2012, p. 184). As the researcher goes through this initial review of the data, he or she can record notes in the margins of transcripts of key ideas or phrases that come to mind. Creswell (2012) suggests that these ideas serve as “initial categories” and the statements in the data serve as evidence to support each idea. In this study, I reviewed each interview transcript and identified significant statements. As I identified significant statements, I highlighted each statement and recorded notes in the margins of the transcript. The notes were general statements that captured the meaning of the statement.

After the researcher has done an initial review of the data, the researcher then begins to describe, classify and interpret the data. Creswell (2012) explains that it is during this step that qualitative researchers “build detailed descriptions, develop themes or dimensions, and provide an interpretation in light of their own views or views of perspectives in the literature” (p. 184). This is done by identifying codes, using the codes to develop themes, and then using the themes to create an overall description of the data. After completing an initial review of the data (identifying significant statements and recording notes), I used the notes to identify initial categories. These categories served as the “big ideas” that were then broken down into smaller categories that served as codes. Once each statement was attributed with a category, I then assigned each statement to a code.

There are several sources from where code labels can emerge (Creswell, 2012). Creswell offers that some codes are “exact words used by participants” (in vivo codes) while others might be “drawn from social or health sciences,” and others still might be
“names the researcher composes that seem to best describe the information” (p. 185). In this study, the codes were generated from the Ladson Billings’ (1995) framework on culturally relevant pedagogy and Gay’s (2002) framework on culturally responsive teaching. In the table below are the codes that were used for this study.

Table 2.

Codes of Culturally Relevant Pedagogy and Culturally Responsive Teaching

<table>
<thead>
<tr>
<th>Codes</th>
<th>Academic Achievement</th>
<th>Cultural Competence</th>
<th>Social Consciousness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Instructional materials</td>
<td>Language</td>
<td>Real-world applications</td>
</tr>
<tr>
<td></td>
<td>Instructional resources</td>
<td>Awareness of differences</td>
<td>Addressing societal inequities</td>
</tr>
<tr>
<td></td>
<td>Communication styles</td>
<td>Respect of differences</td>
<td>Development of critical lens</td>
</tr>
<tr>
<td></td>
<td>Individual growth</td>
<td>Culturally familiar</td>
<td>Exploring multiple perspectives</td>
</tr>
<tr>
<td></td>
<td>Learning needs</td>
<td>Diverse mathematical contributions</td>
<td>Culturally relevant curricula</td>
</tr>
<tr>
<td></td>
<td>Cooperative learning groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peer coaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manipulatives</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Learning styles</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Once each teacher statement was assigned a code, I then classified them into themes. According to Creswell (2012) the process of classification during coding “involves identifying five to seven general themes” (p. 186). He explains that the themes “are broad units of information that consist of several codes aggregated to form a common idea” (p. 186). Since the codes used in this study were developed from Ladson-
Billings’ (1995) framework on culturally relevant pedagogy and Gay’s (2002) framework, the codes were sorted according to the themes in each framework. The themes were then used to create an overall meaning for each participant as well as across participants. Ultimately, I wanted to describe in what ways middle school mathematics teachers understand culturally relevant and responsive teaching and how their understanding impacts their teaching strategies. In the table below are the themes and subthemes that were used for this study.
### Table 3.

**Themes and Sub Themes of Culturally Relevant Pedagogy and Culturally Responsive Teaching**

<table>
<thead>
<tr>
<th>Codes</th>
<th>Sub Themes</th>
<th>Themes</th>
</tr>
</thead>
</table>
| **Academic Achievement** | • High expectations and demand of academic excellence for all students  
• Support students to set as well as meet academic goals  
• Evaluate instructional materials and resources for their “multicultural strengths and weaknesses”  
• Incorporate instructional materials and resources that are representative of the diversity that exists within and across cultural groups  
• Create learning environment that does not intellectually silence students  
• Recognize differences in communication styles among students  
• Implement practices that support the diverse communication styles of students  
• Understand and appreciate students’ differences in learning styles  
• Incorporate instructional practices that support the diverse learning styles of students (i.e. cooperative learning groups, peer coaching, autobiographical case studies and fiction, motion, and movement)  
| **Cultural Competence** | • Expand knowledge about other groups  
• Go beyond awareness and respect of cultural differences  
• Encourage students to maintain their cultural integrity as they aim for academic excellence  
| **Language**  
• Awareness of differences  
• Respect of differences  
• Culturally familiar  
• Diverse mathematical contributions | **Creation of learning environment that supports diverse learning needs and interests of students**  
**Awareness and attention to diverse communication styles of students**  
**Implement instructional practices that reflect the diverse learning styles of students**  
**Development of knowledge base about cultural diversity** |
<table>
<thead>
<tr>
<th>Social Consciousness</th>
<th></th>
<th>Implement culturally relevant curricula</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Real-world applications</td>
<td>• Connect mathematical content to students’ cultural experiences</td>
<td></td>
</tr>
<tr>
<td>• Addressing societal inequities</td>
<td>• Empower students to develop critical lens and apply their mathematical understanding to the world around them to change societal inequities</td>
<td></td>
</tr>
<tr>
<td>• Development of critical lens</td>
<td>• Implement learning opportunities for students to explore multiple perspectives</td>
<td></td>
</tr>
<tr>
<td>• Exploring multiple perspectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Culturally relevant curricula</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

59
Subjectivity

As a former math teacher and a student who has studied culturally relevant and responsive teaching, I had to be mindful of my own biases during the study. These biases are caused by the personal experiences of the researcher. Xu et al (2012) offer the use of peer debriefing as a way to “minimize potential bias” (p. 133). As a result, the researcher shared her initial findings with colleagues and professors. The purpose of sharing initial findings was to garner feedback about areas that may have needed clarification or elaboration. Since the ultimate goal of the study was to capture and share the participants’ understanding of culturally relevant pedagogy and culturally responsive teaching, it was important to check whether the findings from the study were truly reflective of the voices of the participants in the study (Xu et al, 2012).

Summary

For this study, I used the procedures of qualitative research to collect data on four middle school math teachers. The purpose of the study was to uncover middle school math teachers’ understanding of culturally relevant and responsive teaching practices as well as how that influences their teaching practices. In order to gain insight about teachers’ understanding, I administered a survey and conducted an in-depth interview with each participant.

This chapter described the methods that I used in this study and was organized in the following manner: research design, rationale, setting, participants, sources of data, analysis of data, and subjectivity. In the next chapter, I will share my findings from the study.
Chapter Four

Findings

In this chapter, the findings from this study will be presented in five parts. The first 4 parts will present findings from each participant and the fifth part will present a comparison of the four participants. This study included four middle school teachers who are all female and self-identified as White or Caucasian. Their teaching experiences ranged from 2 to 39 years.

Part 1: Kristie’s Understanding of CRP and CRT

The first teacher that I surveyed and interviewed was Kristie. She currently teaches 6th grade and has two years of teaching experience. She racially/ethnically identifies as White. I met with Kristie during her planning period. She was very welcoming and inviting. As we settled down for the interview, she pointed out some of her students’ work and she gave me a quick tour of her classroom. The walls in her classroom were adorned with colorful posters of classroom rules and procedures and math information as well as student work. Student desks were organized in rows and columns with her desk at the front of the classroom. There were also 3 classroom computers lined up on the right side of the classroom.

In section 1 of the survey, Kristie positively affirmed 5 out of 6 statements and negatively affirmed 1 out of 6 statements dealing with academic achievement. In section 1 of the survey, Kristie positively affirmed 5 out of 5 statements dealing with cultural competence. In section 1 of the survey, Kristie positively affirmed 5 out of 5 statements dealing with social consciousness. In section 2 of the survey, Kristie chose or provided a culturally responsive teaching strategy 6 out of 9 times when presented with a classroom
scenario. In section 3 of the survey, Kristie was presented with 14 teaching practices and asked to identify practices that are culturally relevant and responsive. 9 out of the 14 practices were culturally relevant and responsive teaching practices. She correctly identified 4 out of the 9 practices. 5 out of the 14 practices were not culturally relevant and responsive teaching practices. She identified 1 out of the 5 practices as culturally relevant and responsive.

**Academic Achievement**

*Creation of learning environment that supports diverse learning needs and interests of students*

Teachers who are culturally responsive recognize that each student in their classroom has different learning needs and interests. With that understanding, the teacher focuses on creating a learning environment that focuses on the individual growth of each student. Kristie understands and appreciates the individual learning needs that each student brings to her classroom. For that reason, she strives to implement practices that focus on the individual growth that students are making as they work to meet academic goals. When discussing the various tools that she uses to assess student learning, she explained that while some assignments are graded for accuracy, there are some that are not (see transcript in Appendix E). Rather than merely focusing on the accuracy of student responses, Kristie uses student mistakes and misconceptions as opportunities for meaningful learning experiences. In fact, she pointed out that some assignments such as student investigations are “graded for effort and sort of what was your approach and does it make sense and where did we go wrong? So we use those as a way to see where the misconceptions are, where the confusion is.” Rather than looking at students’ weaknesses
as a deficit, Kristie uses them as learning opportunities to help students discover their mistakes and learn from them.

In addition to supporting students overcome their weaknesses, Kristie also shared a strategy that she uses for students who master concepts before their peers. She shared, “I do a lot with my students who have shown me repeatedly that they have mastery. We put them in completely different skill areas so they move ahead of us on the computer and work with different math programs online to advance so they’re not stuck and spinning wheels.” Instead of limiting the learning potential of students or ignoring the learning struggles of students, Kristie strives to create a learning environment that is supportive of the individual learning needs and growth of students.

When creating a learning environment that supports the individual learning needs of students, teachers must also equip students with tools to support their learning. During a discussion on the various ability levels of students, she offered “I was gifted from my principal with these fraction calculators [pulls out calculator], which allow students to perform calculations with fractions, and I did give these to specific students who really, really struggled to help get them through their assignments. Those that struggled plowed through with the help of these and completed the assignment that they otherwise would never have turned in.” By providing students with appropriate learning tools, Kristie is able to support her students toward meeting academic goals.

**Awareness and attention to diverse communication styles of students**

A teacher who supports culturally responsive teaching practices recognizes differences in communication styles among students and implements practices to support those communication styles. When discussing strategies for meeting the diverse needs of
students, Kristie shared that for “students who have a stronger understanding of maybe a first language, providing the activity in that language.” She also discussed strategies for working with parents of ELL students. She shared, “I do have parents who struggle with English as a second language and therefore are much more comfortable with Spanish as a first language and will often pair them up with one of our interpreters in the building so that when we are meeting and talking about their student’s progress. That’s more of a culturally responsive technique when you are dealing with parents but it inevitably helps the student because then the parents understand what we are doing. I have a parent who comes in to my classroom and will sit side by side with her son during math instruction in an attempt to learn it herself so she can help him but then also she can receive communication from him about how we are completing these math problems so when he gets home she understands because she doesn’t read English.” Rather than seeing the differences in communication styles as a deficit Kristie is able to implement practices that support the diverse communication styles of her students while still demanding academic excellence.

Implement instructional practices that reflect the diverse learning styles of students

Teachers who implement culturally responsive teaching practices implement practices that support the diverse learning styles of students. Kristie shared that she implements instructional strategies to support those styles. She shared that in addition to using food as manipulatives, “We use string at one point, we use rubber bouncy balls, there’s a variety of manipulatives we can use that the text actually requires to complete the different investigations.” Kristie is able to implement learning tools that are
appropriate in supporting her students learn new content while working toward meeting academic goals.

In addition to incorporation various tools for learning, she also shared that she uses a variety of assessment tools to assess her students’ learning. She offered, “at the end of each text, I try to infuse a project. So we sort of do a practical application of what we’ve learned because the texts themselves are very specific to a skill set. So one text would include for example all the operations with fractions, adding, subtracting, multiplying, and dividing and then you move on to a new text. At the end of that text, we did a project with those different skill sets” and “I always do, I guess I’d call it a standard paper, pencil test, a formal assessment where I really look at…a summative assessment would be the way to say that. Formatively we assess by turning in all of our investigations, they’re not graded entirely on accuracy.” She also shared, “I happen to have a lot of students who are interested in drawing and creating and things like that. And as you can see [points to student drawings behind her desk] so I try to focus on those skills and that drive and kind of infuse that into the project because if it is not interesting then it’s boring.” The implementation of various learning tools and assessments in the classroom demonstrates Kristie’s understanding and appreciation of the diverse learning styles of her students.

Teachers committed to supporting the academic needs of all students provide students with multiple opportunities to learn content. For students who are struggling to understand the material, Kristie provides additional support outside the classroom to meet their needs (see transcript in Appendix E). She explained that those students come to her classroom during lunch and it is an opportunity for some students to “get over the
frustration or the confusion of not wanting to ask questions in class or not comfortable.” She also added that for some students it is an opportunity to get a “second shot to get something figured out if they couldn’t figure it out during the regular class period. And it’s a smaller group so they get a little bit more individualized attention.” In addition to offering additional support for students who are struggling, Kristie also relies on multiple sources for additional practice. When asked to share her primary sources for teaching content, Kristie shared that she relies heavily on the “Connected Math” textbook series but also relies on other sources to support her students’ learning needs. She remarked, “I do frequently go out on my own and find extra practice activities because I find unfortunately that some of our students need additional practice like we’ve exhausted the text and the options there.” By providing her students with multiple opportunities to learn new content, Kristie is able to support her students to meet academic goals.

**Cultural Competence**

*Development of knowledge base about cultural diversity*

Teachers who demonstrate cultural competence must go beyond an awareness and respect for cultural differences. Teachers must implement classroom practices that support students to maintain their cultural integrity as they aim for academic excellence. When discussing ways in which she supports her ELL students, she shared, “when you have students who have a stronger understanding of maybe a first language, providing the activity in that language.” She went on to point out that while she doesn’t have students who struggle with English as a second language, she does have parents who do. As stated in the previous section, Kristie shared an example of a parent who comes to her class during instruction in order to learn the math content so that she can help her son at home.
Rather than looking at the language barrier as a deficit, Kristie creates a learning environment that is supportive of the cultural differences.

In addition to encouraging students to maintain their cultural identities as they strive for academic excellence, a culturally responsive teacher allows students to share strategies and tools that are culturally familiar. When asked if she allows students to bring in and share manipulatives or learning tools that they use at home or in their communities, Kristie said, “That would be awesome. I’ve just never had it happen. I’ve never had a student make a suggestion about what might make the learning easier or what they themselves did to understand the material.” Kristie’s willingness to incorporate learning tools that are culturally familiar to her students shows that she is willing to go beyond the use of examples that are reflective of the dominant culture. Furthermore, it demonstrates that she is willing to expand her knowledge of other cultural groups.

**Social Consciousness**

**Implement culturally relevant curricula**

A teacher who is culturally responsive implements curricula that connect content to the cultural experiences of students. When asked to explain how she connects the mathematical content that is taught in the classroom to students’ lives, Kristie pointed out that many of her students “have limited experiences so we center the vast majority of our learning around the city setting.” She went on to explain that “A lot of what we do is fractions and decimals and percentages, which can all be linked back to an experience at your local carryout where you maybe have this amount of money and you want to go buy these items and how is it going to work? And can we make it work? So
that’s a really simple comparison for us to use and we use it all the time in our classroom.” By connecting the content to students’ everyday experiences, students are able to see that they can apply the content to areas beyond the classroom.

An important part of effectively implement culturally responsive teaching practices is the ability to evaluate the relevance of activities to students in your classroom. When talking about implementing activities that are connected to the lived experiences of students, Kristie remarked, “I used to think it was important to make a connection and whether it’s something they’ve experienced yet or not, it was still relevant. So to say ‘you know someday you’re going to want to go buy a car and it’s going to matter how much interest you’re paying on your loan’ and then I read an article very recently that suggested that that’s actually insulting your students.” She went on to elaborate on her point by pointing out that “suggesting that you know I’m going to teach you something that you have no use for yet, it’s not even relevant to you yet, and in many situations, many of our students’ parents don’t have cars so now you’re talking outside of their own life experience which is just way too far out there.” Through her own reflection, she reached a point where she is beginning to “rethink” what it means to incorporate activities and tasks that connect to students’ lives.

Teachers who foster the development of social consciousness provide learning opportunities in which students are able to take mathematical concepts learned in the classroom and apply them to societal issues. Although Kristie doesn’t currently do so, she recognizes the importance of doing so. She shared, “our children just aren’t engaged in enough practical, hands-on activity at home to be able to apply anything that they are learning to really understand math and number relationships and I have to somewhat
agree with that … there’s just so many applications for math that have kind of gone by the wayside, at least it seems, I could be missing something big but they’re not doing any of that at home.” When asked if she has taken the opportunity to take mathematics learning outside the classroom with her students, she said, “To even begin to structure any kind of activity outside of these four walls, it’s overwhelming to me. I, in fact, just learned recently that teachers plan fieldtrips that might sound ridiculous but nobody tells you that. Nobody tells you how a fieldtrip comes to life until you’re a teacher in a building and your students ask and you ask someone else and then you start to get information. And I’m not to a point yet where I’m confident enough, especially with the 6th graders.”

A culturally responsive teacher recognizes the rich knowledge that students bring with them to the classroom but also uses the community and its members as resources to bridge school content to community experiences. While Kristie doesn’t currently partner with community members, she did express interest in doing so in the future. She commented, “I would be way open to having someone come in but finding those resources is always interesting too.” She continued by sharing the following concerns, “How do teachers find people to come into the building? And what is the process for getting them in safely and knowing that they are okay to enter a school and be in the company of children?” She also expressed here lack of confidence in effectively connecting the math content to outside classroom experiences. She remarked, “I don’t know that I’m there yet with understanding the content enough to say ‘okay, how can we take these concepts and really do something worthwhile in the community and represent ourselves and represent Mrs. K, represent [school name] and do something with math?’”

**Summary of Kristie’s Understanding of CRP and CRT**
While Kristie was able to positively affirm most of the statements in section 1 and choose or provide a culturally responsive teaching strategy in most of the scenarios in section 2 on her survey, her interview responses demonstrate that she has a limited understanding of the practices. Kristie’s interview responses indicate that she does implement some practices that are culturally relevant and responsive but there are practices that are critical to meeting the goals of culturally relevant pedagogy that she doesn’t currently implement. For example, while she positively affirmed all the statements that dealt with implementing culturally responsive teaching strategies for meeting the goals of social consciousness, she wasn’t able to provide concrete examples of how she has implemented experiences for students to use mathematics to question and critique societal issues. Furthermore, in section 2 of her survey, Kristie indicated that she would use examples that are familiar to students when they are struggling to understand mathematical content but didn’t provide an example culturally familiar examples that she uses in her classroom during her interview.

**Part 2: Michelle’s Understanding of CRP and CRT**

The second teacher that I surveyed and interviewed was Michelle. She currently teaches 7th and 8th grade but has had experience teaching math at other grade levels. In the past she has taught 2nd through 6th grade also. Michelle has 39 years of teaching experience. Before sitting down to conduct the interview, Michelle mentioned that she had previously retired from teaching but had returned the previous year after being asked by her principal to do so. She also mentioned that she would be retiring in a few weeks. She racially/ethnically identifies as Caucasian. I met with Michelle during her planning period. She met me in the front office and we walked up to her classroom together. As we
walked to her classroom, we had small talk about our day and the upcoming testing period. Once we arrived to her classroom, she gave me a brief tour of her classroom. She pointed out students’ work on the wall, laptop cart, and student notebooks. The student desks in her room were organized in groups of 3-4 and her desk was at the front of the classroom. Along the left side of the classroom were 4 student computers.

In section 1 of the survey, Michelle positively affirmed six out of six statements dealing with academic achievement. In section 1 of the survey, Michelle positively affirmed five out of five statements dealing with cultural competence. In section 1 of the survey, Michelle positively affirmed five out of five statements dealing with social consciousness. In section 2 of the survey, Michelle chose or provided a culturally responsive teaching strategy seven out of nine times when presented with a classroom scenario. In section 3 of the survey, Michelle was presented with 14 teaching practices and asked to identify practices that are culturally relevant and responsive. Nine out of the fourteen practices were culturally relevant and responsive teaching practices. She correctly identified seven out of the nine practices. Five out of the fourteen practices were not culturally relevant and responsive teaching practices. She identified two out of the five practices as culturally relevant and responsive.

**Academic Achievement**

*Creation of learning environment that supports diverse learning needs and interests of students*

Michelle appreciates the individual learning needs that each student brings to her classroom. As a result, she focuses on the individual growth that students make throughout the year. She stated, “I have kids of varying abilities. I have kids, if I can
show growth in all of them and that’s all that’s really expected of me. That’s all that should be expected of me.” For Michelle, she recognizes that emphasis should be placed on the individual growth that students make during the learning process. For that to happen, she meets each student where they are and supports them in setting as well as meeting academic goals.

The creation of a learning environment that doesn’t “intellectually silence students” is an important component for ensuring the academic achievement of all students. Michelle creates an environment in which students are able to share and explore multiple perspectives. When asked how she accounts for the different ways in which individuals approach mathematical tasks, Michelle shared, “So I can remember different ways of doing things so when I have a topic like that, I’ll show them another way to do it or another way to do it. And then it’s always the case that you’ll have a kid in the class that says “I didn’t do it that way. I did this.” And I say, “Here, right here. Show them what you did. We’re all going to watch and see how you did it.” And the kids will say “Oh.” Then I’ll go over the three ways we just did it and I’ll do it again.” Michelle recognizes that mathematics isn’t a universal language and while there might be only one correct answer to a problem, there can be different approaches to solving that problem.

**Awareness and attention to diverse communication styles of students**

A teacher who supports culturally responsive teaching practices exhibits awareness and attention to the diverse communication styles of his or her students. In order to create a learning environment that doesn’t intellectually silence students, Michelle implements practices that support the diverse communication styles of students. She shared, “I’ve had kids that are in my class, brand new to the United States, not a
word of English and I had kids who are very, like I told you, I sit them down next to each other, I’m sitting here, you’re on that side, I’m on this side. I’ll tell what to tell them.”

Rather than ignoring students because of the language barrier, Michelle creates learning opportunities for students to learn the content as well as share their understanding of the content.

**Implement instructional practices that reflect the diverse learning styles of students**

Teachers who implement culturally responsive teaching practices understand and appreciate the diverse learning styles of students. Michelle expressed, “I have kids of varying abilities. I have kids, if I can show growth in all of them and that’s all that’s really expected of me. That’s all that should be expected of me.” She also added, “It’s always the case that you’ll have a kid in the class that says ‘I didn’t do it that way. I did this.’ And I say, ‘Here, right here. Show them what you did. We’re all going to watch and see how you did it.’” Rather than limiting the approaches that students use to solve problems, she shows students a variety of approaches and allows students to share their own approaches.

Teachers who implement culturally responsive teaching practices implement practices that support the diverse learning styles of students. One way that Michelle does this is by utilizing a variety of tools to teach content as well as assess student learning. She stated, “Every quarter I’ll set up two things for them to do on here plus I’ll have a quiz and then I’ll have projects and their notebook so their grade is based on the projects, the notebook, that quiz, and SuccessMaker.” In addition to using multiple tools for assessment, Michelle also incorporates a variety of materials to teach content. She
remarked, “I think a child who doesn’t speak English for example when I told them how to do integers, any integers, I had, I used little bingo chips. And I used red and black. Red were negative and black were positive. And I showed them with the chips what it means to add a positive and negative number and how they cancel each other out. I mean, even if you can speak English, if I put the problem, even if you could not, if I put the problem on the board with the white board and show them with the chips and show them when you carry them up you eliminate them, you slide them off into the cup and what you have remaining on the desk is your result.” By incorporating a variety of learning and assessment tools, Michelle demonstrates that she is committed to supporting each student to meet academic goals.

**Cultural Competence**

*Development of knowledge base about cultural diversity*

A teacher who is culturally responsive not only acknowledges the cultural differences that exist among students but also appreciates those differences in the classroom. Rather than viewing the language differences as a deficit, Michelle views the student’s cultural backgrounds as an asset for learning. Michelle shared, “I’m bringing up these group of learners that are bilingual. You want to talk about a great skill to have. They can flow from one language to another like me washing my hands. And it’s just amazing to me.” By recognizing the rich backgrounds that students bring to the classroom and allowing them to bring that to the classroom, Michelle encourages students to maintain their cultural integrity as they aim for academic excellence.

**Social Consciousness**

*Implement culturally relevant curricula*
A teacher who is culturally responsive implements activities that are culturally relevant. When asked whether the cultural background of a student can have an impact on the mathematical learning that takes place in the classroom, Michelle responded by saying, “Definitely. I mean depending on, you know what you spend money on. If you come from a 3rd world country, I mean you don’t go to the mall you go to the market. If they are given some kind of a situation that is foreign to them that’s going to be difficult for them to learn.” When asked how she would adapt instruction for that student, she answered, “I would just put it in the realm of what they would spend money on and what does money look like in your culture.” By recognizing the influence of one’s culture on the learning that takes place in the mathematics classroom, Michelle is then able to connect mathematical content to students’ cultural experiences.

Michelle promotes social consciousness by bringing in community members to demonstrate the use of mathematics outside the formal classroom. She said, “For the math content, yes people within the community like engineers or doctors or how math is used in their, we had a guy in here that was from Sun Oil, the oil refinery, and talking about how math fits in with working over there.” The inclusion of individuals within the community allows students to realize that mathematics learning isn’t limited to the formal classroom setting but that it is applicable beyond the classroom.

**Summary of Michelle’s Understanding of CRP and CRT**

Although Michelle positively affirmed all of the statements in section 1 and chose or provided a culturally responsive teaching strategy in most of the scenarios in section 2 on her survey, her interview responses demonstrate that she has a limited understanding of the practices. Michelle’s interview responses show that while she is currently
implementing some practices that are culturally relevant and responsive, there are some practices that she indicated on her survey that she isn’t implementing. For example, she indicated that she encourages students to make connections between their home language and academic language but when asked how she does that, she said that she doesn’t. While she allows students to use their home language during small group work or in parent/teacher conferences, she doesn’t implement other strategies for helping students make those connections between home and academic language. Moreover, in section 2 of her survey, Michelle indicated that she would incorporate resources that are reflective of students’ lives. In order for teachers to be able to effectively do this, teachers must also be able to evaluate resources for their “multicultural strengths and weaknesses”.

Michelle’s interview responses don’t indicate that she does this.

**Part 3: Angela’s Understanding of CRP and CRT**

The third teacher that I surveyed and interviewed was Angela. She currently teaches 7th and 8th grade math. She has 11 years of teaching experience and during that time she has also taught 3rd grade. Angela racially/ethnically identifies herself as White. I met with Angela at the end of the school day. She met me in the front office and as we walked to her classroom, she explained that her school had recently implemented an extended day period due to the number of school closings that the school system had experienced. Each day for the last 30 minutes of the day, a couple of the teachers on the hall would supervise students as they waited for dismissal. This duty was rotated among the teachers. As I got out my materials for conducting the interview, she explained to her students that they would be packing up their materials and going to wait for dismissal in the classroom next door. She also reminded students of their homework assignment and
had them turn in their notebooks for grading as they left for the day. As I looked around the classroom, I noticed that student desks were set up in a “U-shape” with groups of 2. In addition to student work on the walls, there were also posters displaying the classroom rules and procedures as well as important dates. Along the sides of the classroom were bookshelves with student textbooks as well as two computers. Angela’s desk was at the front of the classroom.

In section 1 of the survey, Angela positively affirmed 6 out of 6 statements dealing with academic achievement. In section 1 of the survey, Angela positively affirmed 4 out of 5 statements and negatively affirmed one out of five statements dealing with cultural competence. In section 1 of the survey, Angela positively affirmed 3 out of 5 statements and negatively affirmed two out of five statements dealing with social consciousness. In section 2 of the survey, Angela chose or provided a culturally responsive teaching strategy 6 out of 9 times when presented with a classroom scenario. In section 3 of the survey, Angela was presented with 14 teaching practices and asked to identify practices that are culturally relevant and responsive. 9 out of the 14 practices were culturally relevant and responsive teaching practices. She correctly identified 3 out of the 9 practices. 5 out of the 14 practices were not culturally relevant and responsive teaching practices. She identified 3 out of the 5 practices as culturally relevant and responsive.

**Academic Achievement**

*Creation of learning environment that supports diverse learning needs and interests of students*
The creation of a learning environment that meets each student where they are and supports them to grow academically is important. Rather than focusing on accuracy, Angela focuses on the academic growth that students make as they strive to meet academic goals. She commented, “The daily work that they do like what you would consider worksheets, practice worksheets, those I actually only grade for completion. I don’t grade those right/wrong because to me that’s the learning process.” She added, “So they do them, sometimes in partners, sometimes independently and then we go through them. Right then and there they change answers, fix answers, and those are graded more like on an effort basis and on completion.” By focusing on the students’ learning process as they learn content, Angela is meeting students where they are and providing learning opportunities for them to develop in their learning and understanding of the material.

Implement instructional practices that reflect the diverse learning styles of students

Teachers who implement culturally responsive teaching practices incorporate instructional practices that support the diverse learning styles of students. Angela expressed that she utilizes a variety of tools to teach content as well as assess student learning. She remarked that students “have typical tests and quizzes that you would receive just on paper and pencil tests and quizzes. They also are assessed the heaviest, the heaviest assessment they get is what is called their math notebook which is like a portfolio that they keep of their daily notes, lessons. They glue their foldables in there. The vocabulary, graphs, everything they create in class gets taped or glued inside the portfolio. There’s several partner and group projects that we do like all the posters out on the walls out there right now was a major assessment where they were given
quadratic equations for the 8th and linear equations for the 7th and they had to create a story that matched the expression and they had to make the table and the graph and find the factors. So there’s many different ways that they are assessed. The daily work that they do like what you would consider worksheets, practice worksheets, those I actually only grade for completion.” By incorporating a variety of tools for assessing student learning, Angela provides multiple opportunities for students to demonstrate their learning and understanding of the material.

Angela promotes academic achievement by providing students with multiple opportunities to learn content. She remarked, “the one thing with this Connected Math, they don’t give a whole lot of drill and practice and they don’t, it moves too fast so might be done with a particular lesson number but the kids may need 2 or 3 more days of practicing that skill so then I have to pull other things in.” She went on to say, “I pull in computer technology, any types, like understanding the algebra with the fast food menu that you just looked at.”

When asked what types of resources she would like to incorporate if she had an unlimited amount of money, Angela said, “if I had a laptop or an iPad on every desk every day I would use it because that’s the kind of thing that the kids love. Whether it’s webquest or whether it’s using applets for graphing calculators and so unlimited resources that would be the first one I would think of. They still very much enjoy creating and building things so I spend an extensive amount of my own money on art supplies because they like to build the prisms to find the surface area and so I’m like a junk collector and I just collect stuff but if it could be really cool stuff that they could actually build with, I would spend money on that.”
Angela understands and appreciates students’ differences in learning style. When discussing the diverse backgrounds that students bring to the classroom and how she deals with them, she responded, “they will teach each other those techniques that they learned in 4th, 5th, 6th grade or even just ‘my mom made up sentence so I can remember order of operations’ or whatever so they bring things to the table quite a bit and those are always fun to share.” By allowing students to share their own ideas on how they approach a mathematical problem, Angela empowers students to value the knowledge that they bring to the classroom while also encouraging them to appreciate the perspectives of others.

**Cultural Competence**

*Development of knowledge base about cultural diversity*

Teachers who implement culturally responsive teaching practices recognize that students’ cultural identities are an asset to learning. While Angela appreciates the cultural differences that exist among her students, she doesn’t believe that cultural differences impact mathematics learning. When asked how she connects mathematics content to students’ cultural backgrounds Angela remarked, “I guess I just never thought of implementing or thinking of specific ways to pull out cultural backgrounds from the kids. I think of it more as with 7th and 8th graders, they have their own subculture being at that age level that I focus on.” She added, “So we can implement graphing with sports scores and it might be a Black athlete but I don’t particularly think to pick a Black athlete just because some of my kids are Black. I think of more that they like sports. Or graphing cellphone data and I focus I guess on the activity level the social development and the age of junior high kids but have never thought of how to incorporate culture into
the math.” While Angela recognizes that students’ lived experiences can impact mathematics learning, she views it more as differences in generational experiences rather than cultural experiences.

A mathematics teacher who implements culturally responsive teaching practices incorporates examples that go beyond those that are reflective of the dominant culture. When describing how she connects examples to students’ lived experiences, Angela commented that she adjusts examples based on her students’ generational experiences (see transcript in Appendix G). She explained, “so for an example one of the questions was about stereo component pieces and they had to buy like receivers and speakers and all this different stuff and after they were struggling for a while with the problem it turned out like that they didn’t understand what like an amplifier was and then they just got into conversation about why you would need to buy all of that stuff whenever you would have your music on your iPod.” For Angela, adjusting examples to be relevant to students’ lives is based on “generational things” rather than students’ “ethnic cultural background.”

Angela did point out, “Now in like a different subject like social studies because I do teach 1 hour of social studies, that seems more easy to me because we study parts of the countries elsewhere and study religions and we have kids of different religions that have learned about trips to Mecca and all of these different things. But with math it just doesn’t seem to pop out at me like that.” For Angela, it is easier to incorporate cultural examples in some content areas than others.

Teachers who are culturally responsive encourage students to use and share learning tools that are culturally familiar. By doing so, teachers recognize that
mathematics is not a universal language and the manner in which an individual understands mathematical content is influenced by his or her cultural background. When talking about one of her students from Kenya, Angela shared, “I had no idea really what he had learned and where he was in his academics but numbers are numbers. And so where he fell short was similar to any other kid might fall short just because they haven’t had the educational skills up to that point.” She went on to say, “I mean I don’t see why my Asian kids or my Black kids or my, I have kids that are Muslim, why would they need math presented to them differently than anyone else? And they’re all just interested in it when I make it fun and when I make it relevant to them as far as what they do with their life but they’re all doing the same thing. It’s not like I see a lot of differences I guess in that.”

**Social Consciousness**

*Implement culturally relevant curricula*

A teacher who is culturally responsive implements learning opportunities in which students are able to apply mathematical skills to outside classroom experiences in a meaningful manner. When asked if she takes her students out in the community or if she brings in community resources to her classroom, Angela said, “There’s nothing that I personally have initiated but there’s already programs the school does so they do the JA in a day which is very strongly math-based so they have a whole day of the Junior Achievement and for the 7th grade they focus on economics so they’ll have them balance checkbooks and deciding on the benefits of buying home insurance and all that kind of stuff.” She also shared, “the other activities I guess that we do aren’t really math-focused like we’re going to the Botanical Gardens just because it’s an outreach with our
neighbors to get into the community and for them to support our school, which they do. They give us plants and work with us but it’s not like a math-focused.” While the school has implemented opportunities to connect the school to the community, Angela hasn’t done so.

**Summary of Angela’s Understanding of CRP and CRT**

Even though Angela positively affirmed most of the statements in section 1 and chose or provide a culturally responsive teaching strategy in most of the scenarios in section 2 on her survey, her interview responses demonstrate that she has a limited understanding of the practices. For example, Angela indicated that she adapts classroom resources to reflect the diverse cultural backgrounds of her students but when asked how she does this, she explained that she doesn’t think that culture influences mathematical learning. Throughout her interview she remarked that she focused more on including activities or tasks that were related to the generation of students in her classroom (see transcript in Appendix E). She explained that she sees the differences in the mathematical classroom more of a “generation gap” rather than due to “cultural differences”. In section 3 of the survey, Angela was not able to correctly identify culturally relevant and responsive practices. A comparison of Angela’s survey responses and interview responses shows that Angela has a very limited understanding of culturally relevant and responsive teaching practices.

**Part 4: Elizabeth’s Understanding of CRP and CRT**

The fourth teacher that I surveyed and interviewed was Elizabeth. She currently teaches 7th and 8th grade and has 2 years of teaching experience. She racially/ethnically identifies herself as White. I met with Elizabeth during a teacher workday after the school
year had ended. When I arrived to her classroom, I noticed that some classroom materials were packed up and some of the student desks were stacked up and lined up on one side of the classroom. There were a few desks that were still laid out in the classroom and they were in groups of 4. Elizabeth’s desk was on the left side of the classroom.

In section 1 of the survey, Elizabeth positively affirmed six out of six statements dealing with academic achievement. In section 1 of the survey, Elizabeth positively affirmed five out of five statements dealing with cultural competence. In section 1 of the survey, Elizabeth positively affirmed three out of five statements and negatively affirmed two out of five statements dealing with social consciousness. In section 2 of the survey, Elizabeth chose or provided a culturally responsive teaching strategy eight out of nine times when presented with a classroom scenario. In section 3 of the survey, Elizabeth was presented with 14 teaching practices and asked to identify practices that are culturally relevant and responsive. Nine out of the fourteen practices were culturally relevant and responsive teaching practices. She correctly identified seven out of the nine practices. Five out of the fourteen practices were not culturally relevant and responsive teaching practices. She identified zero out of the five practices as culturally relevant and responsive.

**Academic Achievement**

*Creation of learning environment that supports diverse learning needs and interests of students*

Teachers who are culturally responsive recognize that each student in their classroom has different learning needs and interests. In order to support each student in meeting academic goals, the teacher focuses on implementing practices that focus on the
individual growth that students make when learning content. Elizabeth shared, “we used a website called EasyCBM.com and it was mostly a progress monitoring website where I could see where the kids were at and they could track their own data and see how they were doing and progressing in a couple different content areas.” She also added, “they take that STAR assessment and it tells them you’re at a such and such grade level and you have this score and I have them all keep track of that and as they take that quarterly, see how much they grow, have them set goals and so that they are constantly try to set and reach their own goals.” She explained, “I see that as a big accomplishment because they are kind of aware of where they are at and how they’re growing so even if they’re not doing so well in every little assignment, well you’re here and now you’re here, that’s success. It’s not necessarily that you got every little thing along the way but that you grew and helping them see their strengths and weaknesses and how they’ve grown.”

**Awareness and attention to diverse communication styles of students**

In order to create a learning environment that is supportive of the diverse communication styles of students, a culturally responsive teacher must implement practices that don’t intellectually silence students. Elizabeth talked about having open conversations with her students about their needs and interests as well as incorporating tools to assess her students’ needs and interests (see transcript in Appendix H). An example that she gave was, “There’s always a moment where like they bring up something you know that’s relevant that they should know so I go okay we can stop and talk about that even if it’s not you know what was on the day’s lesson plan but was in the standards. If it’s something I see that they need and it’s relevant then I definitely stop and take the time to teach that.” She also pointed out that she incorporates various learning
tools for students to demonstrate their mathematical thinking and understanding of content. Whether it was small-group work, projects, or worksheets, students have multiple opportunities to communicate their mathematical thinking.

*Implement instructional practices that reflect the diverse learning styles of students*

In order to implement instructional practices that reflect the diverse learning styles of their students, teachers must first understand the academic identities of their students. When asked how she strives to better understand the learning needs of students, Elizabeth shared, “I give them a written or like a sheet kind of like an interest survey to see how they like to work…I did like the multiple intelligence survey that told me whether my students learn best through nature or art, music as well as a survey to see if they prefer hands-on, auditory, visual, what kind of learners they are.”

Teachers who implement culturally responsive teaching practices incorporate instructional practices that support the diverse learning styles of students. When discussing the resources that she relies on when creating activities, Elizabeth said, “I consulted a few different ones besides “Connected Math” I used a Pearson book, ones that had different examples. I tried to give them a variety of experiences as well as looking at resources found online like from the website “Teachers Pay Teachers” whenever I can find different activities just to try to have a variety where I can try to meet everybody’s needs.” She also shared, “A lot of them are kinesthetic learners so if they get to touch and move things or match things up that can help them. Other hands-on activities, sometimes it’s a website where they get to go and deal with manipulatives or play a math game related to the content.” She also offered, “I noticed throughout the
year that geometry was the lowest strand across both my seventh and eighth graders so they did a geometry project where they got to work with all the content and build a little city out of geometry pieces.”

**Cultural Competence**

*Development of knowledge base about cultural diversity*

Teachers who promote cultural competence recognize the importance of incorporating students’ cultural experiences into classroom activities. When asked to describe the attributes of a culturally responsive teacher, Elizabeth offered that one should be able to “relate to my students’ lives in the real world. What they are doing with basically anything that pertains to them and their culture.” In order to implement learning activities that are appropriate to the diverse cultural experience of students, teachers must expand their knowledge about other groups. For Elizabeth, it is important the she goes beyond recognizing and respecting the cultural differences that exist among her students. She is aware of the importance of getting to know her students in order to incorporate appropriate instruction.

Elizabeth commented that her current teaching experience was different from her previous teaching experience. In order to accommodate for that difference she said, “I had to adapt my teaching style to meet inner city kids whereas I had previously come from like rural areas and smaller school districts.” Elizabeth pointed out “we do talk about trying to have conversations about how they might use stuff at their home lives.” She also explained, “A lot of times there was something that would relate to something that I would do because I try to have a very open and honest conversation with my students like when they’re, if they’re not responding to what they’re learning or the
directions just talking to them to figure out what’s going on.” In addition to having open conversations with students about the relevance of content to their outside classroom experiences, Elizabeth also shared “I survey my students at the beginning of the year and they like to work with their peers and I know that can apply to them in their future as well when they get out in their careers so they do some group work and cooperative learning activities.”

**Social Consciousness**

*Implement culturally relevant curricula*

A teacher who is culturally responsive connects content to students’ cultural experiences. Elizabeth shared, “having discussions with them, I try to ask them about what kinds of you know, if they do have those experiences with money and taxes and leaving a tip at a restaurant.” She added, “We do calculating taxes and calculating tip at a restaurant so I talk to them about how you know that might actually apply to them when they go out to eat or to a restaurant and talk about my own experiences with this to try to help them make that connection.”

While Elizabeth doesn’t take her students out in the community to do mathematics, she shared that she tries to bring in tools that connect to students’ community experiences. She offered, “I’ll bring in advertisements and things for when they’re dealing with taxes and discounts and percent off. They looked at real coupons and things they could buy at the store and how that kind of played into stuff.” She also shared, “I know they’ve kind of done some budget planning like if it’s around Thanksgiving, bring in like math something that has to do with planning like a Thanksgiving dinner and going out shopping and purchasing you know. What’s the best
“option there?” By connecting the concepts to students’ real-life experiences, Elizabeth is able to equip students with mathematical skills that they can apply beyond the classroom.

Teachers who support students to develop social consciousness implement learning opportunities that allow students to explore multiple perspectives. While Elizabeth begins most lessons with guided examples, she also incorporates opportunities for students to work through problems with their peers (see transcript in Appendix H). She shared that students complete practice problems “in smaller groups or partners and then come back together, go over how it went, see if there’s any overall problems or misconceptions throughout the class.” By offering opportunities for group work, students are able to dialogue and interact with each other as they share ideas.

**Summary of Elizabeth’s Understanding of CRP and CRT**

Although Elizabeth positively affirmed most of the statements in section 1, chose or provide a culturally responsive teaching strategy in most of the scenarios in section 2 on her survey, and correctly identified most of the practices that are culturally relevant and responsive, her interview responses demonstrate that she has a limited understanding of the practices. For example in her survey responses, Elizabeth indicated that she would use examples that are familiar to students’ lives but she wasn’t able to provide concrete examples of how she does that in her classroom. Elizabeth also indicated that creating classroom projects that involve parents and community members is a culturally relevant and responsive teaching practice but when asked how she does this in her mathematics classroom, she didn’t have concrete examples of how she does that in her mathematics classroom (see transcript in Appendix E).
Part 5: Overall Teachers’ Understanding of CRP and CRT

All teachers mentioned that they create learning environments that support the diverse needs and interests of students by focusing on supporting the individual growth that students make as they toward meeting academic goals. While this is an important component for supporting students in achieving academic excellence, another important component is evaluating instructional materials for their “multicultural strengths and weaknesses.” While each teacher mentioned that they refer to the Connected Math curriculum and teacher websites for teaching resources, there was no mention of whether they consider the strengths and weaknesses of the materials in connecting to students’ cultural backgrounds. In fact Michelle shared that she looks at the school district website for the curriculum alignment map and prints it off and “I just check it off and design my lesson plans around the topic that I need to cover.” While this is an appropriate skill for planning lessons, it is also important to evaluate instructional resources in order to ensure that the teacher is incorporating resources that are inclusive of the diversity that exists within and across cultural groups.

All teachers mentioned that they try to connect math to students’ lived experiences but there was no mention of implementing activities that promote the development of a critical lens in order to address societal inequities. For Kristie she said that it is difficult for her to think about how to effectively do that because she isn’t comfortable enough with the mathematical content. When discussing her teaching assignments, she pointed out, “I never grew up thinking I was good at math or did exceptionally well in math in school. So it’s not an area that I would’ve watched myself go into with great certainty saying that ‘I’ve got this’. I would’ve ran away screaming.” While she is more
comfortable with the material now, she is not at the point where she is confident enough to go outside the “box.” When I shared an example of having students analyze voting patterns within their community and using that information to create voting campaigns, Michelle welcomed the idea. She said, “Oh, that’s a great idea plus it incorporates social studies. Oh yea, that’s a good idea.”

All teachers mentioned an awareness of the diverse backgrounds of their students but there was little mention of the use of culturally familiar examples to teach mathematical concepts. Kristie, Michelle, and Elizabeth each talked about relating concepts to money, food, or fundraisers. For Angela she didn’t see culture as being connected to mathematical learning so many of her examples were connected to things like sports, cellphone use, and restaurant menus. While the teachers were open to connecting mathematics to students’ lives, there were no concrete examples of how they have incorporated culturally familiar examples when teaching mathematics.

All teachers incorporated instructional practices that support the diverse learning styles of student. These practices included cooperative learning opportunities, peer coaching, hands-on activities, and technology. For example, Angela had her students complete a project in which her students created a story to match an equation (linear equation for 7th grade students and quadratic equations for 8th grade students) and used that information to create a table and graph to find the factors. Elizabeth had her students apply geometric concepts when creating a model of a city.

While there was mention of ELL learners in the classroom, there was not much mention of how the teachers connect students’ home language to formal mathematical language. Kristie shared that she has parents sit in on instruction to learn the
mathematical content. Michelle commented that she allows her students to use their home language when doing group work and has students sit in on parent-teacher conferences to translate. Angela mentioned that “numbers are numbers” when asked how she connects the diverse knowledge that students bring to the formal mathematical knowledge. She went on to add, “I mean the kids that are serviced here, I guess I don’t feel like their upbringing was any different than anyone else’s that would be at any other school right now.”

Connecting school experiences to community and home experiences is an important part of being a culturally responsive teacher. All four teachers mentioned that their school had programs that brought in members from the community to mentor and/or tutor students. When asked about incorporating community resources in their classrooms, Michelle was the only teacher to give an example of how she had an engineer from a company in the community come in to talk about how he uses mathematics in his career. Kristie and Elizabeth seemed open to doing so in the future. Kristie expressed that at this point she thinks that doing something with a small-group like an afterschool program first would be a good way to begin before doing a “full-scale 6th grade wide ‘here we go’ project.” Kristie and Elizabeth also seemed open to incorporating tools to help parents support their students in connecting formal mathematical knowledge to outside classroom experiences. When asked about send resources home to parents, Elizabeth stated, “It’s something I can think about more. It would be interesting to see how that would go.”

Summary

In this chapter, I shared the findings from this study. The findings are revealed through direct quotes from participants’ interviews, survey responses, and my
interpretations of participants’ responses. In the area of academic achievement, participants’ responses demonstrated that they recognize the significance of focusing on students’ individual growth in order to support students in meeting their academic goals, implementing practices to support students’ diverse communication styles, and incorporating practices to support the diverse learning styles of students. In the area of cultural competence, participants’ responses showed that they understand the importance of recognizing and respecting students’ cultural differences. Some participants’ responses also showed that they understand that an important factor in meeting the goals of cultural competence is encouraging students’ to maintain their cultural integrity as they aim for academic excellence. Lastly, participants’ responses revealed that they understand that an important component of meeting the goals of social consciousness is connecting mathematical content to students’ lived experiences. These findings indicate that the teachers have some understanding of culturally relevant and responsive teaching practices. In chapter five, I will discuss my findings, share implications for the field of education, discuss limitations within this study, and share concluding remarks.
Chapter Five

Discussion and Conclusions

In this chapter, I will provide an overview of the study, reflection on my findings, share implications for future research, discuss limitations within this study, and share concluding remarks. The overview of the study includes a review of the study and the procedures that were implemented during the study. My reflection on the findings is comprised of my conclusions and their connection to the literature on culturally relevant and responsive teaching practices. Implications for the field of mathematics education are shared in the section on implications for future research which is then followed by my discussion of limitations within this study. Lastly, I share my concluding remarks related to this study.

Overview of the Study

The purpose of this study was to investigate how middle school mathematics teachers understand culturally relevant and responsive teachings as well as how their conceptualization of those practices impacts their teaching practices. A qualitative study was conducted in an urban school district in the Midwest region of the United States. Four middle school teachers were surveyed and interviewed.

The tools (survey and interview protocol) that were implemented during the data collection and analysis process of the study were framed by Ladson-Billings (1995) and Gay’s (2002) frameworks. Both frameworks were used to answer the research questions that guided this study. The questions are:

- Researcher Question 1: In what ways do math teachers understand culturally relevant pedagogy and culturally responsive teaching?
• Research Question 2: In what ways do teachers’ understanding of culturally relevant pedagogy and culturally responsive teaching impact the conceptualization of their teaching strategies?

Once each participant was surveyed and interviewed, I transcribed each recorded interview, conducted a line-by-line analysis to identify significant statements, coded each significant statement, and identified themes and sub themes within and across interview transcripts. These themes were then used to come up with an overall meaning of how the teachers understand culturally relevant and responsive teaching practices as well as how that understanding impacts their teaching practices.

**Reflection on my Findings**

The results in this study provide important information into how this group of middle school math teachers understand culturally relevant and responsive teaching practices. Moreover, they provide insight into how their conceptualization of these practices impacts their teaching practices. In the sections that follow, I will share what the teachers’ responses tell us about their understanding of culturally relevant and responsive teaching practices.

**Academic Achievement**

All four teachers shared information that demonstrated an understanding of the significance of implementing practices that support the diverse learning needs, interests, communication styles, and learning styles of students. This understanding was reflected in the teachers’ implementation of various tools for learning and assessment, focus on students’ individual growth, creation of a learning environment that allowed for diverse communication styles, and incorporation of activities that support students’ diverse
learning styles. By implementing these practices, these teachers are exemplifying practices that are critical to supporting students’ academic achievement. However, there are some practices that are critical to meeting the goals of academic achievement that weren’t evident in the teachers’ responses.

While the teachers shared that they rely on a variety of resources when planning and implementing lessons, there was no mention of evaluating these materials for their “multicultural strengths and weaknesses”. An important component in meeting the goals of academic achievement is the evaluation of instructional materials and resources for their “multicultural strengths and weaknesses (Gay, 2002). The evaluation of resources and materials for their “multicultural strengths and weaknesses” is important part of ensuring that there is an incorporation of instructional materials that are representative of the diversity within and across cultural groups.

All the teachers remarked that the “Connected Math” curriculum served as the main source of knowledge in their classrooms. When asked whether they rely on other sources such as students as the main source of knowledge, none of the teachers said that they did. While textbooks and curriculum maps are important tools for planning lessons, teachers must also realize that the knowledge that students possess can also serve as an important source of knowledge. Matthews (2008) maintains, “teachers must possess critical orientations that allows them to realize when cultural knowledge can be seen as important as text knowledge and when those aims intersect, compete, or both” (p. 130). For the teachers in this study, there was an awareness of the knowledge that students bring to the classroom but it was not as valued as the text knowledge.

Cultural Competence
All the teachers shared information that demonstrated an understanding of incorporating practices that support the goals of cultural competence. This understanding was demonstrated in the teachers’ awareness and respect of the cultural differences that exist among their students as well as their willingness to expand their knowledge about other cultural groups. While these are important elements for implementing culturally relevant and responsive teaching practices, the teachers were some elements that are critical for cultural competence.

All the teachers in this study mentioned that they have community members come into their schools to serve as mentors and tutors for their students. While this is an important part of building school-community relationships, it is also important to draw on the community members’ funds of knowledge and incorporate it into mathematics lessons. Frye et al (2010) advise that it is important to “provide students with the knowledge and skills needed to function in mainstream culture while simultaneously helping students maintain their cultural identity, native language, and connection to their culture” (p. 7). In the mathematics classroom, this requires teachers to incorporate learning opportunities that connect the formal mathematics content to students’ cultural backgrounds. Such learning experiences show students that they can maintain their cultural integrity while still aiming for academic excellence.

While the teachers were aware of the diverse lived experiences that students bring to the classroom, they weren’t sure how to use that information to incorporate culturally familiar examples in their mathematics teaching. This finding is consistent with Frye and her colleagues (2010), who argue that in order for teachers to effectively implement culturally familiar examples in their mathematics lessons, they must be shown how
culturally familiar examples and students’ informal mathematical knowledge can be used to facilitate the process of mathematics teaching and learning. When teachers aren’t provided with appropriate models or examples of how to connect culturally familiar examples to mathematics content then they struggle to do so appropriately which can lead teachers to not incorporate such examples in their classrooms.

Teachers should also be provided with opportunities to work with their colleagues, parents, and community members to learn how they can authentically incorporate community experiences into the mathematics classroom. By forming these dialectical relationships, teachers can develop a better understanding of how they can appropriately use “informal/cultural knowledge and critical thinking” as they “build bridges to culturally accepted mathematics knowledge and culture of school” (Waddell, 2014, p. 4). This is an important component for supporting students create meaningful connections between their cultural backgrounds and the mathematical content that is taught in the classroom. Drawing knowledge from those who are involved in the lives of students outside of the classroom is an important step in beginning to figure how to effectively accomplish this goal.

In addition to using culturally familiar examples in the classroom, teachers must also show students the mathematical contributions of individuals from different cultural backgrounds. When asked whether they share the mathematical contributions of individuals from different cultural backgrounds, none of the teachers said that they did. The incorporation of such examples supports students in identifying with the subject of mathematics while also showing all students that the subject of mathematics isn’t limited to certain groups.
**Social Consciousness**

Each of the teachers’ comments had elements that demonstrate some understanding of the goals of social consciousness. This understanding was shown in the teachers’ incorporation of real-world applications and opportunities for exploring multiple perspectives. However, there are some essential elements for social consciousness that were missing in the teachers’ comments.

All four teachers mentioned that they incorporate examples where students are able to connect the mathematical content to real-world applications. While these opportunities are an important aspect of mathematics learning, it is also important to incorporate learning experiences in which students can apply the mathematical content to explore issues in the community around them in order to become social change agents. For this to happen, teachers must use resources within the community to “understand how they can use contexts, culture, conditions and language to support mathematics teaching and learning” (NCTM, 2014, p. 65). When teachers are able to implement activities that connect mathematics to students’ cultural and lived experiences, students are able to see the subject of mathematics as applicable beyond the classroom.

In addition to applying mathematical content to their community, students must also be empowered to develop a critical lens for understanding the world beyond their community in order to change societal inequities. Again, while all the teachers commented that they implemented real-life applications in their classroom, none of them were able to say how they empower their students to become social change agents. As discussed by Siwatu (2007), the successful implementation of such activities can be supported by opportunities to observe and work with mathematics teachers who have
effectively implemented such examples. By observing other teachers successfully implement mathematics activities that empower students to apply mathematics to issues in the world around them, teachers are more likely and willing to “imitate” the behavior.

**Main Conclusions of Findings**

The focus of this study was to explore how middle school mathematics teachers understand culturally relevant and responsive teaching practices. While the results from this study are not generalizable for all middle school math teachers, they provide important information about how this group of teachers understand culturally relevant and responsive teaching practices. Furthermore, the information from this study showed how the teachers’ understanding impacts their teaching practices. These two points were the central focus of the research questions of this study.

The first research question focused on teachers’ understanding of culturally relevant and responsive teaching practices. All teachers were able to identify culturally responsive teaching practices that are important for meeting each one of the areas of culturally relevant pedagogy (academic achievement, cultural competence, and social consciousness). In their responses teachers offered that they implement practices that support: students in meeting academic goals, students’ diverse communication styles, and students’ diverse learning needs. These practices are important for meeting the goals of academic achievement. Teachers’ responses also indicated that they are aware of and respect students’ cultural differences. This is an important element for meeting the goals of cultural competence. Teachers’ responses revealed that they strive to connect mathematical content to students’ lived experiences which is an important part of meeting the goals of social consciousness. Overall, teachers’ demonstrated that they had some
understanding of culturally responsive teaching practices important for meeting the goals of culturally relevant pedagogy.

The second research question focused on how teachers’ conceptualization of culturally relevant pedagogy and culturally responsive teaching practices impacted their teaching strategies. As a result of having a limited understanding of culturally relevant and responsive teaching practices, teachers’ responses indicated that there are some practices that they are currently implementing in their classroom and there are some that they aren’t implementing. In the area of academic achievement, the following practices were missing: evaluation of instructional materials and resources for their “multicultural strengths and weaknesses” and incorporation of instructional materials and resources that are representative of the diversity that exists within and across cultural groups. Although teachers indicated that they incorporate various learning and assessment tools, in order to ensure that they are meeting the goals of academic achievement, they must assess their tools for their incorporation of diverse cultural backgrounds. It is important for students to not only see themselves in the materials being used in the classroom but to also have access to materials that incorporate a variety of cultural backgrounds.

In the area of cultural competence, the following practices was missing: connecting students’ home language to formal mathematical language and incorporating the mathematical contributions of individuals from different cultural backgrounds. Even though the teachers remarked they allow students to use their home language when working on assignments in class or that they are open to students’ use of methods that are they are familiar with when solving problems, teachers must also be involved in helping students connecting their home language and culturally familiar tools to the mathematical
content. By doing so, teachers are able to encourage students to maintain their cultural integrity while aiming for academic excellence. This is an important culturally responsive teaching practice for meeting the goals of cultural competence.

In the area of social consciousness, the following practices were missing: empower students to develop critical lens and apply their mathematical understanding to the world around them to change societal inequities and implement learning opportunities for students to explore multiple perspectives. Even though teachers mentioned that they connect the mathematical content to students’ lives, they shared examples such as incorporating students’ names, favorite foods, and hobbies in word problems as ways that they do this. This demonstrates a limited understanding of the culturally responsive practices that are necessary for meeting the goals of social consciousness. In order to meet the goals of social consciousness, teachers must connect mathematical content to students’ cultural experiences by incorporating culturally familiar examples or tools in their teaching. When teachers are able to do this, students are able to see the value of the mathematical content beyond the classroom. Furthermore, it serves as a foundation for students to apply the mathematical content in their homes and communities. This is also an important step toward equipping students with the skills to develop a critical lens for addressing the societal inequities in their communities and beyond.

Implications of the Results

While there is a growing body of research on the implementation of culturally relevant and responsive teaching practices in the middle school mathematics classroom, there is a gap between the frameworks and how to effectively apply them in the middle school mathematics classroom. In order to close this gap, there needs to be an exploration
of how middle school mathematics teachers’ understand the practices as well as how their conceptualization impacts their teaching strategies. The focus of this study was on identifying the understandings of the practices and their influence on teachers’ practices. The results of this study have implications for the field of mathematics education.

First, there is a need for teachers to realize the impact that one’s culture has on mathematics learning. As previously stated, some of the teacher participants remarked that they didn’t see culture as an influence on students’ mathematics learning. According to NCTM (2014), it is imperative that all students have access to “skilled and effective teachers who know and understand the cultures and communities from which their students come and who also use this knowledge to create meaningful tasks that build on students’ prior knowledge and experiences” (p. 69. When this is realized, mathematics teachers should then use the cultural backgrounds of their students as the foundation for the mathematics teaching and learning that goes on in their classroom. The incorporation of students’ cultural backgrounds during mathematics instruction supports the goal of making mathematics learning more inclusionary and accessible to all students.

Second, there is a need for professional development on implementing culturally relevant and responsive teaching practices. All the teachers in this study indicated that they hadn’t taken part in any professional development focused on these practices. As a result, teachers demonstrated a limited understanding of the practices. In order for teachers to be able to effectively implement these practices, they must be provided with opportunities to learn about the practices, implement the practices, and reflect upon the practices. Furthermore, teachers should be provided with examples of teachers appropriately implementing the practices. Through such professional development
opportunities, teachers are able to see how “students’ cultural orientations” can serve as an asset to creating “culturally compatible classroom environments” (Frye et al., 2010, p. 7). Such understanding has the potential of leading to the appropriate and successful implementation culturally relevant and responsive practices.

Lastly, there is a need to provide teachers with resources that are representative of the diverse backgrounds of their students. Waddell (2014) argues that it is important for “students to grapple with the messiness and unpredictability of the real world through applications with direct connections to students’ lives” (p. 4). Each teacher participant indicated that they relied on the “Connected Math” curriculum and teacher websites as main resources for teaching the content. While these resources may be of value in some instances, they don’t connect students’ cultural backgrounds to the mathematical content in a meaningful manner. In order for students to make meaningful connections between the mathematics content and their daily lives as well as the world around them, the resources that are used to teach the material must attend to their backgrounds.

The implementation of culturally relevant and responsive teaching practices in the mathematics classroom requires teachers to expand their knowledge about other cultural groups and use incorporate that knowledge into their practices, policies, and lessons. Such a task can be daunting given the multitude of cultural experiences that students bring to the classroom. The results from this study reveal steps that can be taken to support mathematics teachers toward successfully incorporating students’ cultural backgrounds in their classroom.

**Recommendations for Future Research**
Teachers who implement culturally relevant and responsive teaching practices in the mathematics classroom believe that all students want to learn and are committed to preventing the failure of all students (Brown, 2007). When this is realized then it is reflected in the mathematical practices that are implemented in the classroom. It requires more than surface, inorganic practices such as using students’ names in word problems or incorporating holidays in activities. Teachers use students’ cultural experiences to authentically connect formal mathematical knowledge to students’ cultural backgrounds. The implementation of culturally relevant and responsive teaching practices can support teachers to effectively to carry out these goals. Teachers must have a deep understanding of these practices and incorporate them in an authentic manner in their classroom. Below are recommendations for future research on middle school math teachers’ understanding and implementation of culturally relevant and responsive practices. The recommendations are based on the results from this study and literature on this topic.

Future research should focus on changes in teachers’ understanding after the implementation professional development. Participants in this study indicated that they hadn’t taken part in any professional development on implementing culturally relevant and responsive teaching practices in the mathematics classroom. It would be interesting to compare teachers’ understanding of the practices before the implementation of a professional development workshop and their understanding after taking part in the workshop. Since the implementation of culturally familiar examples is context specific, there would be a lot of variation in the examples that teachers implement in their classroom. Thus, professional development would require giving teachers a few specific contexts with examples and then having them come up with their own examples based on
their classroom. The information collected from that study would be beneficial in identifying strategies for supporting teachers to effectively implement culturally relevant and responsive teaching practices.

Since this research only focused on teachers in an urban school district, future research should examine whether teachers’ understanding of culturally relevant and responsive teaching practices varies across different types of school districts (i.e. suburban, urban, and rural). By doing so, this can possibly lead to the development of concrete strategies and examples for implementing culturally relevant and responsive teaching practices that are appropriate for different types of school districts.

Additionally, this study only focused on the understandings of four teachers. Future research should explore the understandings of a larger sample size. Having a larger sample size would provide a richer comparison of the teachers’ understandings as well as the effect of their understandings on their teaching strategies.

Lastly, future research should incorporate observations of teachers in the classrooms. In this study, interviews were used as a follow-up to teachers’ survey responses. It would be beneficial to compare information gathered from the observations to information gathered from the interviews. Together, the data would provide a more complete representation between what the teachers say and what they actually carry out in their classrooms.

**Limitations**

One of the limitations of this project is its small sample size. Replications of this study should include a larger sample size to tease out the factors that influence teachers’ understanding of culturally relevant and responsive teaching practices. Furthermore, by
implementing the study with a larger sample size, the results from the study can be used to come up with generalizations about how middle school math teachers understand culturally relevant and responsive teaching practices. These generalizations can lead to the development of concrete examples for how teachers can effectively implement culturally relevant and responsive teaching practices.

Another limitation is that all the teachers in this study are from the same school district. This was done primarily for convenience. This study was done to collect baseline data that will be used to inform future studies on this topic. By collecting data from teachers in different school districts, I could have seen whether teachers’ understandings vary across school districts.

Lastly, the data collection tools were limited to a survey and in-depth interview. This was due to time constraints. Ideally, I would have liked to incorporate more interviews and at least 2 classroom observations. By incorporating these additional data collection tools, I would have been able to get a richer description of how the teachers’ understandings impacted their teaching practices. In other words, I would have been able to compare what the teachers said in their surveys and interviews with what they actually implemented in the classroom.

Concluding Remarks

The focus of this study was to explore how middle school math teachers understand culturally relevant and responsive teaching practices. Moreover, I sought to examine how the teachers’ understanding impacted their teaching practices. The data that was collected from this study provided valuable information on how the group of teachers in this study understand culturally relevant and responsive teaching practices.
The teachers’ awareness of the diverse backgrounds that students bring to the classroom and their implementation of practices to support students’ diverse needs and interests demonstrate an understanding of culturally relevant and responsive teaching practices. These practices are important elements of academic achievement and support some elements of cultural competence and social consciousness. However, the teachers’ responses showed that they had a limited understanding of the goals of cultural competence and social consciousness. Teachers need opportunities in which they can gain a better understanding of how to incorporate culturally familiar examples into mathematics lessons. Moreover, teachers need opportunities in which they can better understand how to implement lessons that equip students to develop a critical lens in order to explore societal inequities.

By ignoring the “personal and cultural knowledge” that students possess and just focusing on teaching “school knowledge” then the schooling process continues to serve as an impersonal learning environment (Malloy and Malloy, 1998). Such practices are supported by policies and practices such as standardized testing, common core standards, and ability tracking. These practices ignore the rich diversity that exists among students and caters to the learning needs and interests of students from the dominant culture. Thus, the diverse rich experiences and knowledge that some students bring to the learning environment is ignored and devalued. The lack of meaningful connections to students’ prior knowledge and lived experiences continues to exclude rather than include all students in the learning that takes place in the classroom.

In order to implement fair and equitable learning opportunities in all mathematics classrooms, all stakeholders (policymakers, educators, and teacher educators) must work
together to develop and implement programs that are aimed at providing teachers with information on how to better meet the diverse learning needs and interests of students. Within schools, teachers need to be provided with time to work together to develop programs aimed at being inclusive of the diverse group of students that they teach.
References


Appendix A

Pilot Survey

Teacher ID: ____  Grade Level: ____  Teaching Experience: ____

SURVEY: TEACHING EXPERIENCES WITH CULTURALLY DIVERSE STUDENT POPULATIONS

Circle the letter that best describes how you feel:
A = Agree  D = Disagree  U = Unsure

As a mathematics teacher, I can help all my students experience academic success.  A  D  U
As a mathematics teacher, I can motivate all my students.  A  D  U
As a mathematics teacher, I hold high expectations for all my students.  A  D  U
As a mathematics teacher, I individualize instruction for students.  A  D  U
As a mathematics teacher, I encourage students to make connections between their home language and school language.  A  D  U
As a mathematics teacher, I use a variety of methods to assess my students’ learning.  A  D  U
As a mathematics teacher, I create and implement opportunities for students to engage in cooperative learning experiences.  A  D  U
As a mathematics teacher, I model culturally responsive practices for my students.  A  D  U
As a mathematics teacher, I create a learning environment that encourages competence, relatedness, and autonomy.  A  D  U
As a mathematics teacher, I provide learning opportunities that empower all my students.  A  D  U
As a mathematics teacher, I value the lived experiences and prior knowledge that students bring to the classroom.  A  D  U
As a mathematics teacher, I incorporate students’ funds of knowledge into classroom practices.

As a mathematics teacher, I value and use parents’ input in my classroom practices.

As a mathematics teacher, I can recognize when my attitudes, beliefs, and values interfere with providing the best teaching to my students.

As a teacher, I have assessed my own racial/ethnic identity in order to assess my classroom teaching.
Appendix B

Pilot Interview Protocol

• What are your experiences with working with culturally diverse student populations?

• How do you help your students experience academic success in the mathematics classroom?

• What do you do when a student doesn’t experience academic success in your classroom?

• Do you individualize mathematics instruction for your students? Why or why not?

• How do you motivate your students?

• How do you establish and foster relationships with your students?

• What are some reasons that you would contact a student’s parents?

• Do you make mathematics content culturally relevant for your students? Explain!

• What teaching methods (i.e. worksheets, lecture, note-taking, group work) do you use most frequently in your classroom? Why?

• How do you decide what should be taught in your classroom?

• What methods do you use to assess student learning in your classroom?

• Do you feel well equipped to adapt mathematics content to meet the culturally diverse needs of all your students? Explain!

• Do you believe that a teacher’s cultural background has an effect on his or her classroom instruction? Why or why not?

• Do you believe that a child’s cultural background has an effect on his or her math education? Why or why not?

• Are you able to discuss how factors such as powerlessness have influenced the current conditions of various ethnic groups in Mathematics Education? Why or why not?
Appendix C

Survey

*Adapted from: Using Mathematics Strategies by Guha and Preservice Teachers’ Culturally Responsive Teaching by Siwatu

Gender (circle one): Male  Male  Female  Female

Highest degree earned: __________________________

Major: __________________________  __________________________  __________________________

                   Undergraduate  Graduate  Graduate

Describe your certification (i.e., Ohio Middle Grades, Michigan K-6)  __________________________

How long have you been teaching? _______________ years  What grade level do you current teach? _______________

Have you had experience teaching math at other grade levels? Yes ____  No ____  If yes, please list the grade levels. ______________

What is your present average class size? _____ students  How do you racially/ethnically identify yourself? ___________

On a scale of 1-4 (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree), please rate how you feel about the items below:

I can help all my students experience academic success.  1  2  3  4

I am able to teach students to use mathematics to question and challenge their own beliefs and actions as well as those of others.  1  2  3  4

I encourage students to make connections between their home language and academic language.  1  2  3  4
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<th>Statement</th>
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<td>I adapt instruction to meet the learning needs of my students.</td>
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<td>I value the lived experiences and prior knowledge that students bring to the classroom.</td>
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<td>I can recognize when my attitudes, beliefs, and values interfere with providing the best teaching.</td>
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<td>I am able to implement mathematical tasks that empower my students to develop a critical lens.</td>
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<td>I am able to identify ways that the school culture is different from my students’ home culture.</td>
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<td>I am able to teach students about the mathematical contributions of their culture.</td>
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<td>I am able to gather information that identifies my students’ academic strengths and weaknesses.</td>
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<td>I am able to empower my students to see themselves as contributors and leaders.</td>
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<td>I consistently communicate with parents about their child’s academic progress.</td>
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<td>I implement instructional strategies that support my students’ cognitive and developmental needs.</td>
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<td>I am able to adapt classroom resources to reflect the diverse cultural backgrounds of my students.</td>
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I am able to implement mathematical learning experiences that encourage students to question and critically analyze societal issues.

I am able to encourage and support all students to openly discuss and critique mathematical ideas.

**For each scenario below, circle the action that you would take:**

A student in your class is struggling to correctly use an algorithm for subtracting two digit numbers.

A.) Continue to reteach the algorithm until the student learns it
B.) Give the student a calculator
C.) Allow the student to use an algorithm that they are familiar with.
D.) Other: ________________________________________________________________________________________________

Students in your class complain that the examples in their textbooks don’t make sense because their textbooks are old.

A.) You ignore their complaints and continue to assign them problems in the textbook.
B.) Assign students examples from a different textbook.
C.) Ask students to explore and share mathematical examples in their community.
D.) Other: ________________________________________________________________________________________________

A student in your class is struggling to connect the mathematical vocabulary with the mathematical problems.

A.) Give the student a dictionary.
B.) Encourage the student to work with a peer.
C.) Use real-life examples to explain the vocabulary.
D.) Other: ________________________________________________________________________________________________

A group of students always use their home language when working on mathematical problems.

A.) Encourage students to continue to do so but explain that they have to be able to explain their work in a manner that all students can understand.
B.) Discourage students from using their home language in the classroom.
C.) Separate the group and ask them to work with other students.
D.) Other: ________________________________________________________________________________________________
A student in your class struggles to use the mathematical procedure that you taught but is able to use a different procedure with success.

A.) Require the student to use the procedure that you taught.
B.) Reteach the procedure.
C.) Ask the student to share the procedure with the class.
D.) Other: ________________________________________________________________

Students in your class don’t seem to understand the examples that you are using to explain a mathematical concept.

A.) Explain the mathematical concept using examples that are familiar to students’ everyday lives.
B.) Continue to reteach the concept using similar examples.
C.) Skip the concept.
D.) Other: __________________________________________________________________________

When communicating with a student, you notice that the student isn’t receptive to your directions or feedback.

A.) Refer the student to an administrator or counselor.
B.) Remove the student from your class.
C.) Ask the student if there is some other way you can make your directions/feedback more useful to them.
D.) Other: ________________________________________________________________

A student seems unmotivated in your class but is always eager to share his/her involvement in events outside of school.

A.) Devise a way to incorporate aspects of such events into classroom instruction.
B.) Assign the student more work.
C.) Refer the child to his/her counselor.
D.) Other: __________________________________________________________________________

Students in your class comment that they are not going to need or use the material that you are teaching in their life.

A.) Give them examples of how the material is useful.
B.) Ignore the students’ comments.
C.) Incorporate resources that reflect students’ lived experiences.
D.) Other: __________________________________________________________________________
Below is a list of teaching practices. Please check off practices that you believe are culturally relevant and responsive:

- Implement instruction that is explicit in linguistic and behavioral codes.
- Approach the learning environment with a colorblind perspective.
- Incorporate cooperative learning opportunities.
- Link students’ histories and worlds to mathematical content.
- Seek to understand the hopes, concerns, and suggestions that parents have.
- Celebrate holidays like Thanksgiving and Cinco de Mayo.
- Communicate clear and high expectations for all students.
- Create classroom projects that involve parents and community members.
- Visit students’ communities to learning about how they interact and learn in that environment.
- The textbook and teacher serve as primary sources of knowledge.
- Have students share artifacts from their cultural, write about their cultural traditions, and research different aspects of their culture.
- Use a variety of methods to assess my students’ learning.
Use student names in word problems.

Require all students to use the same mathematical approach.

On the lines below, please provide an example of how you implement culturally relevant and responsive teaching practices:
Appendix D

Interview Protocol

• What is the definition of culturally relevant pedagogy?
  o What are some of the personal characteristics and traits of a culturally relevant mathematics teacher?
  o What are some of the instructional behaviors of culturally relevant mathematics teacher?
  o In what ways do you implement culturally relevant pedagogy?

• What is your understanding of culturally responsive teaching?
  o What are some of the personal characteristics and traits of a culturally responsive mathematics teacher?
  o What are some of the instructional behaviors of culturally responsive mathematics teacher?
  o In what ways do you implement culturally responsive teaching practices?

• In what ways does culturally relevant pedagogy address math content standards? Culturally responsive teaching?

• On your survey, you circled the following as culturally relevant and responsive teaching strategies. What makes you see those strategies as culturally relevant and responsive?

• What are your experiences with working with culturally diverse student populations? (According to Creswell, it’s important to start with a general question then use that to narrow in on responses)
  o What is your comfort level with teaching culturally diverse student populations?
  o How do you reach out to students from diverse backgrounds at this developmental stage?
  o Describe how you are able to implement strategies to minimize the effects of the mismatch between your students’ home culture and school culture.
  o Describe how you are able to teach students about their culture’s contribution to mathematics?
• Describe some challenges that teachers face when teaching mathematics? Why?
  o How do you overcome these challenges in your classroom?
  o What barriers do you think your students face when learning mathematics? How do you help them overcome them?
  o If provided an unlimited amount of time and resources, what teaching practices would you implement to effectively meet the diverse learning needs and interests of your students?

• How do you recognize each one of your students as individuals and include their uniqueness in lessons?

• How do you decide what content should be taught in your classroom?
  o What is your source of mathematical knowledge in the classroom? Why?
  o Is it necessary to use the textbook as the main source of mathematical knowledge? Why or why not?
  o What teaching methods (i.e. worksheets, lecture, note-taking, group work) do you use most frequently in your classroom? Why?

• What impact do everyday, outside-of-school experiences have on student interest in mathematics?
  o Do you believe that a teacher's cultural background has an effect on his or her classroom instruction? Why or why not?
  o Do you believe that a child's cultural background has an effect on his or her math education? Why or why not?
  o In what ways do you make mathematics content culturally relevant for your students? Explain!
Appendix E
Kristie’s Interview Transcript

**KRISTIE:** My name is Kristie [Last Name] and I give Winnie permission to record me.

(Some talk about positioning of audio recorder)

**WINNIE:** To begin with, the focus of this study is on how middle school math teachers use culturally responsive and relevant teaching strategies to meet the needs of their diverse student populations. I went through your survey and looked at some of your responses and I just wanted to see based on your responses, what are some instructional behaviors that you think a culturally responsive teacher exemplifies?

**KRISTIE:** Well, I mean there’s always the most obvious which are simply when you have students who have a stronger understanding of maybe a first language, providing the activity in that language.

**WINNIE:** Okay.

**KRISTIE:** This doesn’t specifically apply to my student population but I do have parents who struggle with English as a second language and therefore are much more comfortable with Spanish as a first language and will often pair them up with one of our interpreters in the building so that when we are meeting and talking about their student’s progress. That’s more of a culturally responsive technique when you are dealing with parents but it inevitably helps the student because then the parents understand what we are doing. I have a parent who comes in to my classroom and will sit side by side with her son during math instruction in an attempt to learn it herself so she can help him but then also she can receive communication from him about how we are completing these math problems so when he gets home she understands because she doesn’t read English.

**WINNIE:** Okay.

**KRISTIE:** But those would be the biggest cultural differences or diversity that I’ve experienced at this point. It would just be the language barrier in regards to Spanish and English. I can honestly tell you I have not experienced any specifically obvious cultural differences from there.

**WINNIE:** Okay. So you talked about the language, what about lived experiences? English might be their first language but they have a different lived experience than what you are familiar with or what you experienced. How do deal with that?
KRISTIE: Right. I think that that unfortunately is very common especially in our urban centers. My students, many of them have limited experiences so we center the vast majority of our learning around the city setting. Math, it’s somewhat simplistic to use the carryout concept. A lot of what we do is fractions and decimals and percentages, which can all be linked back to an experience at your local carryout where you maybe have this amount of money and you want to go buy these items and how is it going to work? And can we make it work? So that’s a really simple comparison for us to use and we use it all the time in our classroom. The nice thing is our textbook, our curriculum really deals with things that most students who have been in a public school setting have had some exposure to from kindergarten on up. So fundraisers or a big basis for our understanding is measurement. So measuring progress, so many students are familiar with the thermometer concept. How is our building doing on test scores or raising money for this particular purpose? Or in our case now with recycling, how many pounds of recycling do we have? So the textbook does a great job of linking it to stuff that they have more than likely experienced that it’s pretty hard to find a student who can’t relate in some way shape or form to the concept already provided to me to teach in the book.

WINNIE: And so you mentioned the textbook. Is that your primary source of knowledge or your primary source of what content to teach or do you use other resources?

KRISTIE: Specifically in math, we rely very heavily on the text. It is a series of textbooks. It is not one textbook. It is a series of seven different books that we work in and out of throughout the course of the year. It is called “Connected Math”. Each one builds upon the next. The curriculum instruction department, the math academy, all of those groups that you would contact if you were looking for strategies, lesson plan ideas, things like that, always refer you back to the text and the different supplementals with the text. I’ve never had anyone offer me too much direction outside of the Connected Math materials. I do frequently go out on my own and find extra practice activities because I find unfortunately that some of our students need additional practice like we’ve exhausted the text and the options there. We’ve exhausted the practice materials and we still maybe need a little bit of a boost with a certain skill. So I certainly have to seek those out on my own or make them, which is not uncommon. The text does a nice job of bringing in ideas for using food as manipulatives or anything that you can think of. We use string at one point, we use rubber bouncy balls, there’s a variety of manipulatives we can use that the text actually requires to complete the different investigations. So I find it to be comprehensive enough that I haven’t really had to search too hard or too far to find ways to make it engaging, interesting, and make connections.

WINNIE: Okay. And when you talk about the manipulatives, so of course the text gives you some ideas. If a student suggests something that they are comfortable using like in their home, do you allow them to bring that in or share?
KRISTIE: That would be awesome. I’ve just never had it happen. I’ve never had a student make a suggestion about what might make the learning easier or what they themselves did to understand the material. I had a few students in the very beginning really struggling with the concept of fractions and so we allowed them to continue to use manipulatives well beyond the time when the majority of us were done with those, we didn’t need them anymore. I guess that would be an example of where a student might have expressed an interest in continuing to use that material but they were all from the classroom. It wasn’t anything that they came up with on their own.

WINNIE: Okay. That sounds good.

KRISTIE: This is my second year teaching math and I will be blunt and frank when I tell you that I am not highly qualified in math. It’s not within my licensure at all. And so, I had to learn it very quickly and come up with creative strategies and ideas. So far it’s clicking and it’s working but I don’t know how long I will continue to teach math because I can’t imagine that someone may not enter our building who’s more qualified and therefore should take over this ship so to speak. But so I’m learning this as I go.

WINNIE: Okay, well, thank you for being honest.

KRISTIE: For sure. I tell everyone I can about that because I’m so sure at some point someone is going to come up and say “Excuse me, that’s not within your licensure” and I will say “Thank you, thank you, as I’ve stated 700 times to everyone who will listen”.

WINNIE: Okay. So you use worksheets for instruction and the textbook. What ways do you assess your students’ learning? Do you just use one form, one tool to assess your students and what they know?

KRISTIE: Okay. No. Certainly not. We combine all kinds of data points and sources. For example, at the end of each text, I try to infuse a project. So we sort of do a practical application of what we’ve learned because the texts themselves are very specific to a skill set. So one text would include for example all the operations with fractions, adding, subtracting, multiplying, and dividing and then you move on to a new text. At the end of that text, we did a project with those different skill sets. That’s one form of assessment. I always do, I guess I’d call it a standard paper, pencil test, a formal assessment where I really look at…a summative assessment would be the way to say that. Formatively we assess by turning in all of our investigations, they’re not graded entirely on accuracy. They’re graded for effort and sort of what was your approach and does it make sense and where did we go wrong? So we use those as a way to see where the misconceptions are, where the confusion is. Beyond that, I do a lot with my students who have shown me repeatedly that they have mastery, we put them in completely different skill areas so they move ahead of us on the computer and work with different math programs online to
advance so they’re not stuck and spinning wheels. Those that are struggling come up at lunch. We have lunch and learn everyday. Virtually everyday unless there’s something major going on in the building or a meeting of some sort. The students come up and literally I am available to them. I am not tutoring them. I am not designing curriculum for them. I am just available to answer any question that you have. So that helps some of them get over the frustration or the confusion of not wanting to ask questions in class or not comfortable. And it gives them a second shot to get something figured out if they couldn’t figure it out during the regular class period. And it’s a smaller group so they get a little bit more individualized attention. So that would be a form of assessment as well because I’m kind of looking at how are they progressing during these little lunch meetings with their skills.

WINNIE: You talked about practical applications. How do you choose those? Do you go in the textbook? Do you look for [inaudible]? Do you ask your students?

KRISTIE: To this point it’s been interesting, it’s sort of been a mismatch of different methods. I’ve literally searched project options online just to see what other teachers have done. I did have students from Bowling Green, first year education students in my classroom this year and in both instances, I had a Fall semester group and a Winter semester group, in both instances I posed to them “this is the content you’re going to be seeing us learn, by the end of this I’d like to get your feedback on some project ideas and in both cases I used their ideas for the project for the students. I think sometimes that interest too. I happen to have a lot of students who are interested in drawing and creating and things like that. And as you can see [points to student drawings behind her desk] so I try to focus on those skills and that drive and kind of infuse that into the project because if it is not interesting then it’s boring. But the textbook that I’ve seen to this point doesn’t really offer, unless there’s a supplemental resource that I haven’t seen yet, doesn’t really offer project ideas. So you just kind of find those on your own, I suppose. We’re very lucky we have a woman in our building who’s a phenomenal math teacher who does everything project-based so she’s a great resource too.

WINNIE: So you ask her for some ideas?

KRISTIE: I certainly could. I haven’t gone there yet just because I’ve been able to sort of find these ideas along the way but I know other people have and I’ve seen what her students are producing on the walls and it’s very cool.

WINNIE: What do you think are some challenges that math teachers face with teaching diverse student populations?

KRISTIE: I can’t speak to this with great knowledge necessarily but it’s kind of my understanding that there’s this movement to kind of shift our understanding of math and our learning of math and get away from the whole drill and kill, memorization style of learning math. I have to be
honest and say that if that is the movement that my students have been exposed to and if that has been their experience, it is failing them. Because not knowing your math facts is absolutely crushing their ability to perform simple calculations like simplifying fractions, finding common multiples. Now I can’t say with certainty because again I’m two years into the profession. I don’t know what their experience has been from the start. But if in fact they were taught in a setting or in an environment where it wasn’t pressed for them to memorize some of these early basic math ideas, their number sense has suffered. And again, their ability to just move forward is really stymied because they spend so much time looking at these [pointing to multiplication tables] that they can’t get anything done. So I think that’s one concern that I have if I were to stay in this math realm for the long term and of course I would be required to go out and pursue some additional study of my own to get myself highly qualified for math. I would be really concerned about that for the students coming up. And I also think that unfortunately technology probably has distracted us just a little bit in the sense that we rely very heavily on tools to solve our math understandings or misunderstandings versus simply understanding how numbers relate to one another and knowing how to do simple calculations. But I battle with that if our mission is to produce college and career ready graduates, if I’m your boss, I don’t care how you got me the answer. I just want the answer, right? So I don’t care if you used a calculator to figure this problem out or if you went online as long as you come to me with accurate information, I’m quite pleased. And the same can be said I think for a college professor. So I really struggle with this conundrum. Do I force them to work through these problems and figure them out with their own understanding of numbers or do I allow them to simply use the tools and the resources and get it done easier? I don’t know. I’m really stuck with that. So that’s a battle I face.

WINNIE: Okay. So your students, how do you [go about incorporating technology in your classroom]?

KRISTIE: Well, it really depends on what we are working on. So we right now are currently working on adding and subtracting decimal numbers. And I’ve been very much a stickler that we have to be able to successfully to complete these three-digit decimal number problems without a calculator. However, we are going into percentages and I feel like with percentages because there seems to be again this confusion about powers of 10 and where does my decimal go? Left or right? That it would be helpful for them to be able to have the calculator as a double-check because they could perform the calculation and then double-check themselves and see where they are going wrong. Especially if they are going wrong consistently in the same way. Another tool I was gifted from my principal were these fraction calculators [pulls out calculator], which allow students to perform calculations with fractions, and I did give these to specific students who really, really struggled to help get them through their assignments. Those that struggled plowed through with the help of these and completed the assignment that they otherwise would never have turned in. So I guess that tests whether this technology is functional then yea
it is because it’s getting students to do their work. But how much of their work are they doing? I question that.

**WINNIE:** Are they able to apply it to a new situation?

**KRISTIE:** Exactly.

**WINNIE:** If you give them a word problem, how does that play out in checking their understanding? Do they really understand the concept?

**KRISTIE:** Absolutely. And if left to their own devices, could they work through the algorithm to figure it out on their own without the support of the calculator? I don’t know. You know what I mean? These are all things that I’m still uncovering and discovering. I don’t know frankly. I think you could teach for 50 years and still not have the answers to these questions.

**WINNIE:** I think it’s something that math educators are struggling with. NCTM keeps up with new ideas, new proposals but nothing’s really changed that much. They’re still trying to figure it out.

**KRISTIE:** I think and somebody made the comment that our children just aren’t engaged in enough practical, hands-on activity at home to be able to apply anything that they are learning to really understand math and number relationships and I have to somewhat agree with that. I mean, I don’t know of a single child that goes home and actually measures something and have to like...there’s just so many applications for math that have kind of gone by the wayside, at least it seems, I could be missing something big but they’re not doing any of that at home.

**WINNIE:** So that brings up another good point with professional development. You said you’re not highly qualified to teach math. Are there professional development opportunities that are offered to you in overcoming some of those challenges that you are struggling with?

**KRISTIE:** Without question. In fact, I don’t think my ratings would be anywhere near where they are had I not gotten help of the Math Academy, lesson views, and online application that we use to access all of the additional materials for the Connected Math program. There’s great resources there. Certainly, professional collaborations and speaking to other people. I was blessed to have a mentor who’s a math teacher when I entered the TPS system so that was very helpful. So yes, there’s plenty of professional development opportunities but I don’t necessarily know with 100% certainty that I could still develop to be a phenomenal math teacher if there isn’t a lot of math in me. Does that make sense?

**WINNIE:** Yes.
KRISTIE: You know when asked to identify what I wanted to teach and to pick my grade level and my content, I went with those areas where I think I’m the strongest. I never grew up thinking I was good at math or did exceptionally well in math in school. So it’s not an area that I would’ve watched myself go into with great certainty saying that “I’ve got this”. I would’ve ran away screaming. So it just happens to be the way that my professional experiences worked out that the buildings where I’ve been placed, this is the need that I was filling. And it’s again working and the students are obviously learning or at least their test results suggest that they’re learning but I don’t know with all the professional development in the world if I could still be as good as someone else who maybe has more of that in them.

WINNIE: So because you’ve experienced that challenge of identifying with math as a subject that you are teaching now. When you notice that with your students and some of the talk in math education is how do you get all students to identify with the learning domain. Because if you can’t do that then of course they’re not going to do well or they’re not going to learn at all. So how do you deal with that when you have students in that scenario?

KRISTIE: Well, it’s interesting. I used to think it was important to make a connection and whether it’s something they’ve experienced yet or not, it was still relevant. So to say “you know someday you’re going to want to go buy a car and it’s going to matter how much interest you’re paying on your loan” and then I read an article very recently that suggested that that’s actually insulting your students. By suggesting that you know I’m going to teach you something that you have no use for yet, it’s not even relevant to you yet, and in many situations, many of our students’ parents don’t have cars so now you’re talking outside of their own life experience which is just way too far out there. So I’m starting to kind of rethink that and we spend a lot of time talking about Hot Cheetos I kid you not because they all love them and they all want to buy them. So we kind of reference everything back to Hot Cheetos. Now you have to go borrow a dollar from your mom because you don’t have any money to buy Hot Cheetos and she says fine but you’re going to have to pay me 5 cents over and above the dollar. That’s called interest. At what percentage is that? You know, just trying to find ways to reach them with things that might make sense. But it’s challenging and to get everyone to embrace the domain, that’s the interesting thing too. Math covers lots and lots of territory especially in 6th grade. I’m sure in all grades but 6th grade is the only thing I know. So you might have one who embraces the domain at the beginning of the year. First quarter is all about everything they enjoy and now here we are in 3rd quarter and they’ve completely checked out because they have no interest whatsoever in decimals. Conversely, I’ve got a few who’ve just recently come onboard, who’ve really surprised me because now all of a sudden we’re talking about money and they care. So all across the board, you have people checking in and checking out from day to day based on what we’re talking about and the concepts and the skill and how comfortable are they with it. So I don’t necessarily know that there is ever a time that everybody is on board but I also don’t think there’s ever a time where everybody is off the ship. I think we have a lot of...
WINNIE: Flip-flop.

KRISTIE: Yes.

WINNIE: So you talked about the Hot Cheetos and how you use that to kind of grab their attention and give more relevance for them. How do you think everyday experiences, whether it’s at home or in their community, when they are outside of the school, how do you think those experiences impact the learning that goes on in the math classroom?

KRISTIE: I think they serve all learning in all honesty. I mean a perfect example is a student who is a scholar student, straight A student, excellent behavior, came into the building on a random day of the week and told me that the book bag had been left at the other parent’s house, there was some arguing going on and then he was moving. So we went through this for two weeks. Everyday I’m not sure if I’m coming back tomorrow. I think I’m moving. I’m not sure if I’m coming back. So for two weeks, we had no homework, we had no textbook. What I did get from him was very limited. He was obviously very distracted. Now, he’s completely back on track and doing an excellent job but you can’t miss two weeks of a quarter and recover from that with the kind of grades you started the school year with. So it absolutely usurped his grade for the 3rd quarter. He went from being an honor roll student to barely passing so I think that that plays every role in how they do in the classroom. Without question. I see very few students who I can pinpoint who can deal with those multiple stressors and still be successful learning. My opinion.

WINNIE: Do you think there’s opportunities for you to have students go out in their own communities and take what they’ve learned in your classroom and apply it in some way whether it is through a project or some kind of...

KRISTIE: Gotcha. I’m sure there’s phenomenal opportunities for that but I still feel like every week I’m recreating the wheel. I’m certainly...[inaudible] and do I have all the right supplementals? And am I totally prepared for this? Imagine what could go wrong here and what could go wrong there. To even begin to structure any kind of activity outside of these four walls, it’s overwhelming to me. I in fact just learned recently that teachers plan fieldtrips that might sound ridiculous but nobody tells you that. Nobody tells you how a fieldtrip comes to life until you’re a teacher in a building and your students ask and you ask someone else and then you start to get information. And I’m not to a point yet where I’m confident enough, especially with the 6th graders. I don’t know what it is with them. They kind of lose their mind in the spring which I know a lot of grade levels and students do but 6th graders seem to be going through something a little bit more inherently genetic that makes it even that much harder that I’m confident enough to take them outside of these boundaries. Maybe in a very small group, club-type setting, afterschool would be a good place for me to begin something like that before I would launch a full-scale 6th grade wide “here we go” project idea. I don’t know that I’m there yet with understanding the content enough to say “okay, how can we take these concepts and
really do something worthwhile in the community and represent ourselves and represent Mrs. K, represent [school name] and do something with math?” You know what I mean? I’m just not quite there.

WINNIE: So then are you willing to have somebody come in from the community?

KRISTIE: Oh, there’s no question! There’s no question. I would be way open to having someone come in but finding those resources is always interesting too. That would be another question for Mr. K [principal]. How do teachers find people to come into the building? And what is the process for getting them in safely and knowing that they are okay to enter a school and be in the company of children?

WINNIE: Well, thank you. I know we have to wrap up but is there anything else you’d like to add that I haven’t asked?

KRISTIE: No

[Ended the interview with thanking her for her time]
Appendix F

Michelle’s Interview Transcript

MICHELLE: My name is Michelle [Last Name] and I have agreed to take part in this interview and be recorded.

WINNIE: Thank you. Okay, we are now recording.

MICHELLE: I was going to show you this. This is SuccessMaker and it’s the school district’s website for reading and math and you can program it such that the student selects reading and/or math. And you set it up for any length of time that you deem necessary. Most teachers set it for 15 minutes for math and 15 minutes for reading because the students are in the lab for a half hour but when my students go to the lab, I set it up such that they do 25 minutes of the topic that I have appointed for them to do. And in this case it’s on data analysis and probability. There’s a way to go in and manipulate the software that such the student will only receive the skills that you want them to receive which is what I did here and this star notes that the student has completed the assignment and this is the percentage over here. Now SuccessMaker is set up such that no matter what I can’t manipulate this part of it. That...each skill will only provide the student with 4 practice questions and if they get those 4 practice questions correct, it will move to the next skill that I have selected. If they miss a skill depending on whether it’s the first time they did it, the second time, the third time, or the fourth time, the computer assigns them more practice in that particular skill before it will move to the next one. So their percentages are pretty much held between an 80 and like a 60 which is not really very reflective of a teacher’s grading scale because 93-100 is an A and so on down the line so what I’ve done when I get this data, I make a box plot of it and I put the kids in there as A, B, C, or D and if they are in the top fourth of the data they get an A. If they are in the middle or the second fourth, they get a B, C, D. So that’s how I…the percentages are kind of misleading but an 86 would be an A. And a 68 would probably be a B or a high C.

WINNIE: Okay.

MICHELLE: Okay? So that’s how that goes. For this quarter I gave them two assignments I gave them probability, grade level 7 and this probability level 2 has more 8th grade material on it.

WINNIE: Okay.

MICHELLE: Okay? So that’s how that goes. And there are all my students. Now the difficulty with this is though they can’t...this software isn’t loaded onto my chrome books. They can only do in the computer lab and the computer lab has been used for testing and so my other class their time with me is one day a week, I have half an hour to take them to the computer lab to do it but
their time has been a mute point because they couldn’t go because they are testing for the primary down there.

WINNIE: Oh no.

MICHELLE: So that’s why I’m showing you only one class, the other class doesn’t have nearly as much done on this because of all the testing that is taking place but I’ll do my best to get them in before June 3rd. Yea, that’s that.

WINNIE: You do this for every unit?

MICHELLE: Yes. Every quarter I’ll set up two things for them to do on here plus I’ll have a quiz and then I’ll have projects and their notebook so their grade is based on the projects, the notebook, that quiz, and SuccessMaker.

WINNIE: Okay.

MICHELLE: And like I said, I use my...these are on the school district website, the curriculum alignment map and I printed it out and I just check it off and design my lesson plans around the topic that I need to cover.

WINNIE: Now, do you find that you are able to get through the topics?

MICHELLE: The first and second quarter, I nearly finished things but with the testing, oh my gosh it was a nightmare. I’m lucky if I covered half of it.

WINNIE: So then if you don’t, let’s say 2nd quarter you get through halfway of the curriculum map, do you just move on to the next quarter?

MICHELLE: Yea, you have to.

WINNIE: Okay.

MICHELLE: That’s, you know.

WINNIE: And then when they come to the testing, the students just...

MICHELLE: It’s like [takes a deep breath], it’s like trying to deal with a farmer’s field and tossing seeds out and trying to cover the area or concentrating on half of it, cultivating it, watering it, and fertilizing it. That’s what it’s like.
WINNIE: [Laughs]

MICHELLE: Okay. [Laughs] Is that a good analogy?

WINNIE: Yes, it’s a very good analogy.

MICHELLE: There you go. That’s what it is.

WINNIE: Wow. That’s tough. I know we faced the same issue when I was teaching you would get to the 4th quarter and you would pick the main topics that you wanted to focus on.

MICHELLE: Exactly.

WINNIE: You’re like there’s no way.

MICHELLE: There’s no way.

WINNIE: Absolutely no way.

MICHELLE: No.

WINNIE: Wow. Well, I had some other questions on here for you. I’m not necessarily going to ask...

MICHELLE: Well you know what, when I read this stuff, I really would like to know what you mean by that because I do have...I mean I know what culturally relevant means. My students are all from lower income families. All of them are and dealing with that aspect of it as a teacher I’ve done so my entire life. I had 3 years where I taught in a private Catholic school in Columbus in an upper class neighborhood and so I do have some experience in that area. These children that I’m teaching I dearly love them which is why after I retired, I came back because they are the fuel to the flame in my heart. That’s what they are. I really enjoy being a teacher and I enjoy my interactions with people, my young people. I think kids are very special and these children face much more difficulty and hardship because their basic needs are not being met to the degree that the kids that I had in the private school do. I mean things that they just assumed everybody had, these kids don’t have and it’s as simple as that. And I know bad things can happen to everybody and they do. I saw some bad things there too. You know. There’s illness, there’s all kinds of stuff that is not, doesn’t pick and choose but I would say hands down, these kids are at, especially when it comes to school, they’re at a detriment because their parents have not experienced that level of education and don’t know even how to begin or what to do to put them in that position. And that’s hard. So they have to be twice as driven at least if they want to do it because they don’t have those people behind them or around them that are going to show
them how except for me. Except for me. You know. And I take that role very seriously and I talk to them about it and how to do it and what to do but somewhere in there there has to be a fire that wants it because as much ability, even students that had the greatest amount of ability, if you don’t have that spark that says I’m going to push myself further, I want it more, I want to taste, now I have a taste, I want a drink, I want the whole thing. They have to want it. You know?

WINNIE: Right.

MICHELLE: And if they do, I can help them and I want to.

WINNIE: Right.

MICHELLE: But in other ways I try to not appreciate that kid more than I appreciate more than any of them. And I don’t because I love all of them. And I try to help each one of them see what their gift is that God gave them. You know? And maybe it isn’t academic but it is there. They ask me “What am I good at? What do you think I’m going to be?” You know? Sometimes it’s hard. Like last week a little girl across the hall in the 8th grade class, for Mother’s Day I was having them do, because we had testing all day and I had like 20 minutes with them and I said “alright, I want you to do something for your mom for Mother’s Day. Make her a little…” I had a little template that they could do. She did hers and fixed it all up and wrote it to me instead of to her mother. I said, “Honey, it’s for your mother.” She goes “No, this is for you. I love you.” The next day, this is bad, the next day she came in, she had a black eye this big [showed size with her hands].

WINNIE: Oh no.

MICHELLE: Her mother hit her in the face with her fist because she received a phone call from one of the other teachers in another subject area because this little girl was not doing well in her classes midterm time.

WINNIE: Right.

MICHELLE: So she received a midterm report that was unsatisfactory in another class and her mother hit her. We had to call CPS. And this little girl is not a defiant or rebellious child. She is a very compliant, obedient, pleasant, loving child. So when I saw her eye, she ran up and told me. I cried.

WINNIE: That had to be tough.

MICHELLE: Right. And their problem in upper-class school, not that it doesn’t happen, I’m sure it does but I was there only three years but I didn’t see anything like that.
WINNIE: So then when you do have students that do come in with these issues, different needs that they bring to the classroom, how do you then make the math, because you still have to teach the math content, how do you as a teacher adjust it in a way that meets those needs?

MICHELLE: Like with her, thank heavens that these classes for the 8th graders are small. They are under 15 students for both classes and being that I have them doing different things, they can do different things at different times with what I have here. I can sit with her and which I do and help her and show her and she’s not failing my class. She’s not failing at, she’s got a C.

WINNIE: So she’s able to do the work?

MICHELLE: She’s able to do the work because she wants to. Thank God, I don’t have kids that flat out refuse to do it because that can happen especially at this time of the year and it probably will so I’m not going to jinx myself.

[We both laugh]

MICHELLE: But you know, you can lead a horse to water, you can’t make them drink. You can’t drown them in the bucket you know what I mean? So I mean yes, using everything that I have within in my power, spiritually, physically, emotionally that I have to get them to want to do it. That’s what I do. You know?

WINNIE: Well, it seems like you’ve had a lot of success especially with incorporating different practices. You have the technology. You have the hands-on experiences. You have art included in there. How do you think that the different instructional practices that you incorporate are culturally relevant? Do you feel like they are? And if so, in what ways?

MICHELLE: I think so. I think a child who doesn’t speak English for example when I told them how to do integers, any integers, I had, I used little bingo chips. And I used red and black. Red were negative and black were positive. And I showed them with the chips what it means to add a positive and negative number and how they cancel each other out. I mean, even if you can speak English, if I put the problem, even if you could not, if I put the problem on the board with the white board and show them with the chips and show them when you carry them up you eliminate them, you slide them off into the cup and what you have remaining on the desk is your result. I mean I think that’s culturally relevant in that it I think most people from any culture could understand that. You know? Things like that. I’m trying to think of other ways. That just popped into my head though as the first thing that you said.
WINNIE: Do you on a whole, are there specific instructional behaviors that a culturally relevant teacher possesses in the math classroom? When you think of a math teacher that is culturally relevant in their practices.

MICHELLE: I would think that they are hands-on. I would think that they would use hands-on manipulatives to further the understanding of any concept. A picture is worth a thousand words but by activities that’s even better.

WINNIE: Any other behaviors you think they would possess?

MICHELLE: What do you mean?

WINNIE: Any other behaviors that the teacher might possess that’s culturally relevant?

MICHELLE: Oh I see what you’re saying. I think a teacher has to be, to be a teacher you have to have an open heart. You have to, if you want to do it, if you want to stay at this for as long as I have, you have to love kids and you have to love them all. You have to accept not a lot back and be willing to put out a lot. And in order to do that, in order to do that, it has to be doing something for you interiorly that makes you feel like you’re doing something important. Because when you feel like you’re doing something important, it doesn’t seem like a task. It seems enjoyable. It seems like the right thing to do.

WINNIE: Okay, what about when it comes to culturally responsive teaching, do you see those behaviors as being different for a teacher that’s culturally responsive in the math classroom?

MICHELLE: I’m not sure what you mean by culturally responsive. What do you mean?

WINNIE: So if you’re thinking about your students and the different cultures that they bring into the classroom. What behaviors does a teacher have to possess in order to be culturally responsive in that classroom? Do you think it’s any different?

MICHELLE: No I don’t. I don’t.

WINNIE: Can you explain why?

MICHELLE: I don’t think it is because I think love doesn’t have a color or a face or a shape. It just is open to all. That’s what I think. Now that you’ve got me thinking about that, at the beginning of the year of course I teach middle school students who are teenagers and the peer group is the biggest, it can be the biggest hindrance to teaching because there’s social media that is just, it didn’t exist in my time and you have the social media and all the stuff that is going on and is bombarding the kids in every direction. What this one says about this one on Facebook or
whatever and that has some very dire consequences with some of these kids. It’s happened in my room this year. I had a little girl who was out sick for a week and a half and one of the other students had started the rumor that she was pregnant.

**WINNIE:** Oh no.

**MICHELLE:** So I had squashed that one with a hammer. I said “it’s none of your business what she is, I mean that is just mean, how would you like someone to say that about you?” Which leads me to another, I’ve spent class sessions on, online I googled this guy’s name, now you’ve got to let me think about this, you probably know his name, he has no arms and no legs, Nick Vujicic, something like that.

**WINNIE:** From Australia?

**MICHELLE:** Yes. I have googled him and I have played his stuff for my kids. And you want to talk about culturally, culturally okay? Come get me I have no arms, no legs, I can’t defend myself. I can talk. You know? And the kids were crying when I showed them that. You know this is, you know, you have to talk to them, when you’re teaching kids you speak to their heart. If you want to have them stay with you for more than 5 seconds, they have to think that you care about them. And if you, and I don’t care what you look like. And I don’t care where you come from. You’re a human being, period. And I care about it. I care about you and I want to make you the best you that you can be.

**WINNIE:** Okay. So with that in mind, so math has had a reputation for being...

**MICHELLE:** Difficult.

**WINNIE:** Difficult, universal language, 2 plus 2 equals 4 anywhere you go in the world. But there are instances where the way we think about different math content, the tools that we use, the language we use might differ from one person to another.

**MICHELLE:** You are right.

**WINNIE:** So how do you take that into account for your students?

**MICHELLE:** Great. So I’ll present a topic, right? And the kids won’t get it. Let’s say three-quarters of them get it but there’s a good quarter of them who don’t understand what the heck I’m talking about. Okay. So, one of the things that has really helped me is 39 years of experience. So I can remember different ways of doing things so when I have a topic like that, I’ll show them another way to do it or another way to do it. And then it’s always the case that you’ll have a kid in the class that says “I didn’t do it that way. I did this.” And I say, “Here, right here. Show them
what you did. We’re all going to watch and see how you did it.” And the kids will say “Oh.” Then I’ll go over the three ways we just did it and I’ll do it again. This way. Alright let’s do it this way. Alright, who likes this way the best? Who likes the second way the best? Who likes the third way the best? Okay? That has worked more and that has paid off dividends for me more times than I can tell you. Doing that. And another thing is making the kids do projects. I don’t do group projects very often but not this year but last year when we had these practice questions for the OAA before we got the PARC test, I gave them each a question and I had them do a presentation. They had to present the question to the class and until you teach somebody else how to do something you really don’t know how to do it. You think you do but until you have to stand up there and show them how to do it, step by step, I mean you know what you did zip zap, super quick but now I have to show them and tell them exactly how did I do this, how did I do this, where did I go from here to there. So that is a good thing too. Doing a presentation in front of the class.

WINNIE: Okay. Do you have any students that English is not their first language? Any ELL learners?

MICHELLE: Yes, quite a few.

WINNIE: How do you support them with merging their home language to the formal math content knowledge?

MICHELLE: You know what? Their home, I have some Hispanic students. We have a good number of Hispanic students here. Probably 25% of our student body is Hispanic and they’re first generation Hispanic from Mexico. And in many cases, parents do not speak any English at all. So I’m bringing up these group of learners that are bilingual. You want to talk about a great skill to have. They can flow from one language to another like me washing my hands. And it’s just amazing to me. Most of them are very good students in math. Now to answer your question, how do I merge that with home? I don’t because the parent can’t, when we have parent-teacher conferences, I demand that the child come with their parent and we sit there and I will say, the mother can pretty much tell by my body language if I’m happy or not. You know? So the child will sit there and tell the mom what I’m saying. You know?

WINNIE: So do you ever have instances where they want to, for example if they are working on a problem, they want to either talk to another peer in their language or you know discuss it?

MICHELLE: Yes and that’s fine.

WINNIE: How do you support that?
MICHELLE: I’ve had kids that are in my class, brand new to the United States, not a word of English and I had kids who are very, like I told you, I sit them down next to each other, I’m sitting here, you’re on that side, I’m on this side. I’ll tell what to tell them.

WINNIE: And they’re able to...

MICHELLE: Yea.

WINNIE: And do you feel, how does that...

MICHELLE: I feel like I have to give a reward to my interpreter for helping me like that and I do. Like you know, “I’m going to give you a candy bar for this week because my gosh you’ve helped him so much.” You know? And that is the best in the world because the new kid has a connection with that person and then they become, they learn English from that person. I’ve seen that happen a lot. You know that’s how they begin to learn English. It’s very powerful.

WINNIE: What do you think are some of the challenges that teachers face when teaching mathematics especially with the diverse student populations that are in the schools right now?

MICHELLE: I think some of the problems that they face are that, number 1, okay I’m a teacher and I have great respect and love for my fellow peers and I’m not putting them down because number 1 you have to have a heart of gold to do this but I don’t think that if you’re becoming a math teacher, they’re putting way too much emphasis on these children’s performance and having it reflect back on you.

WINNIE: As a teacher?

MICHELLE: Yes and that is very, very intimidating. And it’s, I mean it’s basically saying that “you’re useless. If they don’t learn, you’re useless.” It’s like saying to a doctor “if your patient dies, you’re useless.” It’s pretty close to that. Or you know, your patient is not following your doctor’s orders. You have a patient that is coming in and has CLPD and is 50 pounds overweight and is a diabetic and you tell them “okay, go to the gym three times a week, change your diet, do not eat sweets, do not drink alcohol and don’t smoke.” Okay? And they don’t follow any of that. Okay? They don’t follow any of it. And they die. Do you get blamed? No, they didn’t follow my prescription. Well, these kids aren’t following my prescription either but yet I’m being deemed a failure. I mean I could stand up here and talk and teach. Basically, they want you to be their parent. You know take them home, feed them, clothe them, teach them morality, make sure they’re at school on time. Do everything. You know? I can’t do all of that. I can’t. I want to but I can’t. So you know, don’t put it back like that. And that is what the big this is. You know? That is what is, the teachers need to be held with some respect and some area to bounce a little bit and figure it out. And when you’re held to such a tight, fit in this box and do this and do that
and take these children that are of such diverse backgrounds and take them from here to here, it’s impossible. It’s impossible. It is.

**WINNIE:** Do you think that it’s because they’re bringing in different lived experiences or different needs? What makes it difficult?

**MICHELLE:** What makes it difficult for a doctor who has a patient who dies and doesn’t follow the prescription? It’s the same thing. You know? “Do your homework.” “I didn’t do my homework.” “Study for the test.” “I didn’t study for the test.” You know? “Show up to school on time.” “I’m late everyday.” “Get a good breakfast.” “Well, my so and so is here and my mom’s been gone and nobody is at home and blah, blah, blah.” The beat goes on. There are too many extenuating circumstances to lay down thick, heavy criteria on a person when you cannot, this is a living, breathing human being with body and soul that has a free will. You know what, don’t judge me on what someone else does. That’s what you’re doing.

**WINNIE:** Do you think that if there wasn’t such a big push for testing because that’s come about in probably the last ten years, the testing is at such a forefront, do you think if that wasn’t such a big thing in education that maybe it would be easier to meet the diverse needs of students?

**MICHELLE:** Yes.

**WINNIE:** Why?

**MICHELLE:** Why? Because the teacher could feel...I’ll tell you directly why. I told you when you came in what kind of rapport I have with my principal and what kind of freedom it has afforded. When someone has faith in you, when someone has faith in and knows that you can do a good job that does a wonderful thing for you. When people believe in you, you know? It gives you a sense of freedom.

**WINNIE:** Right.

**MICHELLE:** And it gives you a sense of responsibility.

**WINNIE:** Right.

**MICHELLE:** And it’s like, “I don’t want to let you down. I want to do the very best that I can do.” That’s what teachers need. That’s what we need.

**WINNIE:** So being able to know that I can come in and teach? And focus just on the teaching not for the test but so that...
MICHELLE: For them.

WINNIE: Okay.

MICHELLE: Yea. And they’re all in different places in their lives. I have kids of varying abilities. I have kids, if I can show growth in all of them and that’s all that’s really expected of me. That’s all that should be expected of me. And even that is determined by how many days did they come to school. You know when you have kids that are missing 10 days of school in a quarter and there are only 40 days in a quarter and they are missing 10 days a quarter, you can’t expect them to perform at the same level of somebody who is here everyday. With nothing else on the map. And keeping track of all that missed work and trying to put that out there and teach the other ones. You know?

WINNIE: That’s a lot.

MICHELLE: It’s a lot. Yes.

WINNIE: Yes. Okay. How do you deal with, I know you mentioned that sometimes you have parents whose children are ELL learners and they themselves don’t speak English, how do you communicate with those parents besides having the child serve as the interpreter, how do you…

MICHELLE: We have people here that are, we have a Latino group and then they have a Latino person in charge of that that deals with that home-school connection. And that’s what we have.

WINNIE: So if a child is struggling and the parent wants to figure out how to help that child at home, do you as a teacher find resources?

MICHELLE: We would contact that person.

WINNIE: Okay, you contact that person.

MICHELLE: We would contact him and then we would as a threesome we would do it.

WINNIE: Okay. Well, and this goes back to, I know you talked about testing and how that would be one of the ways to alleviate some of the challenges you face as a teacher, if you had an unlimited amount of time and resources, what teaching practices would you implement to effectively meet the diverse learning needs of your students?

MICHELLE: Well, I spend a lot of money on supplies [pause because afternoon announcements came on loud speaker]
Winnie: So what would you, if you had an unlimited amount of time and resources, what practices would you include in your classroom to meet the diverse learning needs of your students?

Michelle: I spend, I started to tell you, I spend a lot of money buying materials and there are lots of manipulatives and project-type oriented things that I would just need money for that. You know? That’s a never-ending thing. And of course, you know it’s nice to have on hand an interpreter. That would be nice too. I didn’t even tell you this. This is quite significant. I have a deaf student in my class. She’s deaf. I have an interpreter in here with me all day, everyday. Well, when she’s in here. She’s in my homeroom and the school district provides him.

Winnie: That’s interesting.

Michelle: Yea. She’s a good student too. She’s an exceptional student in so far as she is deaf and she reads lips amazingly. And she’s got an A in math. She’s a very driven young lady. She spoke before the board of education at one of their board meetings. She speaks as someone who doesn’t hear well but you can understand her. Her family is deaf and so she’s, you know, her family is very much behind and they’re all in for her. They want her to go to college. They want her to become a veterinarian. She’s a very good girl.

Winnie: Wow, that’s interesting.

Michelle: She’s a great lady in that regard. And we have, this is the school where the deaf children for Toledo Public Schools attend. And any child that’s deaf that’s attending a regular classroom has an interpreter that does sign language. I don’t do sign language. I should learn it but I don’t know it. He signs while I’m teaching to her.

Winnie: Oh, that’s interesting. That’s very interesting. Besides the curriculum map that you discussed, that’s basically your guide on what you teach and in what sequence, are there any other resources that you use to teach?

Michelle: Yes, I use their textbooks. And they’re online too. I can put their book up here too which is nice, which I’ve done from time to time. There are...I’ll show you...in here in the lesson view you’ll find all their textbooks that are in here so I just pull it up. The student text, the teacher text.

Winnie: And does that serve as the main source of mathematical knowledge in your classroom?

Michelle: No. Does that? No. I don’t use it that often.

Winnie: Okay. What serves? The curriculum map is the main source of knowledge?
MICHELLE: Yes, that’s the main source. Yes, absolutely.

WINNIE: Okay. What teaching methods, I know we talked about the hands-on projects and you showed me the notebooks, what other teaching methods do you use frequently in your classroom?

MICHELLE: I use the computer a lot. Just about 3-4 times a week. These are my students [pause for students to enter the classroom to grab their belongings]

WINNIE: Well, what impact do everyday outside of school experiences, so their experiences in the neighborhood, their community, what impact do those play in the teaching that you do in the classroom? Do you ever try to connect it?

MICHELLE: Oh yes.

WINNIE: How do you do that?

MICHELLE: They will come in and just say something terrible happened or something wonderful happened, sometimes I’ll just have to scratch what I planned on doing and just, sometimes I’ll just have to scrap what I plan on doing and reinvent what I was going to do based on what’s going on.

WINNIE: Do you ever bring any outside community resources in?

MICHELLE: Yes. As a matter of fact, next week they’re going to be [pause for student to ask a question] What were we talking about?

WINNIE: The outside resources, do you ever bring any outside resources in like their community members or anything like that?

MICHELLE: There’s going to be a person coming in to talk to them about what’s called “Draw The Line” and it’s about sex. And they’re going to have a 10-day session with this person. So they have that going on. That’s going to be, I mean that happens every year. And as far as bringing in people from the outside...

WINNIE: For the math content.

MICHELLE: For the math content, yes people within the community like engineers or doctors or how math is used in their, we had a guy in here that was from Sun Oil, the oil refinery, and talking about how math fits in with working over there.
Winnie: Oh, wow.

Michelle: Yea, it was very interesting. He was here for a morning and the kids really enjoyed.

Winnie: Oh, good. Do you ever have, I know you do projects, do you ever have them do projects within their own communities?

Michelle: You mean like rake leaves, get involved.

Winnie: No, something connected to math. So maybe if you’re teaching something connected to statistics or probability, having them go out and...

Michelle: Go to the casino [laughs].

Winnie: They could do that. [We both laugh]

Michelle: Since it’s two blocks away, they could do that.

Winnie: Yes, it’s right up the street.

[Both of us laugh]

Michelle: Alright, now you’re giving me a new idea for next spring. That’s good. [Continues to laugh]

Winnie: One of the projects that I’ve seen done with voting patterns and having students look at their own voting patterns in their community and then come back and create a campaign to raise awareness for voting in the community.

Michelle: Oh, that’s a great idea plus it incorporates social studies. Oh yea, that’s a good idea.

Winnie: I’m not sure if you’ve done anything like that.

Michelle: No, that’s a good idea. I like it. It’s better than that casino.

Winnie: Yea, I don’t know how parents would feel about that one.

[Laughter and side conversation about the casino]

Michelle: It’s not good. I told them that. They’re geared to win. They’re geared to win, not you.
WINNIE: Yes.

[Side conversation about the casino]

WINNIE: Okay. Do you think that if a teacher and a student have a different cultural background that has an impact on the mathematical learning that takes place in the classroom?

MICHELLE: Definitely.

WINNIE: Okay. In what ways?

MICHELLE: Definitely. I mean depending on, you know what you spend money on. If you come from a 3rd world country, I mean you don’t go to the mall you go to the market. If they are given some kind of a situation that is foreign to them that’s going to be difficult for them to learn.

WINNIE: Have you had experiences where you’ve talked about something, for example the mall and one of your students that’s not familiar with that, how did you modify your instruction to make it more relevant for them?

MICHELLE: By putting it, you can put the topic or the conversation with a problem with them purchasing something. I would just put it in the realm of what they would spend money on and what does money look like in your culture. It’s not a credit card, it’s probably a coin and what do you do with it. And how do you get your food? You know? That kind of thing.

WINNIE: Well, that’s it for questions from me. Is there anything that I didn’t ask you about that you might want to share?

MICHELLE: No, I think this is very interesting.

[Ended the interview with thanking her for her time]
Appendix G

Angela’s Interview Transcript

ANGELA: My name is Angela [Last Name] and I give permission to be recorded.

WINNIE: Okay. Thank you. Okay, so as we’ve been discussing, you don’t see a connection or it’s not that easy to connect children’s cultural experiences when teaching math content. Can you say a little bit more about it? You said that it never occurred to you. So now that it’s been brought up to you, can you say how you feel about it?

ANGELA: I guess I just never thought of implementing or thinking of specific ways to pull out cultural backgrounds from the kids. I think of it more as with 7th and 8th graders, they have their own subculture being at that age level that I focus on. So we can implement graphing with sports scores and it might be a Black athlete but I don’t particularly think to pick a Black athlete just because some of my kids are Black. I think of more that they like sports. Or graphing cellphone data and I focus I guess on the activity level the social development and the age of junior high kids but have never thought of how to incorporate culture into the math. And I have kids of several different cultural backgrounds in my room. So that is nice to have all that variation of ethnicities. Now in like a different subject like social studies because I do teach 1 hour of social studies, that seems more easy to me because we study parts of the countries elsewhere and study religions and we have kids of different religions that have learned about trips to Mecca and all of these different things. But with math it just doesn’t seem to pop out at me like that.

WINNIE: So you said you do have students from different racial and ethnic backgrounds in your math class. What are the challenges that you might face as a math teacher with making sure that you’re reaching each of their diverse needs or that you think math teachers face in general? Because the diversity of our student population is changing a lot, what are some of the challenges?

ANGELA: As related to their cultural background?

WINNIE: Well being able to meet their diverse learning needs and their interests, the different experiences that they bring to the classroom, do you feel like it’s a challenge?

[Pause because a teacher walked in to ask a question]

ANGELA: I lost my train of thought. I have to think for a second.

WINNIE: That’s okay.
ANGELA: I do many different things as far as linking the math to real-life situations. That would be...

[Pause because an announcement came over the intercom]

ANGELA: That the kids would find relevant so that the questions aren’t, they get distracted by a math question that’s talking about something going on that they don’t have any experience with so for an example one of the questions was about stereo component pieces and they had to buy like receivers and speakers and all this different stuff and after they were struggling for a while with the problem it turned out like that they didn’t understand what like an amplifier was and then they just got into conversation about why you would need to buy all of that stuff whenever you would have your music on your iPod. So there’s generational things that I have to be aware of and kind of tweak things so they are relevant to the kids but I don’t really feel like there’s a need to change anything due to their ethnic cultural background. I mean the kids that are serviced here, I guess I don’t feel like their upbringing was any different than anyone else’s that would be at any other school right now. And like I said that’s just maybe particular to this building. I have in the past...

[Pause for student to bring in some paperwork]

ANGELA: Like I had a student who moved here directly from Kenya. So to me and it could be someone from California, there was an adjustment period because you know he didn’t speak English. I had no idea really what he had learned and where he was in his academics but numbers are numbers. And so where he fell short was similar to any other kid might fall short just because they haven’t had the educational skills up to that point. But I guess I just don’t see...I don’t know, help me! I mean I don’t see why my Asian kids or my Black kids or my, I have kids that are Muslim, why would they need math presented to them differently than anyone else? And they’re all just interested in it when I make it fun and when I make it relevant to them as far as what they do with their life but they’re all doing the same thing. It’s not like I see a lot of differences I guess in that.

WINNIE: Well given that, do you feel, so when you’re assessing your students’ learning, do you assess them, do you only use one particular tool to assess all their learning or do you use different assessment tools?

ANGELA: Many different things.

WINNIE: Can you give me some examples?
ANGELA: They do have typical tests and quizzes that you would receive just on paper and pencil tests and quizzes. They also are assessed the heaviest, the heaviest assessment they get is what is called their math notebook which is like a portfolio that they keep of their daily notes, lessons. They glue their foldables in there. The vocabulary, graphs, everything they create in class gets taped or glued inside the portfolio. There’s several partner and group projects that we do like all the posters out on the walls out there right now was a major assessment where they were given quadratic equations for the 8th and linear equations for the 7th and they had to create a story that matched the expression and they had to make the table and the graph and find the factors. So there’s many different ways that they are assessed. The daily work that they do like what you would consider worksheets, practice worksheets, those I actually only grade for completion. I don’t grade those right/wrong because to me that’s the learning process.

WINNIE: You’re just seeing what progress that they’re making.

ANGELA: Right. So they do them, sometimes in partners, sometimes independently and then we go through them. Right then and there they change answers, fix answers, and those are graded more like on an effort basis and on completion. So their main goals are projects, their spiral, tests, and quizzes.

WINNIE: If you had an unlimited amount of time and resources, what are some teaching practices that you would implement to meet just the different needs and interests of your students? I know you do projects and you do tests and the notebooks. Is there anything else that you would want to be able to do given the resources and the time?

ANGELA: If I had an unlimited, well one good thing is we did just get carts of laptops. However, it’s still very limited on the amount of time that we can use them. Up until this year, the 7th and 8th grade had no computer time. We weren’t even permitted in the computer lab. This year they have 2 portable carts now that we can sign out but that’s 2 carts to be signed out among the whole building. I, especially with the level of the math I teach and how many resources are out there, if I had a laptop or an iPad on every desk everyday I would use it because that’s the kind of thing that the kids love. Whether it’s webquest or whether it’s using applets for graphing calculators and so unlimited resources that would be the first one I would think of. They still very much enjoy creating and building things so I spend an extensive amount of my own money on art supplies because they like to build the prisms to find the surface area and so I’m like a junk collector and I just collect stuff but if it could be really cool stuff that they could actually build with, I would spend money on that. As far as time, I’m still kind of getting used to the common core and my hope was that due to the limiting of topics that I might feel more like I was successfully getting through things by the end of the year but I don’t feel that way at all. I feel like if I could teach 3 hours of math a day, I still don’t know if I could get through what they want them to get through and be able to say “yes, I taught them at every way that I could with every different strategy that I could and now they get it and maybe there’s a couple who just
can’t see that topic.” But you just constantly feel like it’s time to move on. So I would love more time but…

[Pause for announcement on intercom]

Winnie: Speaking of, we talked a little bit about the different experiences kids bring to the classroom. Do you ever go out in the community and bring some of those resources into the classroom or maybe take your students out into the community to teach them math or encourage them to do a project with something that they are familiar with in their community?

Angela: There’s nothing that I personally have initiated but there’s already programs the school does so they do the JA in a day which is very strongly math-based so they have a whole day of the Junior Achievement and for the 7th grade they focus on economics so they’ll have them balance checkbooks and deciding on the benefits of buying home insurance and all that kind of stuff. Really, the other activities I guess that we do aren’t really math-focused like we’re going to the Botanical Gardens just because it’s an outreach with out neighbors to get into the community and for them to support our school, which they do. They give us plants and work with us but it’s not like a math-focused. And then we have some area churches that send people in for tutoring and come in to offer support. They bring us paper if the kids need supplies they bring things. So we have a good relationship with the immediate community around us, which is nice.

Winnie: So you talked about the textbook. Do you use the textbook?

Angela: I do.

Winnie: Besides the textbook, are there any other resources that you rely on as sources of knowledge?

Angela: I was going to say I use the textbook but I embellish on the textbook quite a bit. We use what’s called “Connected Math” so it kind of sets up the scenario that’s followed in each book. It kind of forces you then to use the book because then you take those lessons intermittently. If you jump around, the story doesn’t make sense. So like right now the 7th grade story is about kids doing a walk-a-thon and they go through collecting the pledge plans, finding out their rate of walking speed, how far they have to walk to get a certain amount of money, then they’re going to buy t-shirts. So each lesson is linked into this storyline that’s supposed to give them a real-life connection. But I pull in computer technology, any types, like understanding the algebra with the fast food menu that you just looked at. I use many, many other resources to kind of back it up because the one thing with this Connected Math, they don’t give a whole lot of drill and practice and they don’t, it moves too fast so might be done with a particular
lesson number but the kids may need 2 or 3 more days of practicing that skill so then I have to pull other things in.

**WINNIE:** Do you go on the Internet or do you Google some materials?

**ANGELA:** I get tons of stuff on the computer from different teacher sites. There’s literally hundreds of thousands of things you can get for free and they’re nice things. So that’s probably my main source.

**WINNIE:** What about [pause to look over survey responses] As far as going back to assessing your students and their learning, what do you do if a student, if you’re explaining something and they have another method or another tool or another example that they might bring either from home or in their community, do you allow them to share that, do you allow them to use that, how do you go about that?

**ANGELA:** Absolutely. One, if you’re familiar with the 7th and 8th grade math, a lot of it is brand new to them. It’s things they’ve never done. So there’s not a whole lot of “well, I did this last year.” But with the basic number sense skills, there is that they now have to apply. So I’ve had kids several times like multiplying 3 by 2 digit numbers that use like this lattice technique and I had to have them show me. And I’m like “What?” So one of them drew out the lattice and I was like “Holy Cow!” Because some of the kids get crossed over and their ones become hundreds trying to do long division and multiplication so they went around through it because we do a half hour of math intervention a day which is separate from the core content and they will teach each other those techniques that they learned in 4th, 5th, 6th grade or even just “my mom made up sentence so I can remember order of operations” or whatever so they bring things to the table quite a bit and those are always fun to share.

**WINNIE:** Okay. When you attend professional development workshops that are provided by the school system or whoever, have you found that you’ve been provided with some tools or resources that have been able to help you negotiate between the different needs that your students bring to the classroom? Have any of them focused on that?

**ANGELA:** The big buzzword of the last year or two was “differentiation.” Almost to where you want to throw up every time you hear it. Yes, I’m saying that on tape but seriously we differentiate because we’re good teachers. We do it naturally but now all of a sudden every single thing you do has to be written down and to be proven to be research-based intervention just because somebody decided that they were going to post data on how to do that intervention, now it’s research-based or not when it’s something you’ve done all along. So as far as having tools and skills presented to us on reaching learners that’s been shoved down our throats for the last couple of years. What part of it is relevant and useful though? And what part of it isn’t? That’s where the tricks come in because I don’t have my kids in the classroom all day
where I can have little Jimmy finish his reading assignment early so I can pull him over and help him with something in math. You have 52 minutes with the kids to do the math and you don’t have all these bits of pieces of time to set up things the same way that you might in 2nd, 3rd, 4th grade. That’s where it’s a good thing with our math intervention where we get a half hour at the end of the day that we separate the kids into groups and in that half hour now I can go back. I have kids that still can’t combine like terms when the rest of them are solving quadratics so that’s the time that I can go back and do those things because to make 27 kids listen to how to combine like terms again because 2 didn’t get it and they know so they’re comfortable with it. Like they’ll say “Are we going to try this this afternoon?” and I’ll be like “Yup, this is what we’re going to do this afternoon.” So they’re okay with it. They’re not feeling panicked.

[Pause for office call letting her know that a parent has arrived to meet with her]

ANGELA: And I would say the district has been good with providing differentiation strategies and identifying learning types but it’s something that kind of keeps changing. You can keep trying new things forever.

WINNIE: Is there something that you wish that the district would offer you that’s not being currently offered?

ANGELA: Not that I can really think of off the top of my head. There’s really nothing pertaining to me right now. And I feel like they have given support.

WINNIE: Well, that’s all the questions that I have for you.

[Ended the interview with thanking her for her time]
Appendix H

Elizabeth’s Interview Transcript

ELIZABETH: Elizabeth [Last Name] and I give permission to record.

WINNIE: Thank you. So in your survey, I asked you about your use of culturally relevant and responsive teaching practices. How do you define that for yourself?

ELIZABETH: Culturally responsive, I basically define that as things that relate to my students’ lives in the real world. What they are doing with basically anything that pertains to them and their culture.

WINNIE: Okay. When it comes to the subject of math, do you find it hard, do you find it challenging or do you find it easy to be able to do that?

ELIZABETH: Kind of in between. Some content is harder than others to relate specifically to them where they’re at right now. But then some stuff does relate really well to them. Anything dealing with like money, relates really well. But then there might be some stuff they might not deal with ever or maybe not until later in life that can be more challenging to relate to them.

WINNIE: Okay. So when you’re given those instances, what do you do? Do you look for resources? Do you talk to other teachers? How do you [trails off].

ELIZABETH: Yea, I use a variety of resources. Technology, different hands-on activities to try to engage them in the content.

WINNIE: Okay. And the hands-on activities that you do, how do you decide what’s most appropriate for your students?

ELIZABETH: They really like anything they can get their hands on. So whether it’s a manipulative or different task card activities where they get to match things up. A lot of them are kinesthetic learners so if they get to touch and move things or match things up that can help them. Other hands-on activities, sometimes it’s a website where they get to go and deal with manipulatives or play a math game related to the content.

WINNIE: Okay. And you mentioned manipulatives. Do you ever have them bring in anything from home that might help them better understand a concept?

ELIZABETH: I don’t think I did this year in math. It was my first year teaching math. I don’t think they brought anything in.
Winnie: Did you ever have students suggest something or mention like “oh at home, when I’m working on this, I use blank”?

Elizabeth: [pause for while to think] In terms of...I’m not sure if they have or not but they will relate things to their home life. Do you mean something like that?

Winnie: Mmhmmm...yes.

Elizabeth: Yea, we do talk about trying to have conversations about how they might use stuff at their home lives. From that standpoint, yea.

Winnie: Okay. And when it comes to...[pause to look over notes and survey]...I see you said this was your first year teaching math.

Elizabeth: Mmmhhmm.

Winnie: Did you attend any professional development workshops or receive any kind of support or resources on dealing with the different needs that students brought to the classroom?

Elizabeth: Not specifically for math this year. I know I’ve got some coming up over the summer and next year but not specifically for math. I did have to teach science so I did a lot more in that.

Winnie: Okay. Do you think that might be helpful?

Elizabeth: Yea, definitely. I am looking forward to doing a lot more professional development with math to keep up with changes and getting new ideas.

Winnie: What kind of workshops...you said you’re attending some summer workshops.

Elizabeth: Yes. Math Circles.

Winnie: Okay.

Elizabeth: A new one to the area kind of through BGSU. They’re starting a Math Circles for this area. I’m attending that over the summer.

Winnie: What is that? I’ve never heard of that.
ELIZABETH: It’s a collaboration among math professionals ranging from teachers teaching K through 12. I know it’s a growing thing. There’s a couple of Math Circles around the state of Ohio. I think it’s like between educators and college professionals that teach math. They work with math activities and solving and thinking of different ways to kind of engage students.

[Phone rings...takes break to answer it]

WINNIE: Okay. So you were mentioning Math Circles as one of the professional development workshops that you are going to attend this summer. Is there anything else that you plan on attending?

ELIZABETH: There’s a professional development through our district that has to do with our math text “Connected Math” and applying that to the standards. I’m going to attend that to get more familiar with the text that the district provides.

WINNIE: Okay. Do you find...I noticed that on the survey you checked off some practices that were culturally relevant and responsive. What made you check those as practices that you found culturally relevant and responsive?

ELIZABETH: Can I see that again? [Asks for her survey]

WINNIE: Yea. [Hands survey to her]

ELIZABETH: I forget what I marked off.

[Pauses to look over her survey responses]

ELIZABETH: I know one of them; a big thing is cooperative learning. I survey my students at the beginning of the year and they like to work with their peers and I know that can apply to them in their future as well when they get out in their careers so they do some group work and cooperative learning activities. As I said earlier, I like to check, have a conversation with them about how they might have used anything in real life like we do calculating taxes and calculating tip at a restaurant so I talk to them about how you know that might actually apply to them when they go out to eat or to a restaurant and talk about my own experiences with this to try to help them make that connection.

WINNIE: When you said “survey your students”, how did you do that? Was it just verbal or did you give them something?

ELIZABETH: I give them a written or like a sheet kind of like an interest survey to see how they like to work. [Pauses] I’m thinking back to what all I had on there. I did like the multiple
intelligence survey that told me whether my students learn best through nature or art, music as well as a survey to see if they prefer hands-on, auditory, visual, what kind of learners they are. I check in with them throughout the year with surveys to see like “do you think you’re grasping the content? Are you getting enough help in the classroom? Is there too much, too little homework?” Et cetera. So I try to check in with them as often as I can and to make sure I’m meeting their needs.

WINNIE: Okay. When it comes to applying their cultural experiences in the classroom, do you ever seek help from maybe their parents or community members? Or do you ever…

ELIZABETH: I’ve worked with their community a little bit but not as much with their parents but we have like mentors and volunteers that come into the school that have worked with the students.

WINNIE: Okay. What is their role when they come in? Do they just come in to tutor or to help or [inaudible]?

ELIZABETH: There’s various ones. We do have mentors that come in and tutor and work one-on-one with students. We have some volunteers come in to work with afterschool programs like an engineering club or they help the kids with the task that they are working on.

WINNIE: What do you think are some of the challenges that are faced by math teachers when it comes to teaching students from diverse backgrounds?

ELIZABETH: One of the challenges is just a lot of the kids will be at different levels. I have some who are at a 3rd grade level. [Speaker interrupted] Various levels like I’ve had kids at the 3rd grade level all the way through almost high school level math. So that’s one challenge. And just being able to differentiate to me all those learners. Being able to teach them the grade level content that they need to know and also help them build the gap or bridge the gap or close the gap, whatever you want to call it. From where they’re at you know, get them to grow each as individuals.

WINNIE: Okay. What do you use…so you said different levels…when they come in at different levels, figuring out how to bridge that gap. What do you use as your main source of knowledge? Is it mainly you, the textbook, the students?

ELIZABETH: For the math content?

WINNIE: Mmmhmmm, for teaching.
ELIZABETH: I used a variety of different texts and materials. A variety of textbooks not just one but I consulted a few different ones besides “Connected Math” I used a Pearson book, ones that had different examples. I tried to give them a variety of experiences as well as looking at resources found online like from the website “Teachers Pay Teachers” whenever I can find different activities just to try to have a variety where I can try to meet everybody’s needs.

WINNIE: Okay. So given your own lived experiences and your own background, do you find that sometimes that can either play a part in the teaching that goes on when your students don’t share the same background or cultural experiences?

ELIZABETH: Could you kind of repeat that?

WINNIE: So given your own lived experiences and how you learned math and how you use it and the tools that you bring to the classroom and then some of your students have different experiences and different ways of learning math and understanding it, do you feel like that plays a role in your teaching or the learning or even just the classroom environment?

ELIZABETH: I think it definitely plays a role and I’ve had to get to know my students and where they come from because I grew up in a completely different area and was taught how many years ago and it was so different and I’ve had to learn a lot about their experiences and their backgrounds to be able to try to build a rapport with the students and then be able to get students to respond to my teaching. I’ve had to build a rapport and relationship with my students. You know build up and respond to their needs and learn about them throughout the year like I started off first year here last year and had to learn that it was going to be a certain way I had to adapt my teaching style to meet inner city kids whereas I had previously come from like rural areas and smaller school districts.

WINNIE: Do you feel like you’ve gotten the proper tools or the resources to be able to...

ELIZABETH: Yea, I feel like I’ve gotten to where I need to be and I understand their needs a lot better and I know where to get the tools that I might need whatever math tools or technologies that I might need to meet them. I feel like I know where to get it or I have it or I can find it.

WINNIE: How do you decide what content should be taught in class? I know you mentioned the textbook and you mentioned going on some of the websites like “Teachers Pay Teachers”. Do you also rely on other sources you know maybe students or parents or you know whatever may be?

ELIZABETH: I think first and foremost is the Ohio State Standards. I have to you know teach that content and then when I do see a need for them to learn something you know relevant I do find resources or stuff. There’s always a moment where like they bring up something you know
that’s relevant that they should know so I go okay we can stop and talk about that even if it’s
don’t you know what was on the day’s lesson plan but was in the standards. If it’s something I see
that they need and it’s relevant then I definitely stop and take the time to teach that.

WINNIE: What teaching methods do you use the most frequently?

ELIZABETH: Usually there’s I don’t want to call it lecture but providing like background
information with examples. I do a lot of guided examples so kind of like a note-taking, note-
taking with examples and then having the kids, I kind of start with like, sometimes a video and
then notes and guided examples of the teacher and then let them have time to work with the
content. A lot of times in smaller groups or partners and then come back together, go over how
it went, see if there’s any overall problems or misconceptions throughout the class and then
they will work on the content individually with an assignment or homework or a task. That’s the
basic structure.

WINNIE: Do you ever, I know you noted on the survey that you use different tools for
assessment? What are some of those tools?

ELIZABETH: We have a couple of different assessments through the district. One is called
SuccessMaker and it’s a computer program where they work on their math skills and it will
teach them as they go through. It will keep leveling up as they advance. This year we used a
website called EasyCBM.com (?) and it was mostly a progress monitoring website where I could
see where the kids were at and they could track their own data and see how they were doing
and progressing in a couple different content areas. We use what’s called STAR assessment
through [inaudible] or accelerated reader where it’s kind of the same company which they took
quarterly to see how they were growing and then of course there’s the state assessments like
the PARC assessment as well as you know regular classroom tests, quizzes, formative
assessments like exit tickets and things like that.

WINNIE: Do you ever have them do projects or anything like that?

ELIZABETH: Yes, we just did kind of like an end of the year project where I could kind of see how
they were grasping the content as well as it was another reinforcement. Like I noticed
throughout the year that geometry was the lowest strand across both my seventh and eighth
graders so they did a geometry project where they got to work with all the content and build a
little city out of geometry pieces.

WINNIE: How did they decide on that city? Did you kind of just…did you give them…

ELIZABETH: There were guidelines like I told them there were a whole bunch of different
sections of the city that they could build and I said you know try and include these shapes and
the different buildings and then they got to make it 2-D and then make it 3-D with nets so they
got to fold them and figure out which net made which shape.

**WINNIE:** How did that turn out? Did you feel like it reinforced the concepts?

**ELIZABETH:** Definitely because they had to do a lot of background information with the vocab.
So they were using technology to research “what is this shape?” or “what does this term
mean?” and they would draw it out and define it so it really reinforced the content then they
applied that as they built their city so it was kind of like in stages where they started off with
vocab and the shapes and then they got to actually build it 2-D and then 3-D so it was really
cool.

**WINNIE:** Okay. In the future would that be something you would do again?

**ELIZABETH:** Yea, I definitely would because I know it’s still a weak strand and I think other
classes in the future will benefit from having it. I saw it as a much more engaging way for them
to build the content knowledge and the background than you know sitting and watching a video
or doing a worksheet. It was so much more engaging for them and they to make it their own
little individual creation.

**WINNIE:** Would you look for other ideas as far as projects?

**ELIZABETH:** Yea. Like I said this year was my first so it’s mostly just trying to hang on at some
point. I definitely do see it as a benefit where they get to take ownership of what they are doing.
They get really into it when they have independence and ownership of what they are learning.

**WINNIE:** Okay. How do you see outside lived experiences impacting the learning that goes on in
the math classroom?

**ELIZABETH:** Well, like just their home lives kind of? Like how that affects it?

**WINNIE:** Home lives, their community experiences, their interactions with their peers outside of
the classroom.

**ELIZABETH:** It’s kind of a rough neighborhood and a lot of our students have some tough
backgrounds. I’m not really sure if that really helps their experiences with math much. I
know...I’m trying to think...like I’m not sure how much they interact with math experiences
outside of school other than the basics like money, shopping and dealing with experiences like
that. I’m not sure that they get a lot other than that. I know we talk about income taxes and
things like that. They’ll bring up that kind of stuff so I guess that kind of affects what they know
about money and numbers. That’s a tough one.
WINNIE: Do you ever send materials or anything home besides homework to kind of engage their parents or to let them know what's going on and maybe see if they can connect something that they are doing in the home?

ELIZABETH: No, I don’t think I really did this year. I’m not sure. It’s something I can think about more. It would be interesting to see how that would go.

WINNIE: Alright. It’s always challenging to figure out what’s the best you know way to meet their needs even outside of the classroom.

ELIZABETH: Yea.

WINNIE: You said here that you use real-world examples in order to apply mathematical practices and then you give some discussion on how concepts may apply to their lives. How do you do that? Is it just a conversation? Is it having them design or come up with problems to solve themselves of things they’ve seen in the community? How do you engage them in that?

ELIZABETH: A couple of ways like I’ll bring in advertisements and things for when they’re dealing with taxes and discounts and percent off. They looked at real coupons and things they could buy at the store and how that kind of played into stuff. So I try to bring in any real-world experiences that way. I know they’ve kind of done some budget planning like if it’s around Thanksgiving, bring in like math something that has to do with planning like a Thanksgiving dinner and going out shopping and purchasing you know. What’s the best option there? So I mean they might not be doing it quite right now in their lives but it’s something that they might do down the line, creating budgets, things like that. Let’s see what else do we do? But other than that the thing about having discussions with them, I try to ask them about what kinds of you know, if they do have those experiences with money and taxes and leaving a tip at a restaurant. [Paused to think...commented that a lot was escaping her mind at the moment] I guess along those lines, trying to ask them about their experiences and then applying, what I’ve learned, you know I’m still pretty young but you know I’m just figuring out how I use the math content in my own life and trying to apply that to them.

WINNIE: As you went through the multiple choice section of the survey and you were presented with different scenarios, how did you decide on what you felt, it said circle the option that you would take, where there cases where you thought of other actions you might take or maybe thought of more than one?

ELIZABETH: I think there was one where I wrote something a little bit different but most of the times I think I could find one that I would take. A lot of times like real-world examples, hands-on, encouraging students, [inaudible], I know I did write in the one, using other manipulatives and
resources to help them learn. [Looking over her survey responses] A lot of times there was something that would relate to something that I would do because I try to have a very open and honest conversation with my students like when they’re, if they’re not responding to what they’re learning or the directions just talking to them to figure out what’s going on.

**WINNIE:** I noticed that you did circle here that you are comfortable teaching your students about the mathematical contributions of their culture. In what ways do you do that?

**ELIZABETH:** [Asks to look at her survey]

**WINNIE:** Do you ever, I know I’ve seen some teachers pull in profiles of different mathematicians from different cultures and use that to kind of engage in that discussion. Is that something that you do?

**ELIZABETH:** Yea, I would do that and kind of talk about that and things like that.

**WINNIE:** Do you feel like they are responsive or engaged even if it’s not someone that they identify with as far as culture or somebody from a different background? Do you feel like they...how do you feel like react to that?

**ELIZABETH:** I feel like it does tend to help them kind of see things out there and who’s you know learned these things in the past but I do feel like it helps them kind of see it more concretely rather than these abstract concepts that they don’t care about.

**WINNIE:** I noticed you said you can recognize when your attitudes, beliefs, and values interfere with providing the best teaching. When you do have an instance like that, how do you deal with it?

**ELIZABETH:** I feel like sometimes I was taught one way and I went through school and enjoyed it and I’m completely different than my students sometimes so I can recognize like why I get this this certain way because I went through this but they don’t really get that because they don’t do that or they you know haven’t experienced something like that. So I have to kind of adapt and figure out how can I relate this to them or what can I do differently? Learning and teaching is definitely not the same as what I experienced so I just continually try to adapt to their needs.

**WINNIE:** Okay. How do you define academic success? You said you can help all your students experience academic success. How do you define that?

**ELIZABETH:** A big part is just seeing where they are coming in at the beginning of the year and then achieving a goal. At the beginning of the year like I said they take that STAR assessment and it tells them you’re at a such and such grade level and you have this score and I have them
all keep track of that and as they take that quarterly, see how much they grow, have them set goals and so that they are constantly try to set and reach their own goals. I see that as a big accomplishment because they are kind of aware of where they are at and how they’re growing so even if they’re not doing so well in every little assignment, well you’re here and now you’re here, that’s success. It’s not necessarily that you got every little thing along the way but that you grew and helping them see their strengths and weaknesses and how they’ve grown.

WINNIE: Well, that’s it for my questions for you. Is there anything that you would like to share that I didn’t ask you about?

ELIZABETH: Not that I can really think of. You know it’s my first so I kind of figured things out as I went along.

[Ended the interview with thanking her for her time]