AFRICAN AMERICAN URBAN PUBLIC HIGH SCHOOL GRADUATES' EXPERIENCES CONCERNING MATHEMATICS

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DEDICATION

This dissertation is dedicated to my ancestors and all of my teachers. For it is because of them and their teachings that I exist and this dissertation a reality. “I am because we are.” This is a special tribute to the late Mr. Charles E. Mitchell and the late Dr. Robert Glover Thomas (Uncle Sonny) as exceptional examples of men with a passion for knowledge and a dedication to teaching youth.

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ABSTRACT

This interpretive qualitative study explored African American urban public high school graduates' experiences concerning mathematics, how these experiences may play a role in the choice to further their mathematics education, and how the Model of Academic Choice (MAC) may facilitate in the understanding of the experiences.

It examined the lived experiences of seven African American urban public high school graduates concerning their mathematics education. Through criterion-based sampling, the seven participants selected had graduated from a public high school located in Northeast Ohio school districts having similar characteristics.

Data were collected through semi-structured interviews that explored participants' kindergarten through post-secondary mathematics experiences. Vignettes chronicled each of the participants' mathematics experiences and an analysis of emerging themes from within and across vignettes were presented.

The emerging themes were tediousness in learning mathematics, student engagement in the classroom, educational trajectory, reality check regarding the effectiveness of one's kindergarten through grade twelve experiences in preparation for college, persistence, classroom environmental conditions, feelings about learning

mathematics, behaviors resulting from feelings about learning mathematics, expectations of self and others, attributions of success and/or failure, one's sense of self as a student and one's self-concept of ability in mathematics. These themes parallel with the MAC constructs of cost, participant's task specific beliefs, participant's goals and general self-schemata, past events and related experiences, persistence, cultural milieu, affective reactions and memories, expectancies, participant's interpretation of past events, and self-concept of ability, respectively. The MAC proved to be a good theoretical framework for explaining the participants' experiences.

The results of this study may be instrumental in having educators and policy makers alike reflect upon their practices to improve the academic outcomes of African Americans in mathematics education. This research contributes additional lived experiences of African Americans to the bank of qualitative research to help in understanding factors that may promote or hinder the participation of African Americans in STEM-related courses.

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CHAPTER I

INTRODUCTION

This study focuses on the mathematics experiences of African American public high school graduates in urban settings. As a mathematics teacher of high school students in an urban district, it is my desire to inform my own practice. My experience in teaching mathematics has confirmed that not all students are intrinsically motivated to participate in the process of learning mathematics. As such, I would like to improve the engagement of all students in their study of mathematics, especially those who are less inclined to put forth an effort to participate in learning mathematics. To this end, it is my hopes that this study would permit the voices of students to be heard thereby providing a rich insight into students' thoughts and beliefs as well as a means for educators and policy makers to continue a dialogue that will improve the educational outcomes of African American students in mathematics education.

This chapter presents some problematic issues regarding the education of African Americans and other marginalized groups. Also, included are the purpose for doing this research and the associated research questions. Additionally, presented are the significance of the study, context of the study, and key terms with their related definitions.

Statement of the Problem

Academic achievement or success has been valued as a vehicle to move up the social and economic ladder in America. Researchers have examined such personal factors as students' race/ethnicity, gender, and socio-economic status (SES) to determine the effect of these factors on students' achievement behaviors in mathematics to better understand why rates of academic success for African Americans and other marginalized groups lag behind their Caucasian counterparts (Teel, Durbruin-Parecki & Covington, 1998). Moreover, Mitchell (1998) reported a disproportionately high number of high school dropouts among African Americans as compared to their white peers. In 2005, African American and Latino students scored more than 20 points below their Caucasian counterparts on the National Assessment of Educational Progress (NAEP) test (Books, 2007). Educational reformers across the political spectrum have expressed alarm about the black-white achievement gap in the U.S. – where, by the end of high school, African American and Latino students' mathematics and reading skills are, on average, about on par with those of white 8th-graders (Books, 2007). Books (2007) asserted that the achievement gap reflects a national failure to realize the democratic ideal of equal educational opportunity. Books (2007) posited that the income gap between what college graduates earned in the United States was an average of 80% more than high school graduates. Additionally, Books asserted that over the past two decades that this gap has more than doubled. In general, the achievement gap illustrates variations among groups of students usually identified by racial, ethnic, linguistic, or socioeconomic status with respect to a variety of measures including attrition and enrollment rates, alienation from school and society, test scores, and attitudes toward mathematics.

Achievement in the content area of mathematics was of particular concern because the choice of employment in this ever-changing technological world is severely limited to low-paying menial and unskilled jobs for those without good mathematical skills and understanding. Additionally, Muhammad (2003) reported that blacks receive only 5 percent of the baccalaureate degrees awarded each year in science and mathematics. This situation is further exacerbated when considering that the census data reported in 2003 indicated Blacks 18 years and older consisted of only 11.5 percent of the entire population for the same age group. Moreover, a report from the National Research Council stated that "the under representation of this generation of minorities leads to further under representation of the next, yielding an unending cycle of mathematical poverty" (Muhammad, 2003, p. 97).

The studies cited above bring to mind what might be the varied perceptions and experiences of African Americans concerning their mathematics education that motivates some to achieve success and a lack thereof for others. In the case of this study, the experiences of African American urban public high school graduates concerning learning mathematics were of interest to illuminate what motivates students to be successful in mathematics.

Purpose of the Research

The purpose of this qualitative study was to better understand African American urban public high school graduates' experiences and how the perceptions of these experiences may have played a role in the choice to further their mathematics education. By using qualitative methodology to elicit the experiences of African American urban high school graduates in their own words, there was an expectation that factors related to

their experiences might offer insight into what hinders and what engages these students in relation to mathematics.

Moreover, there was an expectation that findings from this study would help in identifying effective motivational strategies to improve the achievement behavior outcomes of African Americans who are educated in an urban public high school setting. As a high school teacher who teaches mathematics in an urban public school district, I was particularly interested in the mathematics experiences of African Americans in this setting. I believe the results will inform my own classroom practices for improving students' educational outcomes in mathematics through strategies of effective engagement. Accordingly, this research inquiry focused on how African American urban public high school graduates' experiences may have played a role in furthering their mathematics education. To this end, three research questions were proposed.

Research Questions

The proposed research questions were:

1) What were the K-12 experiences of successful African American urban public high school graduates concerning mathematics?

2) How might these experiences play a role in students' choice to further their mathematics education?

3) How might using the Model of Academic Choice (MAC) as a theoretical framework help in understanding choices of successful African American urban public high school graduates concerning mathematics?

Significance of the Study

This research adds to the collective body of qualitative research concerning issues of African Americans in mathematics education. Prominent scholars/researchers have identified and have advocated for further research in African American achievement in

mathematics (Ali, Akhter, Shahzad, Sultana & Ramzan, 2011; Foster, 2005; Snipes & Snipes, 2005). Snipes and Snipes (2005) identified six areas regarding African American achievement in mathematics as well as science. These areas were 'the historical awareness of education of African Americans, teacher's expectations and beliefs, cultural awareness, testing, equity in the classroom, and career selections.'

In response to the "call" by Snipes and Snipes (2005), this inquiry focuses on the voices of participants as they articulate their experiences in mathematics in an urban public school setting. The qualitative nature of this study, although not generalizable to others outside of the particular participants, can illuminate the choices of students regarding their mathematics education as they reflect upon their respective experiences in their mathematics education.

The results of this study may be instrumental in having educators and policy makers alike reflect upon their practices to improve the academic outcomes of African Americans in mathematics education.

Context of the Study

The study examined the experiences of African American high school graduates from urban public high schools located in high-poverty neighborhoods in Northeast Ohio. Students attended the same urban college or university, and were considered to be academically successful in mathematics. Additionally, some of these students have realized measures of achievement through passing high-stakes standardized tests in spite of attending school in a high-poverty neighborhood.

For the purposes of this study, high schools in high-poverty neighborhoods were characterized as having the following: (a) students % of poverty $\geq$ 60% which is based on

the number of students who qualify for free and reduced lunch; (b) number of black students as % of total $\geq$ 20%; (c) total property tax per student $\leq$ $4000, and (d) median income $\leq$ $30,000. The data provided for % of total poverty and the number of African American students as a percent of the total was based on fiscal year 2012. The data for the property tax per student and the median income were based on fiscal year 2013 and tax year 2010, respectively (Ohio Department of Education, 2007).

It was anticipated that varying perspectives concerning experiences (inside and outside of the classroom) would become evident through the transcription of the participants' interviews. Additionally, it was hoped that study findings would have the potential to influence educators to develop more effective motivational strategies for improving the success of African Americans in mathematics classes. Ali et al. (2011) reported that the environmental conditions found in mathematics classrooms were important to support motivation because students are not always intrinsically motivated.

Ali et al. (2011) asserted motivation was a key component in learning that stimulates, sustains and gives direction to an activity. Motivational theories for explaining student achievement-related behaviors were incorporated in a model of achievement motivation, the Model of Academic Choice (Eccles et al., 1985), which employed processes of personal, social and cultural determinants.

The Model of Academic Choice (Eccles et al., 1985) conceptual framework herein referred to as MAC, served as a theoretical framework in this study for understanding African American adolescent decisions to further their mathematics education. It was anticipated that the results of this study might be instrumental in career

guidance and contribute to enhancing teachers' instructional practices for improving students' learning outcomes in mathematics.

Definition of Key Terms

To help in understanding the context of the study, the following definitions of key terms are provided.

Experience – how participants understand events encountered through school, particularly their mathematics education experience, told in the form of stories of what their experience was like (e.g. struggle/ease in learning mathematics concepts, "getting it/not getting it," engagement, seeing oneself as capable of learning mathematics, grades, standardized test, faculty, administration, classmates, classrooms, etc.), home (parents, siblings, other family members) and neighborhood (peers, local institutions, and social agencies).

Valuing – "principles and fundamental convictions which act as general guides to behavior, enduring beliefs about what is worthwhile, ideals for which one strives, standards by which particular beliefs and actions are judged to be good or desirable" (Halstead & Taylor, 2000, p. 3).

Expectancies – beliefs about how well one will perform on upcoming tasks, either in the immediate or longer-term future (Eccles & Wigfield, 2002, p. 119).

Perceptions – the process of using the senses to acquire information about the surrounding environment or situation (Electronic Encarta Dictionary).

Persistence – Persistence refers to the learner's decision to continue and complete tasks that are seemingly challenging and/or difficult (Eccles, 2011).

Choice – The initial decision to continue to pursue studies in mathematics or a mathematics-related career (Metallidou, 2010).

Performance – measured by standardized test scores, pre- and post-tests, and other measurement indicators.

Success in mathematics – a student completed a high school course equivalent to Algebra 2/Trigonometry or higher-level mathematics course.

Summary

This chapter presented the purpose of the study detailing the problem of interest and its associated research questions: RQ1: What were the K-12 experiences of successful African American urban public high school graduates concerning mathematics? RQ2: How might these experiences play a role in students' choice to further their mathematics education? RQ3: How might using the Model of Academic Choice (MAC) as a theoretical framework help in understanding choices of successful African American urban public high school graduates concerning mathematics?

Additionally, this chapter included the context of the study detailing its significance and related definitions of key terms to better understand the context. Also, it was suggested that the mathematics experiences of successful African Americans students might be better understood using the Model of Academic Choice (MAC) as a theoretical framework.

Following this introductory chapter, the subsequent chapters will set forth a review of the literature in this field of study (chapter two), methodological approaches used in developing, collecting and analyzing the data (chapter three), The results are presented in chapters four through chapter six. Chapter four contains vignettes of the

participants' phases of education. Themes within individual vignettes are presented and an analysis of connected themes across the vignettes.is provided in chapter five. For chapter six, it should be noted that not only are the study findings discussed and summarized, but also, the chapter includes a discussion of the limitations of the study and recommendations for further research.

CHAPTER II

LITERATURE REVIEW

In this section, the Model of Academic Choice (Eccles, 2010) is described and related literature is discussed in terms of studies that focus on the experiences and/or perceptions of African American students concerning their academic achievement particularly involving mathematics and/or science education.

Model of Academic Choice

The Model of Academic Choice (MAC) as espoused by Eccles (2010) was an outgrowth from the expectancy – value model of achievement motivation developed by Atkinson in 1964 (Eccles & Wigfield, 2002). Both models linked the outcomes of achievement performance, persistence, and choice to individuals' expectancies and task-value beliefs. Expectancies and values were originally defined in 1957 by Atkinson (Wigfield, 1994). "Expectancies were defined as the anticipation that one's performance would be followed by either a success or a failure and value was defined as the attractiveness of succeeding or failing at a task (Wigfield, 1994, p. 50)". However, MAC differs from the Atkinson's expectancy-value theory by having more elaborate expectancy and value components with a broader scope of psychological and social/cultural determinants. Eccles' (Eccles & Wigfield, 2002; Eccles, 2010) current

MAC (see Figure 1 on page 13) is the latest configuration derived from the original MAC model (see Appendix J). The original model was revised to include processes of affective memories, culturally based stereotypes, and identity-related constructs. The MAC expectancy-value model has been used to explain participation in mathematics based on self-perceptions, task perceptions, and subjective value judgments (Eccles et al., 1985). Bong (2001) offered a notion that a function of motives, expectancies, and values determine task choice and persistence as posited by the expectancy-value theory.

The MAC framework has used multiple processes in looking at the achievement behaviors (persistence, choice, and performance) in education. MAC proposed that the learner's perception of task value and his/her current/future expectancies of success influence the achievement behaviors of persistence, choice, and performance (Eccles et al., 1985). MAC outlined the task value into four distinct categories of intrinsic value (interest), utility value (usefulness), cost (negative aspects), and attainment value (importance of doing well at a task). These values and expectancies are developed through a decision-making process as the learner interacts with his/her environment.

In this model, expectancies were associated with the learner's attribution of past events regarding grades, standardized test scores, and other related experiences (Eccles et al., 1985). These past experiences, expectations of others (peers, siblings, teachers, clergy, and parents), and an interaction of the learner's goals influenced the learner's task specific beliefs, namely self-concept of ability and perceptions of task difficulty. Task value was associated with learner's perception of others' attitudes and expectations through a cultural milieu of the sex division labor market and cultural stereotypes of the subject matter and competitiveness (Eccles et al., 1985). These perceptions help to form

the learner's goals that interact with the learner's task specific beliefs to influence the learner's perception of task value (Eccles et al., 1985).

This study focused on the learner's mathematics educational experiences and the achievement behaviors of choice, performance and persistence using MAC as a framework. See Figure 1 on the following page for a diagram of the MAC. The MAC (Eccles et al., 1985; Eccles, 2010; Eccles & Wigfield, 2002) proposes that the achievement-related behaviors of persistence, choice and performance were influenced ultimately by current and future expectations of the learner and/or the learner's subjective task value. These subjective task values and expectations were developed through a process as the learner interacted with the environment.

Stable Characteristics (Process Block 3, PB3)

Eccles (2002) listed the aptitude of the learner and his/her siblings, birth order, personality, and learner's gender as stable characteristics of the learner.

Gender.

According to Eccles et al. (1985), gender differences in science and mathematics achievement were a result of task value beliefs and ability perceptions. Gender differences can be traced to learning opportunities, achievement and choice in mathematics (Catambis, 1994). Achievement choices were found to be predictable by gender in a study conducted by Durik (2006). Additionally, Bembenutty (2009) found gender differences in self-regulating learning habits with girls showing greater self-regulating learning strategies than boys. Eccles (2005) further posits in her theory of expectancy-value that gender differences are largely accounted for in one's expectations of succeeding at a task and the value a person assigns to known options.

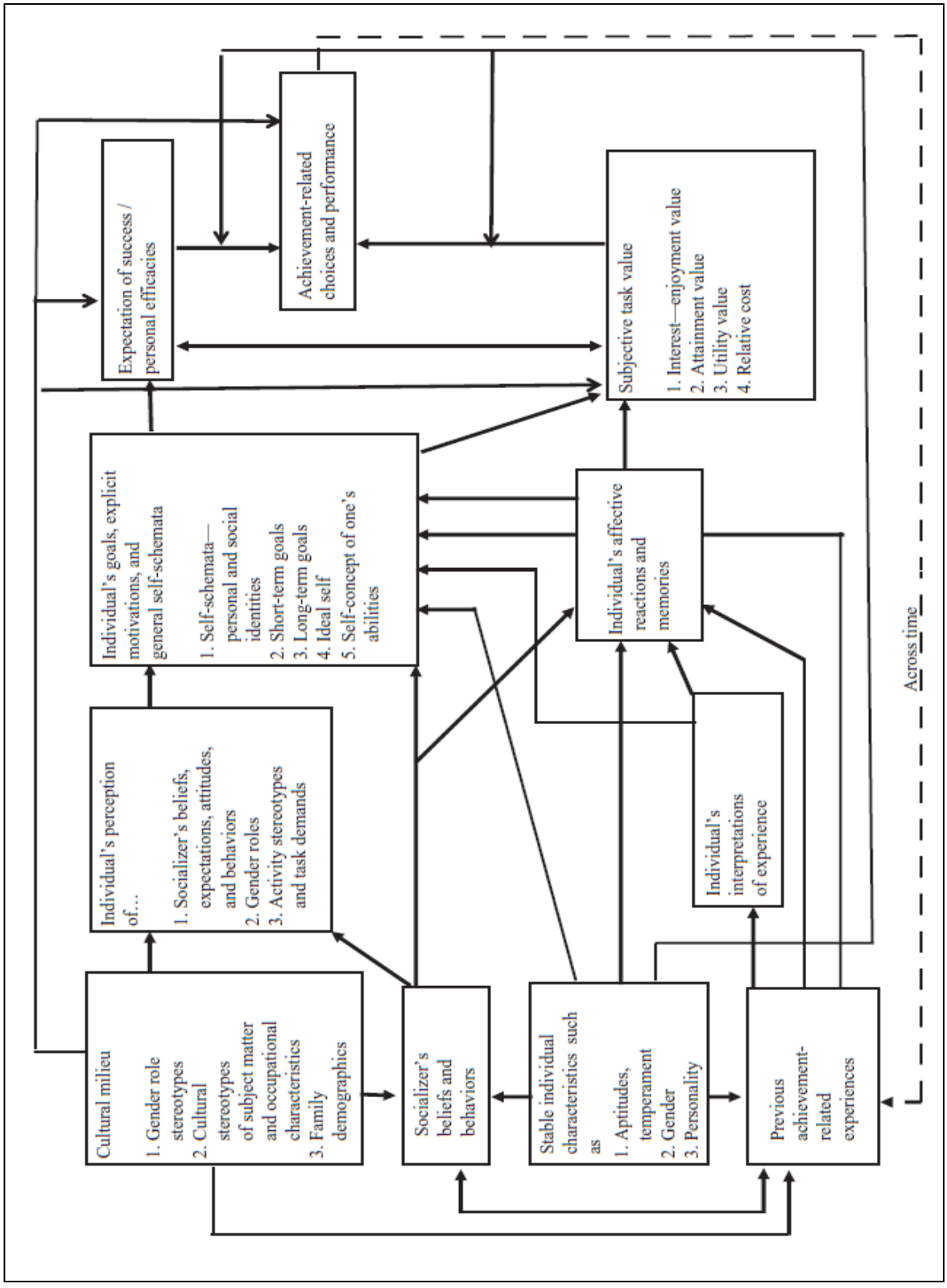


Figure 1. 2010 Eccles et al. Model of Achievement-Related Choices (Eccles et al., 1985)

Cultural Milieu (Process Block 1, PB1)

The cultural milieu included gender stereotypes, cultural stereotypes of subject matter and occupational characteristics, and family demographics. This cultural milieu influenced the socializers' (media, peers, siblings, teachers, clergy, and parents) beliefs and behaviors, as well as the learner's perceptions of the socializers' beliefs, expectations, attitudes, and behaviors. Additionally, the cultural milieu influenced the learner's perception of gender roles and activity stereotypes, and task demands (Eccles & Wigfield, 2002). Campbell (2003) asserted that motivation is culturally influenced and any attempt to encourage academic effort should incorporate culture.

Previous Achievement-related Experiences (Process Block 4, PB4)

Previous achievement-related experiences consist of grades, standardized test scores, unique historical events, and other related experiences.

Interpretation of Past Events - Attributions (Process Block 6, PB6)

Attribution can be considered as an assignment of cause for not doing something. In the model proposed by Eccles et al. (1985), expectancies were associated with the learner's attribution of previous achievement-related experiences, such as, grades, standardized test scores, unique historical events, and other related experiences. In this way, MAC incorporated elements of attribution theory as a process that contributes to the academic behaviors of learners.

In general, attribution theory suggests that a person attributes his/her success or failure to either: (1) luck, (2) others (3) ability, or (4) effort. Those who attribute their success to ability are said to foster an entity or fixed mind-set and those who attribute their success to effort are said to foster an incremental or malleable (growth) mind-set

(Dweck, 2010). Furthermore, the past experiences, expectations of others, and an interaction of the learner's goals influence the learner's self-concept of ability and perceptions of task difficulty (Eccles & Wigfield, 2002).

Goals and General Self-schemata (Process Block 7, PB7)

Self-schemata entailed personal and social identities, short- and long-term goals, ideal self, and self-concept of one's ability. These aspects of the learner greatly influenced individuals' expectancies (expectation of success) and their resulting subjective task values (Eccles & Wigfield, 2002). Short-term goals can help the student to learn the significance between effort and achievement (Barry, 2007). These goals therefore must be specific, measurable/meaningful, achievable, realistic/relevant, and have a time frame (Day & Tosey, 2011). These successes will lead to many other successes on the road to accomplishing or realizing the achievement of long-term goals.

Specific goals that are accepted by individuals as meaningful and relevant with feedback on progress lead to high performance. Mastery goals focus on learning and self-improvement that fosters an incremental or malleable theory of intelligence as opposed to performance goals which are said to focus on competition, not doing worse than others, and ability which fosters an entity or fixed theory of intelligence (Harackiewicz, Barron, Pintrich, Elliot & Thrash, 2002). Dweck (2010) referred to these theories of intelligence as mind-sets.

Furthermore, Harackiewicz et al. (2002) asserted that performance-avoidance and performance-approach goals are two separate functions that lead to two different outcomes. Whereas performance-avoidance goals lead to maladaptive outcomes,

performance-approach goals lead to some positive adaptive outcomes, and when combined with mastery goals, it optimizes motivation.

Socializer's Beliefs and Behaviors (Process Block 2, PB2)

The beliefs and behaviors of a socializer could include the expectations of success that he/she has for the learner, feedback with regard to achievement-related experiences (e.g. effort-based grading), and other relational characteristics, such as, an ethic of caring. Socializers include media, peers, siblings, teachers, clergy, and parents.

Perception of Socializer's Attitudes and Expectations (Process Block 5, PB5)

The learner's perception of gender roles, activity stereotypes, and task demands (Eccles & Wigfield, 2002) were influenced by the cultural milieu, unique historical events, and the beliefs and behaviors of their socializers.

Affective Reactions and Memories (Process Block 8, PB8)

This process serves as a mediator to the subjective task value and the individual's goals and self-schemata through a culmination of previous achievement-related experiences and the learner's interpretations of experiences including the socializers' beliefs and behaviors. By including affective memories in MAC, less rational processes are involved in explaining motivated behavioral choices (Eccles & Wigfield, 2002).

Expectancies (Expectation of success) (Process Block 9, PB9)

Eccles proposed that the learner's perception of task value and expectations ultimately influence the achievement behaviors of persistence, choice, and performance. Eccles & Wigfield (2002) defined current and future expectancies "for success as individuals' beliefs about how well they will do on upcoming tasks, either in the immediate or longer-term future (Eccles & Wigfield, 2002; p. 119)." In contrast to

Bandura's assertion that expectancy-value theory focus on outcome expectations (Bandura, 1997); MAC focused on personal or efficacy expectations (Eccles & Wigfield, 2002).

Aarts, Gollwitzer and Hassin (2004) asserted that goals are tied to our expectation of success and how one values the outcome. Also, a factor in expectancies is the self-concept of one's ability, which relates to broad beliefs about a student's competence in a given domain. Moreover, Eccles and Wigfield (2002) note that the concepts of individual tasks and domain specific tasks can be theoretically distinguishable but they are indistinguishable in practice because they are very highly related. The three achievement-related outcomes of the MAC are discussed in the following section.

Achievement-Related Outcomes (Process Block 10, PB10)

The three achievement-related outcomes of the MAC are choice, performance, and persistence. These outcomes are discussed in the paragraphs to follow. Meaningful choice has to be accompanied with support for autonomy (Deci, 1995, p. 34). This "encourages people to fully endorse what they are doing; it pulls them into the activity and allows them to feel a greater sense of volition and it decreases their alienation" (Deci, 1995, p. 34).

Choice.

Bong (2001) and Durik (2006) found that the subjective task values were more predictive of the persistence and choice of task than the performance of the task. In another study, Tseng (2006) investigated how immigration is associated with educational choices in late adolescence to early adulthood. From using surveys and school records of 789 youth (ages 18 – 25), it was found that the children of immigrants favored courses

that required higher levels of mathematics and science content as compared to the children of U.S.-born parents.

Additionally, Flora (2010) sought to uncover the influences that affected the choice of a pharmacy major or a non-pharmacy major. Findings indicated that "African-American and Hispanic students were less likely to choose pharmacy as a major than Caucasians and Asian-Americans were more likely to choose pharmacy as a major" (p. 1). Additionally, non-pharmacy students were less likely to be interested in science and mathematics than pharmacy students.

Moreover, Metallidou (2010) asserted that the "assessment of the subjective value of a task relates to the initial 'choice' of becoming involved in academic tasks in terms of higher levels of cognitive and regulatory strategy use" (p. 776).

Performance.

Performance refers to a students' performance as measured by standardized test scores, pre- and post-tests, and other indicators of performance. Foster (2005) used indicators that were collectively called "educational achievements" and included attendance, completion of problems, persevering in problem-solving, retention and promotion to a higher mathematics class.

Persistence.

In the context of MAC, persistence refers to the learner's decision to continue and complete tasks that are seemingly challenging and/or difficult (Eccles, 2011). Additionally, Barry (2007) investigated why some of equal ability and potential avoid challenges and withdraw when faced with challenges or obstacles while others persist. Findings indicated that educational persistence and achievement are largely influenced by

the role of peers, family, and ethnic identity enactments (Barry, 2007). Ethnic identity enactments were described using the themes of home fronts and contact zones (Moje & Martinez, 2007, p.9).

Persistence was a major theme that emerged from a study by Powell-Mikels and Berry (2007) that examined African American students' perceptions about and experiences of their mathematics education. Persistence was exemplified by all participants as evidenced by their pursuit of mathematics education, in spite of them failing or dropping one or more college mathematics courses, with a renewed determination. Additionally, persistence was attributed to some caring individual in the lives of the participants.

Subjective Task Value (Process Block 11, PB11)

Task value is associated with the learner's perception of others' attitudes and expectations through a cultural milieu and cultural stereotypes of the subject matter and competitiveness. These perceptions help to form the learner's goals, which interact with the learner's task specific beliefs to influence the learner's perception of task value (Meece & Eccles, 1982; Eccles et. al., 1985; Eccles & Wigfield, 2002).

In its simplest form, Eccles' expectancy-value theory suggested that choices to engage in activities are shaped by competence and value beliefs. Competence beliefs addressed questions of ability, "Can I do this task?" and value beliefs considered the personal importance of a task, i.e., "Do I want to do this task?" (Matusovich, Streveler & Miller, 2010).

Moreover, because the relative importance of the various constructs that influenced subjective task value change over time and across situations, the subjective

task value of various behavioral options changes as well (Eccles, 2011). MAC outlined the task value into four distinct categories of intrinsic value (interest), utility value (usefulness), cost, and attainment value (importance), which are discussed in the following paragraphs.

Intrinsic Value.

Intrinsic value is the enjoyment the individual gets from performing the activity or the subjective interest the individual has in the subject. This component of value is similar to the construct of intrinsic motivation as defined by Deci (2002) and his colleagues, as further discussed later in this chapter.

The construct of intrinsic motivation may consist of autonomy, curiosity, competence, and internalization for reasons of engagement (Eccles & Wigfield, 2002). Other theories that focus on reasons of engagement are interest theories and goal theories (Eccles & Wigfield, 2002). Durik (2006) provided the notion that if one values a task because it is enjoyable and engaging then this would be considered an intrinsic value. Besides intrinsic value, two other aspects of subjective task value are attainment value and utility value.

Attainment Value.

Individuals also engage in tasks that have attainment value. Durik (2006) provided the notion that attainment value refers to the extent to which individuals place importance on high task performance. Eccles and Wigfield (2002) defined attainment value as "the personal importance of doing well on a task" (p. 119).

Additionally, it is posited that attainment value is "linked to the relevance of engaging in a task for confirming or disconfirming salient aspects of one's self-schema" (p. 119). Individuals also engage in tasks that have utility value.

Utility Value.

Utility value "refers to the practical significance of a task and how it can be instrumental in fulfilling other pursuits" (Durik, 2006). Eccles and Wigfield (2002) asserted that "utility value is determined by how well a task relates to current and future goals, such as career goals" (p. 120).

Durik (2006) posited that the achievement of short-term and long-term goals is accomplished through performing tasks high in utility value. A task can have positive value to a person even though he or she is not interested in the task to facilitate reaching important future goals (Eccles & Wigfield, 2002). Utility value can therefore be thought of as an individual having tendencies to exercise delay of gratification and future time perspectives in academic motivation and self-regulated learning activities (Bembenutty & Karabenick, 2004).

Self-regulated learning entails "self-generated thoughts, feelings, and actions for attaining academic goals." (Bembenutty & Karabenick, 2004). Empirical studies have documented the role of ability beliefs and task values as being predictors of achievement choices (Durik, 2006).

Cost.

Eccles and Wigfield (2002) conceptualized cost in terms of the negative aspects of engaging in a task that may lead to task-avoidance behaviors, such as, performance anxiety, and fear of both failure and success, including the loss opportunities that result

from making one choice rather than another. Another aspect of cost was the amount of effort needed to be successful at a task or achieving a goal (Eccles & Wigfield, 2002). Earlier studies have found, in many cases, African American students' academic success comes at the expense of their cultural and psychological well-being, such as loss of friends and loss of connection to a social identity (Ladson-Billings, 1995). A phenomenon related to the cultural and psychological well-being of African American students is referred to as "acting white" (Fordham & Ogbu, 1986). Fordham and Ogbu (1986) found that academically successful African Americans were ostracized by their peers.

In another study, a finding indicated students were not willing to trade away their culture by conforming to public schooling (White-Johnson, 2001). In addition, White-Johnson (2001) found that some teachers felt that European-American teachers needed to understand African American culture. In this same study, parents felt there was a lack of understanding of their children by teachers and administrators. As a result, this cultural mismatch led to misinterpretations of student behavior that often resulted in disciplinary actions such as school suspension or removal from class. Researchers such as Lisa Delpit, Jacquelyn Irvine and others have referred to this mismatch as a lack of cultural synchronization (Irvine, 1991).

Cultural Synchronization

Cultural synchronization is based on anthropological and historical research that gives credence to African Americans having a distinct culture of their own that survived the crossing of the Atlantic and the cruel institution of slavery (Irvine, 1991). M. J. Herskovits (1958; cited in Irvine, 1991) identified examples of these retentions, such as

funeral practices, songs, dances, dress, religious practices, beliefs in magic and the occult, and the concept of time (Irvine, 1991 p. 23). Furthermore, cultural synchronization refers to the synchronization between cultural characteristics and expectations of the learner and teacher (Irvine, 1991).

Boykin (1986; cited in Irvine, 1991) provided a comparison of African and European cultures and asserted that the two cultures are incongruous and contradictory. Boykin's comparison of the two cultures is provided in Table 1 (Irvine, 1991, p. 25) on page 24. When African Americans were in sync with their school and teachers, they exhibited more of the characteristics found in the European culture than those found in the African culture (Irvine, 1991).

Irvine acknowledged that some characteristics and behaviors of African American students were sometimes in opposition to school and to their own achievement. She asserted that no model of academic achievement should ignore the fact that certain behaviors and attitudes are viewed as negative and, as such, greatly deter African American students' achievement (Irvine, 1991, p. xxi).

Irvine (1991) provided a model for African American student achievement that proposes cultural synchronization as a mediator of academic achievement through the interaction of student and teacher expectations. Further, Irvine (1991) suggested that adjustments or interventions can be addressed in the context of the students' home and community.

Strength-based interventions can be developed using the students' home and their immediate community, as these are spaces for developing their social identities. Spaces

for developing social identities were conceptualized by Moje and Martinez (2007) in terms of "home fronts".

"Home fronts" represented the immediate community where a common culture exists and therefore there is connectedness in terms of one's cultural identity. The "home front" may have interpersonal and other institutional brokerage resources that intertwine and are significant in the lives of youth, although institutional mediation is often not present because of historical and more current exclusionary processes (Moje & Martinez, 2007, p.10).

Table 1.

Comparison of African and European Cultures.

African Culture	European Culture
Spiritualism	Materialism
Harmony with nature	Mastery over nature
Organic metaphor	Mechanistic metaphors
Expressive movement	Impulse control
Interconnectedness	Separateness
Affect	Reason
Event orientation	Clock orientation
Orally based culture	Print based culture
Expressive individualism	Possessive individualism
Uniqueness valued	Sameness valued
Person-to-person orientation	Person-to-person orientation

The resilience of the identity forged at the "home front" in the wake of racism and discrimination helps to mediate educational persistence and achievement. Besides "home front", "contact zone" was a theme used by Moje and Martinez (2007), as a focal point and as an explanation in the formulation of social identities within spaces.

Contact Zones

Contact zones were those places that existed outside of the immediate or local community that tend to see people of color as the "others" due to unequal relations of power. This typically is when conflict exists in how one sees one's own ethnic identity in relation to how "others" see one's identity. In contact zones, youth generate an awareness of how discrimination and racism operate in society that serves to help create community collectives against oppression and positive social models for engaging in such struggle (Moje & Martinez, 2007, p.16). Also, cost may be associated with how different social identities and the spaces in which they are formed, mediated, and enacted play out in terms of academic engagement and persistence (Moje & Martinez, 2007, p.9).

Additionally, Brand, Glasson and Greene (2006) suggested that sociocultural factors such as students' cultural identity, and conflicts due to a mismatch between identity and institutional culture, influence their participation and their learning. Brand et al. (2006) discussed the concept of border crossings with regard to science and mathematics classrooms resembling cultural barriers that may determine the achievement behavior of minority students. In other words, science and mathematics classes are likened to being in a foreign land that promotes the legitimatization of white middle class experiences while marginalizing the culture and ways of knowing associated with students of color. As such, "the behaviors that students exhibit in the classroom and their

rationale for doing them are culturally inspired and likely to produce a misreading of these behaviors or a negative response from teachers." Ladson-Billings (1995) concurred with this notion of culture being a consideration in the context of achievement behaviors through her grounded theory of culturally relevant pedagogy.

Culturally-Relevant Pedagogy

In 1995, Ladson-Billings contended that African American students perform poorly because a school's curriculum lacks cultural relevance. She posited that this lack of cultural relevance in the curriculum manifests as a "cultural mismatch" which is defined as the discontinuity of knowledge between home and school. She further asserted that a cultural mismatch leads to indifferent attitudes of students and a lack of motivation.

Almost a decade later, Campbell (2003) suggested that motivation is culturally influenced and any attempt to encourage academic effort should incorporate culture. Incorporating culture may make a difference in how students might experience mathematics and their choice to pursue a mathematics education and/or mathematics-related careers. Additionally, in a theoretical context, culture was an important ingredient for students of non-European descent to fully engage in learning.

Stereotype Threat

Stereotype threat is a self-evaluative threat by which one experiences anxiety based on a widely perceived negative stereotype concerning one's group. The anxiety caused by stereotype threat can lead one to forming a victim's identity, low motivation and poor academic achievement (Steele & Aronson, 1995). Note that one does not have to believe the negative stereotype to experience the effects of this threat; only that the negative stereotype exists about his/her particular group. Steele and Aronson (1995)

hypothesized that African Americans might experience stereotype threat particularly during standardized tests due to a negative societal stereotype about their group's intellectual ability and competence. "Stereotype threat might be expected to undermine the standardized test performance of Black participants relative to white participants who, in this situation, do not suffer this added threat" (Steele & Aronson, 1995, p. 3).

High-stakes Mathematics Test

Lattimore (2005) used interviews to research African American students' perceptions of their preparation for taking a high-stakes mathematics test. The interviews involved open-ended questions regarding students' preparation and perceptions of a high stakes mathematics test. Lattimore interviewed six African American students to examine their perceptions of their preparation for taking a high-stakes mathematics test. Each student was interviewed for sixty minutes.

Lattimore's research was conducted in a large urban high school in Central Ohio with a large African American population. Lattimore was specifically interested in understanding how students prepared for the mathematics portion of the test and what suggestions they would make to improve the process.

It was found that the students believed that instruction and instructional content promoted teaching to the test while narrowing other aspects of learning. Lattimore (2005) stated:

> The articulated perspectives of children instead of the muted voices of children need to have an important place on the policy and research agenda. Until it is placed on the agenda, African American children will continue to be victimized people with their perceptions and voices factored out of the current regime of high-stakes testing throughout the United States. (p. 145).

Intrinsic Motivation Theories

Intrinsic motivation theories focus on reasons of engagement and are similar to the subject task value construct of "intrinsic value" in the Eccles model of academic choice (MAC). Curiosity and self-determination theory (SDT) are two intrinsic theories of motivation (Eccles & Wigfield, 2002) that are analogous to the construct of "intrinsic value" in the MAC.

Curiosity is considered to be an intrinsic motivation theory for reasons of engagement (Eccles & Wigfield, 2002). Moreover, curiosity is one of the three innate components of intrinsic motivation (Ali et al., 2011). Curiosity allows for communication because of wanting to know with a sustained interest. It prompts students to observe more and ask better and essential questions. Additionally, it helps students to remember what they do, see, and hear. Developing curiosity can be accomplished by asking questions about why people think or behave in a certain way. In this way, students' interest can be piqued that leads to authentic learning tasks (DeBruyn, 2008).

SDT entails three components: autonomy, relatedness and competence (Reeve, 2002). Autonomy is concerned with the need to exercise one's own volition rather than acting under coercion. It refers to when a person feels that they are the locus of control (internal) for their actions and behaviors versus an external locus of control (Deci, 1995). When applied to the educational setting, "research suggests that students reporting autonomous motivation tend to be more engaged in school (Reeve, 2006), are less likely to drop out from high school (Hardre & Reeve, 2003), and are more academically successful" (Grolnick, Ryan, & Deci, 1991). In the classroom setting, autonomy is likely

to play an important role in facilitating feelings of relatedness (Kaufman & Dodge, 2009).

A second component of SDT, relatedness, suggests a desire to feel connected to others and a sense of belonging. Feelings of relatedness and value of a behavior are critical factors that affect internalization and integration (Kaufman & Dodge, 2009). Internalization occurs when external reasons are internalized thereby becoming a part of the self. For example, though students are often driven by external reasons to do schoolwork, there are characteristics of the school environment that can facilitate internalization or integration of extrinsic rewards. Two such characteristics are: (1) how connected a student feels to his/her teacher and (2) how valuable the student perceives the task (Kaufman & Dodge, 2009).

The third component of SDT, competence, represents the need to feel confident in meeting the demands of one's environment. Competence is analogous to the construct of intrinsic value in the MAC (Eccles & Wigfield, 2002). Additionally, competence beliefs address questions of ability such as: "Can I do this task?" (Matusovich et. al., 2010).

Dis-enfranchising stereotypes

Brand et. al. (2006) videotaped interviews of participants with the purpose of obtaining perceptions of their own experiences in science and mathematics. In analyzing the data, the transcripts were read and evaluated for evidence of political, economic, religious, community, and other social influences.

Dis-enfranchising stereotypes was one of the two overarching themes that emerged in a study by Brand et. al. (2006). These stereotypes were found to have a

negative influence on students' learning and participation in science and mathematics classes (Brand et. al., 2006). Four assertions of disenfranchising stereotypes emerged (Brand et. al., 2006): (1) students struggled to prove or distinguish themselves from negative stereotypes; (2) students struggled to prevent stereotypical images from affecting their self-esteem; (3) science and mathematics are perceived as subjects that only "smart" people can succeed in; and (4) negative stereotypes discourage minority students from choosing science and mathematics careers.

Student-Teacher Relationships

Student-teacher relationships were one of the two overarching themes that emerged in a study by Brand et. al. (2006). These relationships were found to have a positive effect on students' learning and participation in science and mathematics classes (Brand et. al., 2006).

Two assertions emerged from "student-teacher relationships" which were: (1) students' perceptions of teachers' beliefs about the students' inability caused students to assume defensive stances in the classroom, and (2) students' level of academic performance is influenced by their relationship with their teacher (Brand et. al., 2006).

In conclusion, positive teacher and peer interactions had a positive influence on the participants that, in turn, enhanced their mathematics knowledge and education leading to their success.

The Role of Sociocultural Orientations

Moody (2004) examined the role of sociocultural factors in the mathematical experiences of two African American students by researching their life histories. The objectives of Moody's study were to: 1) identify African American students' perceptions

of their mathematics classroom experiences, 2) determine how their social and cultural orientations affected their experiences, and 3) identify factors that contributed to their success in mathematics for emerging themes and patterns of the data.

Moody (2004) found African American students' success in mathematics was related to the role of sociocultural orientations (values, attitudes, behaviors of parents, teachers, and peers, family structure, parental styles, religious beliefs, school connectedness, knowledge, expectations, and attitudes of the general public), the role of teachers, and the need for role models. Additionally, Moody (2004) found that the social and cultural orientations of the participants were different and the orientations impacted their perceptions of mathematics that influenced their success in mathematics.

Moody (2004) concluded that "understanding mathematical success in the context of many African American students' orientations is important in creating a dialogue among mathematics educators about improving the mathematics education of African American students" (p. 145).

Summary

The Model of Academic Choice (Eccels et. al., 1985; Eccles, 2010; Eccles & Wigfield, 2002) was used as the central focus for the review of the literature. The theoretical framework (MAC) as well as related theories were discussed. Stereotype threat and its relatedness to high stakes testing were included to illuminate factors that can affect the experiences of people of color. Theories of intrinsic motivation, namely self-determination theory and curiosity, were integrated into the review of the literature as it relates to the intrinsic value construct of the subjective task value component of the MAC.

In the following chapter, the MAC will be discussed with regards to its use as a lens of inquiry in examining the lived experiences of African American urban high school graduates concerning their mathematics education. In addition, other related methodological procedures will be discussed.

CHAPTER III

METHODOLOGY

This chapter describes the methods of the qualitative approach used to examine the lived experiences of African American urban high school graduates concerning their mathematics education. The associated research questions are listed and then the discussion begins with the participant recruitment and selection, followed by the qualitative approach and the focus of the study. Next, the development of the interview protocols, procedures for data collection and data management, and descriptions of coding and analysis are discussed. Trustworthiness and ethical issues are discussed next. The researcher's perspectives conclude the chapter.

The research questions were:

1. What were the K-12 experiences of successful African American urban public high school graduates concerning mathematics?
2. How might these experiences play a role in students' choice to further their mathematics education?
3. How might using the Model of Academic Choice (MAC) as a theoretical framework help in understanding choices of successful African American urban public high school graduates concerning mathematics?

Participant Recruitment and Selection

All participants were African American. There were a total of seven participants, five females and two males. The age of the participants ranged from 18 to 63 years old for a total range of 45 years and an average age of 37 years. Their educational background varied from a 1st-year undergraduate student to a doctoral student. Some participants already had obtained at least a 4-year degree and others were enrolled in graduate school. Four of the seven participants were the first person in their family to attend college. The employment status of the participants consisted of full-time students, those who were gainfully employed and one was semi-retired. The following paragraphs discuss the recruitment and the selection of the participants.

Participant Recruitment

The participants' were recruited from their responses to an email sent from the researcher's university email to students enrolled at the researcher's university. The names and email addresses of potential participants were obtained in the following manner. The names of students committed to attend Cleveland State University were found listed in prior years' High School commencement program books. The researcher used a cold call approach via email by sending email correspondence to students via the format, [firstinitial.lastname@csuohio.edu], based on to the student's name listed in High School commencement program books. Approximately 20 emails were sent using this approach resulting in three responses. The email detailed the nature of the study and provided a link to be accessed for the initial screening of the pool of potential eligible participants. See Appendix A for a copy of the email sent to the students. Other means of

recruitment were through the distribution of flyers on the university campus, visiting classes and personal acquaintances. A copy of the flyer can be found in Appendix B.

Additionally, notification was sent to professors teaching a course equivalent to pre-calculus or higher to invite their students to participate in the study. Other avenues for participant recruitment were solicited through programs/organizations affiliated with the researcher's university such as teacher preparation programs, scholars' programs, honors' programs, sororities and fraternities. Moreover, snowballing and personal contacts were used to help in identifying potential participants for the study.

Participant Selection

A purposive criterion sample was employed in this study. All participants were African Americans who were attending or had attended the same northeast Ohio undergraduate university. Eligible participants who responded were selected after the Institutional Review Board (IRB) review and approval of the study.

Seven participants (5 females and 2 males) were selected for the study to achieve measures of triangulation through sources of varying perspectives. Although there was no exact prediction for saturation of the data, it was anticipated by experienced researchers (i.e. committee dissertation chairperson and methodologist) that selecting 6-8 participants would allow for some degree of saturation of the findings.

All participants were high school graduates from urban high schools located in the state of Ohio with similar urbanicity. Strayhorn (2010, p. 186) defined urbanicity as a way of describing the location of a school or neighborhood that reflects statistical characteristics of the metropolitan area of the school or neighborhood. In this study, urbanicity refers to high schools located in Ohio districts (see Appendix C) that have

similar characteristics. Having participants selected from similar urban districts was a sampling strategy to achieve selection of participants in keeping with the focus of the research questions.

Additionally, all eligible participants had completed a mathematics course equivalent to Algebra 2/Trigonometry or above at the high school level. All seven participants were considered to be successful in mathematics. Success in mathematics, for this study, was defined as a student who had completed Algebra 2/Trigonometry or higher-level mathematics course in high school. Successfully completing a course equivalent to Algebra 2/Trigonometry or above at the high school level was a salient criterion because it has been reported that completing an Algebra 2 course increases the likelihood of meeting the benchmark for college readiness for college algebra (http://www.act.org/standard/).

Originally, for this study, success in mathematics was defined as being enrolled in, or qualified to enroll in, a mathematics course equivalent to pre-calculus or higher at the college level. An adjustment was made to the criteria regarding the college-level course requirement due to lack of a critical mass of African American students enrolled in college level pre-calculus or higher mathematics courses at the institution of interest (See Appendix D for details of recruitment efforts). This inability to recruit a critical mass further strengthens the importance of this study and its ability to shed light on the ways in which African American urban public high school graduates experience and respond to schooling influence and their success in mathematics.

The selected participants met the adjusted criteria for high school mathematics and were recruited by various means. All participants were African American and

graduates of a high school located in high-poverty urban neighborhoods with similar characteristics. Each participant successfully completed a high school mathematics course equivalent to Algebra 2 or Trigonometry and had attended the same university located in northeast Ohio. Three participants, Ada, Jeremiah and Phaedrus, were recruited through personal contact. Another three participants, Ruth, Esther and Martha, were contacted through email solicitation. And, Electa was recruited through snowballing.

Qualitative Research Approach

A basic interpretive qualitative study (Merriam, 2009) was appropriate and the best choice for the study because all participants had the opportunity to provide their stories without being bound by time or place. The intent of this study was not to study a cultural group or a phenomenon about some essence or to develop some new theory. The goal of this study was to develop an understanding of the educational experiences of urban high school graduates in mathematics. As such, this study is distinguished from other types of studies including an applied study used for evaluative purposes (Merriam, 2009).

The use of semi-structured interviews provided the flexibility necessary to adapt and/or modify the questions to clarify and elaborate upon participants' responses regarding their experiences. Surveys do not provide for such fluidity. Additionally, it was possible to capture the depth of educational experiences through the interviews and stories concerning participants' experiences in their own words from the participants' perspectives rather than the perspective of the researcher.

Using this current study, the basic interpretive approach focused on the voices of the participants by gathering information through semi-structured interviews. This

allowed the researcher to gain a better understanding of the participants' mathematical experiences and obtained multiple perspectives of those experiences. Previous research related to the MAC and students' experience in mathematics has been done with both surveys and interviews but mostly through longitudinal surveys.

Focus of the Current Study

The current study used methods similar to Moody (2004) and Powell-Mikels and Berry (2007) to investigate the experiences of African American urban public high school graduates concerning mathematics.

Moody (2004) used a phenomenological approach to research the life histories of the students. Methods of collecting data were in-depth unstructured interviews, data from surveys and autobiographies. Also, member checks were implemented in final interviews to explore life histories of the participants in the context of their mathematical experiences. In comparison, this study used a basic interpretive approach to research the mathematical experiences of students while employing semi-structured interviews and a brief questionnaire as methods of collecting data. Similarly, member checks were employed in final interviews in the context of the participants' mathematical experiences.

Moreover, Moody (2004) categorized the mathematical experiences in four phases: Elementary Experiences (Grades 1-5), Middle School Experiences (Grades 6-8), High School Experiences (Grades 9-12), and Collegiate Experience. Likewise, this current study explored the mathematical experiences of the participants into four phases: Elementary experiences, Middle School experiences, High School Experiences and Collegiate Experience. However, the grade levels were not detailed as these may vary

depending on the structure of the respective school system. The collegiate experience was also explored.

The current study is similar to Powell-Mikels and Berry (2007) study by using a purposive criteria-based sample. All participants were recruited from the same university located in Northeast Ohio. In the Powell-Mikels and Berry study, participants completed or were completing the Calculus (I, II, III) series of courses in college as compared to this current study where the participants qualified by completing Algebra 2/Trigonometry or higher-level mathematics course in high school.

Development of Interview Protocols

The instruments used in the study were the pre-interview protocol and an interview guide. The pre-interview protocol and the interview guide are found in the appendices and are described in the following paragraphs.

Pre-interview Protocol

The pre-interview protocol (Appendix E) included demographics, phone number and email contact information of the participants in this study. This protocol was used as an initial screening in creating a pool of potential eligible participants. Inclusionary characteristics used were chosen in keeping with the intent of the study. These characteristics included high school graduate from an urban high school (located in a high-poverty area), attending or had attended the same university, completion of Algebra II or Trigonometry in high school as a salient category, 18 – 65-years old rules out minors and identified as an African American. Exclusionary characteristics, in keeping with the guidelines for research involving human subjects, were pregnant individuals, prisoners, mentally handicapped, mentally disabled persons and minors.

Interview Guide

The interview guide (Appendix F) provided a series of questions and probes to elicit the participants' experiences concerning mathematics. The questions were refined from a pilot study conducted during my enrollment in EDU 808 Advanced Qualitative Research. Questions were used to explore themes about students' experiences concerning mathematics. The questions were changed slightly and adapted as necessary as the data were gathered and analyzed in an ongoing fashion appropriate for qualitative research.

Procedures for Data Collection

This project was approved by the Institutional Review Board (IRB) of the university. Thereafter, recruitment efforts were initiated and then eligible participants were informed of their qualification for the study after using the pre-interview protocol for screening. An informed consent (see Appendix G) was obtained in writing from the participants before commencing the interviews. Two semi-structured interviews were conducted using the interview guide in separate 60 minute to 90-minute sessions at an agreed upon public or private establishment such as the university's library, work offices or church offices in order to accommodate the convenience of the participant.

Interviews used a semi-structured format with open-ended questions. The first face-to-face interview focused on the participant's kindergarten through twelfth grade (K-12) experiences in mathematics. All participants completed the K-12 interviews. Each K-12 interview began with the completion of an intake sheet for demographic information (Appendix E) followed by the use of a series of written interview questions (Appendix F) designed to answer the research questions.

After participants agreed to be audiotaped, the interview was audiotaped using two digital recorders and then transcribed verbatim. After the transcription of interview one, the researcher identified items that needed clarification and then adopted questions/probes in preparation for the post-secondary interview.

Five of the seven participants completed the post-secondary interview. The post-secondary interview was a face-to-face interview that used a semi-structure format with open-ended questions focusing on the participant's mathematics experiences while in college.

The typical time between the K-12 and post-secondary interviews was between two and three weeks. The shortest time between interviews was 2 weeks and the longest was 17 weeks. Two participants did not respond to the researcher's one email request to conduct the post-secondary interview. Table 2 provides an account of the time between the two interviews.

Table 2.

Time Between Interviews.

Participant	K-12 Interview	Post-Secondary Interview	Time Lapsed
Ruth	March 5, 2015	No Response	Not applicable
Esther	March 31, 2015	April 14, 2015	2 weeks
Martha	April 20, 2015	No Response	Not applicable
Ada	March 10, 2015	April 2, 2015	3 weeks
Electa	March 17, 2015	March 31, 2015	2 weeks
Phaedrus	April 11, 2015	August 22, 2015	17 weeks
Jeremiah	May 21, 2015	August 27, 2015	12 weeks

Data Management

NVivo® (qualitative data analysis software) was used initially as the major source for managing the data. NVivo® is a computer assisted qualitative analysis software program that assisted the researcher in organizing, annotating and categorizing data. The platform for coding and analysis of the data was thereafter changed because the computer used for the coding in NVivo® would periodically malfunction. This posed as a problem because the researcher was becoming familiar with NVivo® as a tool for qualitative data analysis. The computer eventually did not allow access to the files due to boot-up issues. Note that documents were no longer available in NVivo® as the computer that contained the software was no longer functioning.

The researcher chose to use platforms that he is much more familiar with, Excel® and Microsoft Word®. The demographic information was logged into Excel® for later retrieval for references and context for analysis and interpretation (Saldana, 2009). Excel® and Microsoft Word® were used extensively for coding and theming of the data after the transcription of the interviews. During transcription, pseudonyms and/or code names were used and no other identifying information was disclosed in the transcribed data. After verifying all transcripts against the recordings, the transcripts were saved into Microsoft Word®. Thereafter, vignettes were created for each participant to chronicle their respective K-12 and post-secondary educational experiences. Initially, a separate file was created with specific codes for each interview in a Microsoft Word® document and stored as well as updated in an Excel® spreadsheet. A code directory was then created, documented and maintained using Excel®.

Analysis of Data

In preparation for coding, the researcher reviewed the transcript of the session for accuracy and complemented them with field notes about notable signs of affect, environmental conditions or events, such as noise during the interview. The participants' perceptions were highlighted emphasizing their responses to mathematical experiences in mathematics classrooms as well as outside of the classroom. Initially, the transcripts and field notes were analyzed for emerging and recurring themes using the electronic data analysis/coding software and thereafter using Microsoft Word® and Excel®. The platforms were changed because the researcher's computer eventually did not allow access to the electronic data analysis software or the files due to boot-up issues.

Each vignette was analyzed by first employing *in vivo* codes from each of the participants' narratives at each educational level. Multiple passes of the vignettes were required to refine and complete the coding.

Codes

The coding was accomplished in two phases – first cycle coding and second cycle coding, which was in an iterative fashion as is the nature of qualitative studies. Additionally, reflexivity was employed to keep track of the research process, to explore ethical dilemmas, and to articulate the process of interpretation (Saldana, 2009).

First Cycle Coding.

Codes consisted of abstracting key phrases, ideas, concepts and relations in the individual interviews and constructing a visual display (Excel®) of these items within and across interviews. The first step in this phase consisted of using broad topics captured in Microsoft Word® as a springboard to code for key phrases, ideas and concepts. These

structural codes were developed from the research questions (Saldana, 2009). Other coding employed in this stage of the study were In-vivo Coding and Values Coding (Saldana, 2009).

In vivo codes allowed for the participants' voice to be heard by highlighting and using the exact words and phrasing of the participant as the actual code. Value codes captured the affective components relative to the participants' values, attitudes and beliefs (Saldana, 2009). The researcher continuously revisited codes and definitions to determine if there were any duplication and, where necessary, combined codes.

Second Cycle Coding.

This phase of coding, pattern coding, consisted of editing and combining the key phrases, ideas, and concepts and their relations that helped in identifying common and distinctive themes and patterns (Saldana, 2009). This synthesis required the various codes to become parts of more general statements that can stand alone from the respective interviews, yet retain their original meaning. In other words, the reader needs to be able to understand the phrases, ideas, concepts, and relations without reading the entire interview. Some codes were recoded, redefined, merged or deleted during this phase of coding when necessary (Saldana, 2009). Excel® was used to aid in the cross-referencing of key elements within and across interviews. This cross-referencing helped in developing connections between findings with respect to whether they confirm, extend, refute, or complement each other and contributed to a richer discussion and understanding of an observed phenomenon.

Memos

In addition, memo writing and comment features of Microsoft Word® and Excel® were used to capture the decision-making process during coding, reflection and theme generating of the study (Creswell, 2007). This information helped with tracking decisions and recalling decisions so that they could be included in the final write-up for transparency and presenting the data with a rigor of integrity.

Categories

There were a total of 139 categories (See Appendix H). Once the codes were constructed, the researcher focused on developing new or novel insights from the findings and creating categories. Saldana (2009) refers to this process as "theming the data." Novel insights pertain to ideas, concepts and relationships that are not represented in any one interview, but rather, are the result of combining interviews and examining them as one larger interview. The categories helped to conceptualize the phenomenon.

The connected findings of the interviews were synthesized into a single interpretation that conveys or enhances the ideas presented by the individual interviews (Creswell, 2007). In forming these clusters, the researcher noted any relationships between themes, considered alternative explanations for relationships, and examined the occurrence of unexpected relationships. The result of the analysis is an authentic list of concepts, ideas and relationships that confirm, refute, or extend existing beliefs and propositions, and serve as a catalyst for future research studies (Creswell, 2007).

Trustworthiness

Lincoln and Guba (1985) identified credibility, transferability, dependability, and confirmability as four measures of evaluative criteria in qualitative research. Measures of

credibility, transferability, dependability, and confirmability were addressed in this study to ensure methodological rigor (Denzin & Lincoln, 2000; Lincoln & Guba, 1985).

Measures of credibility were addressed through the use of two interviews per participant, peer audits with my methodologist, (Saldana, 2009), and the repository of audio recordings of the interviews on two tape recorders (Harper, 2006) to protect the integrity of the data. Transferability was addressed through the thick description of the context, including characteristics of the school districts in which the participants' high schools reside. Findings may have some potential for transferability for high poverty urban school districts composed of sixty percent or more of the student population who qualify for free and reduced lunch and twenty percent or more of the student population are people of color because these are the defined qualifying parameters for school districts in this current study.

Confirmability was accomplished by using an audit trail to document the research process. Additionally, in order to minimize the effects of my subjectivity, reflexive memos were employed. Reflexive memos detailed the researcher's actions during the data collection and analysis processes that may have both advanced and deterred the emergence of data and location of themes and the researcher's interpretation of the data (Galletta, 2013). See Appendix I for an example of a reflexive memo. Additionally, reflexive memos (reflexivity) and copious analytical memos helped to promote responsibility while conducting research (Saldana, 2009); also, it helped the researcher to uncover possible biases and helped to clarify his perspective lenses or world-view as it relates to the research. Moreover, coding was done concurrent the interview data transcription to improve trustworthiness (Saldana, 2009). Dependability involved an

external auditor who served also as my methodologist to examine the process and product of the research as an integral part of the study.

Ethical Issues

The research commenced after IRB approval had been secured. The researcher respected the confidentiality of individuals participating in the interviews by assigning numerical codes and/or pseudo-names to replace their names. These codes were used to identify all transcribed and handwritten data. No data were reported in a manner that could identify individuals without prior consent of those participants. The researcher took care to report results, and describe issues and events in ways that do not attribute blame to any individual or group. Moreover, the researcher informed the participants of their right to withdraw from the study at any time and/or refuse to answer or respond to any question.

Acknowledgement of the Researcher's Perspectives

I am an African American and a graduate of the same high school as one of the participants in this study. The majority of the participants in this study are graduates from high schools located in the same school district as my alma mater. Moreover, I received my four-year undergraduate degree as well as my graduate degree from the same university attended by the participants. Additionally, since the mathematics course I took in high school was equivalent to Algebra II/Trigonometry or higher then I would qualify as a participant for this study if I were not the researcher. I consider myself to be successful in mathematics given that I have obtained a Bachelor's degree in Electronic Engineering Technology and have taught high school mathematics in urban school districts for the past 14 years.

I believe that a student's value of mathematics is positively correlated with achievement behaviors in mathematics. I used the term "value" to reflect some type of exchange taking place or if something is viewed as worthwhile. It seems apparent that if one values something then one would be inclined to make an investment to reap the benefits. Students, much like customers, are looking for value. Aligning mathematics instruction with future aspirations of the students will increasingly demand their engagement in the mathematics classroom. Assigning value means the all-important question – what's in it for me? This may serve as a very important source of motivation in the students' participation in the mathematics classroom.

I am interested in the voices or perspectives of students that I teach regarding their learning in and out of the mathematics classroom. It was my hope that the data might illuminate concepts and/or strategies to improve my instructional methods as well as my readers' strategies in teaching mathematics in an urban setting to African American students.

I promote effort-based grading in my instructional practices to convey to students, that through their effort, success can be realized. Researchers Teel et. al. (1998) found effort-based grading to be an effective intervention in motivating students to learn. Effort-based grading, I believe, combats the emerging stereotype found in the Brand et al. (2006) study that only "smart" people can succeed in science and mathematics. Moreover, I am an African American male with an engineering background who teaches martial arts, as well as mathematics, which might serve to provide a counter-example to the emerging "disenfranchising stereotypes" found in the Brand et al. (2006) study.

The concept of border crossing is one that I ascribe to in my unpublished manuscript: "A Cultural Exchange: Africans' Contributions to Martial Arts – The Untold Story." In my manuscript, I assert that African Americans do not reap the discipline and other benefits that can be derived from training in martial arts because of a lack of participation. I suggest that the lack of participation is due to some African Americans viewing martial arts as foreign to African American culture. The same may be true for African Americans and mathematics. Brand et al. (2006) assert that culture is an integral part of educating students in science and mathematics classrooms and that students' cultural identity and conflicts influence their participation and consequently, their learning.

Summary

This chapter examined the methodology of this research and considered works of previous researchers in terms of the methods employed for their respective inquiry. Also, this chapter explained the interview process (frequency and duration of interviews), procedures for data collection (pre-interview protocol and interview guide), data management, data analysis (transcription of audiotapes, analysis concurrent with data collection, iterative process of collecting and analyzing data), the criteria for participant selection (educational requirements and urbanicity) and recruitment. Additionally, measures for achieving trustworthiness, ethical issues, and the perspectives of the researcher were made known.

The following three chapters present the results of the study. Chapter four presents a vignette for each participant, which is arranged according to the students' matriculation through their respective phases of education. Chapter five provides an

analysis of the participants' experiences within the vignettes and an analysis of connected findings of the participants' experiences across the vignettes. Chapter six provides a summary and a discussion of the findings.

CHAPTER IV

VIGNETTES

The vignettes chronicle the participants' recall of mathematics experiences from elementary, middle, high and through post-secondary schooling as available. The vignettes are structured in this way to establish consistency in the stories to be used "as a stand-alone source of data." Pseudonyms were used for the participants in the vignettes, which include Ruth, Esther, Martha, Ada, Electa, Phaedrus, and Jeremiah. All were contacted initially by email with the exception of Ada, Phaedrus and Jeremiah. Flyers were distributed to Ada, Phaedrus and Jeremiah. Ada is a co-worker. Phaedrus is under my tutelage as a student of Tai Chi; and, Jerimiah and I are members of the same congregation. Ruth was a student at a school where I previously had taught. Esther was a former student. Esther and her sister, Martha, attended and graduated from the same high school.

Ruth

Ruth attended a public school system in Northeast Ohio. In 2012, Ruth obtained a Bachelor's degree in Economic Development and Family Studies from a state university located in Ohio. At the time of the interview, she was enrolled in a graduate program in social work at the researcher's university. Ruth participated only in the K-12 interview.

Ruth didn't experience any difficulties in mathematics until the tenth grade. While in high school, Ruth was enrolled in a Post-Secondary Education Opportunity Options (PSEOP) through a local university.

Elementary

The typical class size was approximately 25 students and at times the classrooms throughout the school would seem to be chaotic. However, Ruth considered herself to be a good student. She emphasized, "I was a good kid. I did my work all the time." Ruth had a pretty good self-concept of her abilities in mathematics. She considered herself excellent in mathematics and always received awards for mathematics while in elementary. Ruth's thoughts about teachers who enjoyed their jobs were those who loved helping children to learn. She said, "They were passionate and spent extra time to help students to understand." In contrast, she characterized teachers who hated their jobs as "those who were indifferent to kids learning, either you got it or you didn't." For example, Ruth explained that "if you got something wrong, the teacher would mark it wrong and wouldn't give any assistance in correcting the errors."

In the fifth grade, Ruth became bored and would get into trouble because she would finish her assignment before other students. She stated that: "I was finished with what I was supposed to do, so I needed something more to do and if they didn't give me something else to do, I found something to do."

What Ruth liked most about her mathematics instruction in elementary was the use of props while learning mathematics. Also, Ruth revealed that there was always one

answer and she enjoyed checking her work to see if it was correct by working backwards. Ruth did not express any dislikes about her mathematics education in elementary.

Ruth sought the assistance of the teacher when she could not figure out a problem. Besides having homework problems in mathematics, Ruth used mathematics outside of the classroom in fairly rudimentary ways when at the store and making sure she had the correct change.

Middle School

Ruth's transition from elementary school to middle school was exciting. She exclaims: "I guess it was like a sense of freedom… So, you kind of felt free in middle school." The mathematics teacher in middle school had a completely different approach than when she was in elementary school. Ruth stated "It was just, you know, teaching methods – the way they presented the information to you."

Ruth loved that her mathematics teacher gave her more challenging things that she attributed to her not being disruptive in class. Ruth said, "I loved it! I loved it! I was excited and I loved it!" Long division presented a challenge to her while in middle school. Ruth sought the help of a friend who had already had the class when faced with challenges. This friend became a mentor/tutor to Ruth as she continued through middle school and high school. Ruth expressed gratitude for her mentor's assistance as follows:

> I realized how blessed I was to have him as a tutor. Because, not only did he teach me a lot as far as what I need to get to the next level, he was very knowledgeable and had a really good approach, basically. And, he knew how to break things down in a way to help me understand and I utilized him when I got to higher grades – even, when I was a freshman in high school. I still would contact him when I had trouble with math.

Ruth recalled that "in elementary school you didn't have to work as hard as when in middle school because in elementary school, you learned pretty much

the same things that you were taught at home." On the other hand, middle school required a lot more information than what was taught at home. Class sizes were about the same as in elementary school at about 20-something students. She liked the challenges middle school presented but took exception to being put on the spot, especially when solving problems at the board.

Moreover, Ruth's mathematics experiences outside the classroom were spending money, calculating costs in catching the bus, and helping her sister with homework for mathematics. Her mathematics experiences outside the classroom during high school mirrored that of middle school with the addition of using mathematics at various jobs and cooking.

High School

Ruth attended a very ethnically diverse high school where she was enrolled in career and technical education classes. At this school, it was not uncommon for teachers as well as students to be speakers of English as a second language (ESL). This required her to be more attentive in her communications with this population. Ruth shared the following: "So, you had to get where they were coming from, from what they were saying."

Approximately twelve students were enrolled in her high school mathematics and trade classes. In the trade classes, mathematics was taught as an integral part of the curriculum. The trade classes consisted of specialized training in Computer Aided Drafting (CAD) and Controllable Numerical Controls (CNC) machinery.

Ruth's tenth grade year in mathematics stood out as one of her best years. She shared the following:

> In tenth grade, my tenth grade year, it was, tenth grade year, it was awesome. My teacher was really into it. And, he was one of those teachers who would give me those extra things. I knew a lot more then, but he knew, like as far as, like you know, when you are at that level – he kind of knew as a class, the things we were learning I had already got, you know. So, he would always give me extra. He would send me home with things. He would give me extra things in class that helped me a lot, so. And, thinking about it now, I don't know if I was any more advanced or if you were to compare me to anybody else in the school or not from that school but from another school. But, it was just advanced in the environment that I was in, so.

Additionally, while in the tenth grade, Ruth passed all of the necessary Ohio Graduation Tests including mathematics as required to graduate from high school. She credited her success to having had started taking standardized tests while in middle school.

Ruth expressed that she did not have any struggles with high school mathematics and that she would consult with her teacher if she needed help with a difficult problem. However, Ruth attributed not learning anything in mathematics for a year to one of her teachers. Listen to her story:

> I didn't learn anything in that year. Um, we did crossword puzzles and we did, um, Sudoku, Sudoku, Sudoku puzzles. Those, they're brainteasers, you know. Well if you don't do anything else but that, what are you teaching me! Um, there were no lessons, there were, was no homework outside of crossword puzzles, word searches for credit, for grades. I did not do anything in that class the entire year; I felt like I didn't learn anything and it was a complete waste of time.

She concluded that the high school mathematics curriculum (crossword puzzles and Sudoku) experienced in the eleventh grade would not prepare her for post-secondary educational goals. Ruth's enrollment in a Post-Secondary Educational Options Program (PSEOP) at a local college was the answer to her dissatisfaction with the high school mathematics curriculum.

Ruth's self-concept in her abilities in mathematics was challenged when she took the college placement test for mathematics. She said the following regarding her college mathematics placement, "I thought I was good in math until I took the test and then I was in remedial math, at first."

Ruth was placed in remedial mathematics based on her mathematics placement results and thereafter completed another mathematics course that met the requirements for her Bachelor's degree which was completed in 2012.

In summary, Ruth found mathematics to be important in the pursuit of post-secondary goals. Although, her experiences in mathematics were not challenged until the tenth grade, her. teacher knew how to scaffold her knowledge for understanding. Thereafter, her disappointment in the high school delivered curriculum led to PSEOP in mathematics as an alternative.

Esther

At the time of this interview, Esther was in her junior-year at college majoring in environmental studies. Esther was an honors' student who attended and graduated from a Northeast Ohio urban public school system. She said proudly, "I was in the honors classes so like we did a little bit more advanced stuff."

Elementary

In elementary school, Esther describes her classmates as being the smarter ones. She said:

> My classmates were like… I guess the smarter ones. It was an honors class; it was called SCOPE. It was like basically they took all the smart kids and put them in that class so basically we had the same classmates since 1st grade all the way to 8th grade until we got to "high school" unless people transferred out. But, basically I knew them since I was six.

Esther recounted that her sixth grade teacher "was not the best teacher but I still learned a little bit." She did not recall any challenges especially when it came to mathematics. Esther said of mathematics:

> Math was like one of the easiest subjects to me… but I know like English and writing - those were like my worst subjects back then, so those were the only challenges that I can remember.

She said the principals were "more involved in the classroom." Outside of the classroom during elementary school years, Esther read books. Regarding grades, she indicates that they were pretty good except for in the fifth grade. Here is what Esther said about herself academically:

> I was kind of slacking but… and then, like in the eighth grade, I was salutatorian of our class. Seventh grade, I got straight A's for the whole year, except I had one bad grade in, like, music. So, that was it. It didn't really count for me, so.

The size of classes was at most 20 students. Esther recalled that one year there was about 12 or 13 students. She had a love for mathematics in elementary school. "In elementary school, I loved math, Multiplication, Algebra. Now, not so much." Esther's challenge was long division. When asked about challenges, this was the response:

> Probably, long division. I hated long division, fractions. Long division - I just could never remember actually how to like finish it. So, once I got it, it was like easy. And fractions - it just used to be the remembering how to multiply them or divide them.

When faced with difficult problems, Esther's resolve would be as follows:

> I would attempt it and then, if I couldn't get it, I would skip it; or, if it looks like an easy enough problem like short hand division, other than long division, I would try doing it first. But if I am still not able to do it, I will skip it, or go ask the math teacher.

Esther doesn't ever recall being tutored but she added that she tutored others. Mathematics outside of school was used just for doing homework.

Middle School

Middle grades were from seventh through eighth grade. Esther's transitioning from elementary school to middle school was described as different in having two teachers instead of one teacher. The mathematics teacher also taught science. Class size was approximately 20 students. Classmates were the same classmates from elementary school. Middle school was a time where Esther's cohort interacted more with other classes. She was placed in an Algebra 1 class while in eighth grade because of being in honors class. Esther indicated that this placement was different that the regular eighth grade mathematics classes. She shared the following:

> We did more algebra in depth. I know like in eighth grade actually we had a real algebra book that we worked from. Like, we actually took algebra one in eighth grade instead of the eighth grade math because I was in honors class but we did not get credit for it. So after, I had to take it twice. I took it eighth grade and ninth grade, so.

Esther admits to being antisocial. Therefore, her challenges were related more to social relationships than academics. This is supported by her following statement:

> The hardest part about eighth-grade was... Well, I guess the more challenging part was not really the academic work but more like social stuff. Making friends but that was like the hardest part to me. Actually, the academic part was pretty easy. Like, I was the salutatorian in my eighth grade class.

The best part of Esther's middle school mathematics experience was having a brand new book. Responding to a question regarding if she thought having a book helped with her learning, Esther responded: "Maybe, I just understood it better. I like algebra. It is actually one of the parts of math I actually like. So, I think that was the best part. Yeah, because you can actually see it." Her response highlighted the importance of the material used to transmit curriculum. This seems to suggests that having a book or even the

quality of a book could make the difference in a student's ability to grasp the concepts in mathematics. In the case of this student, it appealed to her high visual preference for learning.

Esther added that in the sixth grade, students had to copy teacher notes from the board instead of using a book. In addition, sometimes a workbook would be used. "I think like, in middle school, we used the book more, and actually learned stuff." When Esther came across difficult problems, she would "ask the teacher or try to figure it out using the book." Esther used mathematics outside of school just for homework.

High School

Esther's transition from middle school to high school was said to be pretty much the same with this difference – In high school, the classes were on a block schedule. She felt that block classes lasting for an hour and a half was too long to stay in one class.

She didn't like high school her freshman year and by her senior year in high school, she grew to hate it. Esther attributes her feelings to the younger generation attending the high school in the following statement. "I did not like high school. It was, like I guess, the younger generation – they just got on my nerves so much that I did not want to be there."

Esther considered Geometry as one of her worst mathematics subjects. In Geometry class, she was explicit about how no one ever paid attention in class. This is what she said of her experience:

> I took geometry - that was one of my worst math subjects but I made it through. I think I got an 'A' in the class, too. Our teacher didn't really teach much. He used to put people to sleep, so.

In the tenth grade, Esther took Algebra 2 and advanced mathematics, but in advanced mathematics, a substitute was placed in the class and she stated that students "really didn't learn anything." The advanced mathematics teacher moved to Pittsburgh during the 1st quarter thereby requiring the school to hire a substitute teacher for the remainder of the school year. Regarding this event, she said: "And then, like we had a sub for almost the whole year and we did not learn anything."

In the eleventh grade, she was enrolled in a Calculus class. Her most difficult class in high school was Calculus. She said, "I learned a lot but Calculus was so hard." Some methods of coping with her difficulties in Calculus were talking to the teacher, using the mathematics book and using online sources.

Esther recalled having to take Advanced Placement (AP) Statistics in the twelfth grade. She credited her success in her college statistics class to the statistics class taken in high school. Additionally, while in the twelfth grade, Esther participated in a TRIO program at Case Western Reserve University.

Esther described some classmates as "like smart and actually wanted to do right." Others were described as those "who would go to classes half the time" and then others "who just wanted to hang out in the hallways and not go to class or hang out outside." She characterized teachers as okay, good, and pretty good.

Esther's outside activities involved playing volleyball and softball, and an internship at Cleveland Clinic and at Case Western Reserve University. Additionally, she had a summer job and enjoyed hanging out with friends. Meanwhile, her academics remained stable. Esther earned only one C during her high school career and graduated in

the top ten of her class. “I graduated with a 4.01. So, I was number four, I think, out of 250 people or however many there was. So, that’s good.”

Esther participated in tutoring in preparation for taking the ACT. She achieved a score of 26 on the ACT exam. Thereafter, Esther tutored other students and received compensation for tutoring elementary aged students.

What she liked most about her mathematics classes was that she received help when needed. However, Esther did not like that the classes were challenging. She felt that Calculus and AP Statistics were challenging. Esther mentioned that Statistics in college was much easier because she had AP Statistics in high school.

Esther shared the following concerning her state standardized tests:

> I really don’t like standardized testing because I feel like it really doesn’t measure a person’s ability to learn, too much. I mean, I did good on them but some people like … they really don’t do good on test. So, that’s like an unfair disadvantage.

She further supported her opposition to tests by suggesting that alternatives should be made available: “I feel like there should be other work and stuff that would help show the students’ ability to learn than just tests.”

Esther suggested that educators could focus more on mathematics concepts other than teaching to the test to improve the mathematical outcomes of African American students. She advocated for more Advanced Placement classes to be offered across all subjects.

Post-secondary

Esther changed her major three times. Her major was environmental studies. Initially, Esther wanted to major in neuroscience as a pre-med student. Esther changed

her major because she claimed that “she didn’t like people that much and that she didn’t think doing research her entire life was something that she wanted to do”.

Esther felt that her K-12 experiences prepared her for college especially in English as well as mathematics. This feeling was supported in English but not in mathematics upon entering college.

> Math-wise, I was, well I thought I was but they thought otherwise. Well they placed me in this thing called ALEX and it’s a special introductory program -- is like a review of algebra, it had a lot of trigonometry stuff on it and you can take get, well you have it on your schedule for a whole semester or you can test out of it.

Esther was successful at testing out of the special introductory program. Thereafter, she transferred to another college and enrolled in pre-calculus twice. The first time Esther failed pre-calculus but passed the second time with a D. Esther indicated that pre-calculus was very demanding and stressful with the amount of homework and quizzes administered every week. Her thoughts about the second pre-calculus class and teacher were:

> And I vowed not to take that class again because I mean the class is hard and the teachers make it even harder. Like, if you went to her during her office hours she would like not help you at all. She didn't explain things clearly. She was like a really terrible teacher. … but the pre-calc class had so much material in it and you have to remember all the formula. It's like they don't give you anything. My problem was like actually memorizing it and not the concepts of doing it, just memorizing the formulas. It was like I can't, it's so much.

Esther’s difficulty in pre-calculus at college could stem from having a substitute teacher for an entire year in advanced mathematics while in high school. The contents of the advanced mathematics course in high school was intended to parallel a pre-calculus course. As such, a crucial foundation was missing thereby jeopardizing her success in pre-calculus and calculus at the college level as well as calculus at the high school level. I

am familiar with her struggles in calculus at the high school level because I was her teacher for the course. Esther recounts her experiences in calculus as follows:

> Well, I took Calculus and that was not like pre-Calc at all. I mean like a lot of the stuff transferred like the trig functions and stuff. I mean, a lot of it, we did not cover in Calculus. So, I had to take that class twice and I still didn't get that good of a grade … I think the hardest class was Calculus. Like even in college, that's still my hardest class. I don't know! There's something about Calculus that's just not clicking in my head. Like, I can get the trig functions but all the rest of the stuff is crazy …Logs, we were doing those earlier in my Biology classes and I was so confused. I was like – Oh, my gosh! But, I made it through. I used Excel.

Moreover, Esther completed a course in data analysis as one of the two mathematics courses required for her Bachelor's degree in Environmental Studies. She sees statistics and geometric measurements being related to her chosen field of study and future profession. Esther recommendations for educators are as follows:

> They can start teaching math at a lower grade. I mean like teaching higher math in lower grades; like teaching algebra in like fourth or fifth grade compared to let's say eighth grade. So help people get introduced to it early and they can also put more, like more, emphasis on it.

Martha

Martha described herself as a focused student. She said that she "followed the rules and never got into any trouble."

Elementary

Martha's favorite subject was English but she did well in mathematics. She especially found mathematics to be easy during her K-6 schooling. Martha said: "Well, English was actually my favorite subject. Math, I was pretty good at it." She added that there wasn't a lot of focus on mathematics until the middle grades. She said:

> Well pretty much up to the fourth grade, we tried to do math every single day. Fifth and sixth grade, I wouldn't say we did it every day. And if we did do it, I wouldn't say we spent a lot of time on it.

Elementary grade structure went from K through 6. The typical class size in elementary school was no more than 25 students. Martha described some of her classmates as class clowns. Others were said to "take school very seriously and, some were described as smart while others took a little longer to catch on." Martha's notion of some classmates being smart is expressed as follows: "They were able to complete a lesson pretty much on their own without confusion or help."

Martha indicated that she had good teachers and that they did their jobs. Martha didn't experience any difficulties or challenges while in elementary school. She shared that she was awarded the merit or honor roll every grading period. The principals had hands-on approach when talking to students about expectations of behavior and their home or personal situations.

Activities outside of school consisted of playing outside with siblings and friends, volunteering, going to church, and reading. Martha attended tutoring sessions only for enrichment purposes and not out of necessity or some identified deficiency.

Martha liked most being able to figure out and do problems. She liked least that in the fifth or sixth grade, that more time wasn't spent on mathematics. More specifically, Martha didn't like fractions. She replied:

> The only thing that I did not like was when we first started doing fractions, I didn't like that much … Trying to figure out what goes into what, the common denominator and that sort of stuff.

When faced with a difficult problem, Martha would refer to a book and look for an example, and ask the teacher for assistance. Except for addition and subtraction, she did not use mathematics outside of the classroom while in elementary school.

Middle School

Middle school grade structure went from seventh to eighth grade. The transition to middle school was different because of having to change from six or seven classes as opposed to being in one class all day. Also, it was noted that the quantity of work required was different. She said, “It was like more was expected of me than what I had been used to … I needed to keep up. I didn’t want to be left behind.”

The typical class size in middle school was approximately 20 students but no more than 25 students. Some classmates “changed for the better and some changed for the worst.” Martha further explained:

> Some people grew up, grew up a little bit and got into other things. Some people, once they focused on school, they now actually cared more about school because when we were in elementary school it was like you could do a lot more things, get away with a lot more things; in middle school you couldn’t.

She added that the teachers in middle school “treated you a lot different. Like they treated you like you’re supposed to be a lot more mature.” In the seventh grade, Martha found algebra to be difficult because of never having done it before. She worked through this struggle by “paying attention in class and asking for help when needed.” Liking the mathematics teacher played a part in Martha liking the mathematics class and an increase in her paying attention. This algebra class didn’t count towards Martha’s high school graduation and she had to retake it in high school.

Martha added that her in-class successes were “getting decent grades on tests”. She was awarded merit roll or honor roll every grading period. Martha’s daily routine and activities outside of school, home, community and faith-based were pretty much the same as when in elementary school.

Martha liked least being required to complete Study Island and Pro-Ohio tutorial programs. She felt that they were not effective.

> We had to do like little computer programs to help us learn which it really didn't help us that much." … "I didn't really want to do it but I did it anyways. It was part of my grade so.

Study Island is a web-based tutorial program offering students the ability to select a subject matter and related topics. These topics provided specific state standards to review lessons, practice questions, and provide explanations. The program tracks and reports the minimum number of questions answered and a minimum percent correct to determine passage of all topics. After passing all topics in the subject, students are required to pass a post test for the subject. Pro-Ohio is an assessment program that produces diagnostics results of students' performances according to selected state standards and provides related practice problems.

Computations were calculated by hand during the elementary school years as contrasted by the use of calculators during the middle school years. Martha's position was that use of the calculator was easier than computations by hand. "In elementary school we did all the work actually by hand. And now thinking about it, in middle school we would always use the calculator."

High School

The high school grade structure was from ninth through twelfth grade. The class sizes were about 20 to 25 students and, in some, 30 students. Martha indicated that the transition from middle school to high school was easier than the transition to middle school from elementary school. She still maintained good grades in high school. "It was

just, it just seemed easier to me." When asked about the content area of mathematics, Martha exclaimed: "Maybe it was just the teacher that I had in high school explained things better."

The maturity level of the students was more pronounced between middle school and high school as they were required take on more responsibilities for their education. Additionally, the expectations of the teachers were in concert with the maturity levels of the students.

Martha described some classmates as serious while others were described as those who "started to care less." Those who were serious are characterized as being concerned about their grades. She included herself in the group of those who were serious.

Martha characterized her teachers as nice. More specifically, she described her mathematics teachers as follows:

> Math teachers … for twelfth grade in math, I didn't have a math class. My freshman year, I had a very good teacher. He explained things very well. I'd say he gave work to help better understand the lesson he was teaching; tenth grade, the same thing; eleventh grade, the same thing.

The typical class routine was to start with an anticipatory problem/activity at the beginning of the class to introduce the lesson or just proceed right into the lesson. A noted success in the classroom was being the only one to receive a 100% on a test. Martha replied that "it was just nice to be finished with it [referring to the test]."

Martha found multiple step problems to be time-consuming in that they required a lot of work. She said, "I felt like we had to do a lot of work and it wasn't like they gave so much it was just like multiple step problems we had; … They are tiring sometimes." One of her struggles in mathematics classes was not being confident in her answers. To

this point, she said: “It would be sometimes; I just wouldn’t be confident in the answers that I got.” To this end, Martha “just turned her paper in and hoped that she got it right.”

When Martha would come across a difficult mathematics problem, she would “go through the steps, compare the process or answer to another student, and/or ask the teacher.”

Martha had to pass all five parts of the OGT as a requirement for high school graduation. She did not like the tests. “I know some people who did very well in school who didn’t pass the test.” Martha further expounded:

> Kind of, like to a certain extent, it is unfair. But I think that if you go to school, you pay attention and do the work, I mean, I think that you would pass but it’s just that some people aren’t good at taking test. And, if you don’t pass the test then you won’t be able to graduate.

Ada

Ada was enrolled in a master’s degree program in pursuit of her principal’s license at the time of this study and taking a course in school finance as a requirement for her master’s degree. Additionally, she had obtained a bachelor’s degree in art education and was employed as an art teacher at a public high school. Ada attended and graduated from an urban school district; however, she was enrolled in a Catholic Diocese School until the second grade.

Ada had always been an avid reader. She considered her school experiences as normal although she was enrolled in some accelerated courses. Ada described herself as quiet and able to follow directions when given the first time. Because of these qualities, teachers would select her to assist in the classroom. In regard to mathematics, she said: “Math was like, I am not going to say math was like my favorite subject in school but, more or less, I could get it done and move on without struggling.” It seems as though she

was a quick study and complete assignments with limited supervision or assistance. Given these characteristics, she could be a gifted learner.

Ada recalled an early experience of having to pass the Ohio Proficiency Test (OPT) as a graduation requirement. She said the following regarding her preparation for the OPT: “I just did the work, finished the work, never had any trouble with the work.”

Academics posed no challenges to Ada until the twelfth grade and college. she said: “The work started to really expand and it seemed like it could have been a bit more challenging but up until then it really wasn’t.”

Regarding the classroom environment and opportunities to learn, Ada shared the following:

> The teacher would seem to focus more time on the students who constantly would raise their hand or were constantly acting out. So, I was one of those students that kind of fell into the background because I never had the disciplinary problems or I never really had a question about what we were doing. So, I would just be able to just work and kind of be unnoticed.

Elementary School

What Ada liked most about elementary school was that it was fun. All of the students got along and the teachers were engaged. Lessons were fun to her because they were very visual. For example: “So, like if we were talking about money, the teacher would have play money and we would be able to write it on the board. ... I can definitely remember that it was fun.” Ada’s father rewarded her with money for obtaining good grades.

Outside of school, Ada was involved in art such as ceramics and painting at an annex to her church. Additionally, she attended Bible study and liked tutoring other

students as well as track and field. Ada frequented the library every week to check out books with her mother, who was a teacher.

Middle School

Ada did not like the transition from elementary to middle school because it did not have the family environment that she was accustomed to having in the elementary school. Ada attributed the decline in a family atmosphere to larger teacher-student class ratios; where classes were now 1-to-40 as opposed to 1-to-17. These changes in classes resulted in different classroom dynamics where students did not care for one another.

> I didn't like it because once you start to establish a family environment and you know you're in a situation where you don't have that you start to see a lot of changes; especially, like with behaviors because people tend to, not to care as much for each other because they're not with each other literally every second until like two-thirty. So, the atmosphere was a lot different.

Ada found establishing relationships in middle school to be difficult. She mentioned, "So, the atmosphere of middle school was a lot different than elementary school because of that. You really don't have time to establish relationships." She mentioned that middle school was the foggiest part of her life. Ada added that building relationships with teachers was difficult due to the size of the class and the short time in class.

> Middle school, I would honestly say, this was probably the foggiest part of my life… as far as even building relationships with the teachers because the classes were too big and they went too quick.

She said the following concerning class size of at least 35 students and the opportunity to learn: "It definitely takes away your opportunities to learn when you have so many students in front of you."

High School

The school Ada attended was home to rival gangs and she described the atmosphere as chaotic. “You had over a dozen gangs in that school at once. It was chaos. Chaos because every five seconds there was a fight.” She felt that the quality of education began to erode during the time she entered high school. She said, “But, the quality of education at high school was not – it started to erode at that point.”

In Ada’s mathematics classes, there were students that had a wide range of varying degrees of ability. As a consequence, she did not find the mathematics lessons challenging because the lessons were tailored toward the student of average ability. “…it would almost be like a base lesson for all. And, it was kind of easy where you could do it but it wasn't challenging. …it was like a worksheet.”

Ada was able to learn the mathematics concepts at an accelerated rate when compared to her classmates.

> It didn't take me long to get the concept. So it was almost like okay I'll get the worksheet but the other students would get most of the attention. Almost like, for me, almost like giving me busy work. The teacher couldn’t get to me because it was like I was always done, and ready for the next thing, while some people were still struggling with problem one or two.

What Ada liked most about mathematics was its unique nature. She likened mathematics to an art form due to its unique nature. Also, Ada liked doing mathematics problems because an absolute answer was required. In the same vein, she didn’t like having to justify how to get the right answer.

Outside of the classroom in high school, Ada used mathematics when at the arcade, or bus fare, going to the dollar store, or to go get ice cream. Buying tennis shoes

was an event that started in high school when she acquired her first job and her dad taught her about budgeting.

Ada was required to take and pass the Ohio Proficiency Test (OPT) as a part of her graduation requirements in the late nineties. During that time period, the OPT had only four parts. Science was not tested at that time. She passed all four parts of the test while in the ninth grade. “Right, I passed all four parts on the first try in the ninth grade - I was done with it.”

Post-secondary

The first time Ada went to college, she found it difficult. Adding to her challenges was giving birth to a child. Ada dropped out for a while and worked, but went back. “I was still overwhelmed and confused because …, even though I thought I knew a lot, I didn't know a lot. It was a lot of things I missed out on in high school.” Ada had come to a realization that she needed tutoring to be effective in college. She decided to take advantage of the plethora of tutoring services offered at the college. “I realized I was kind of behind what a lot of other people had learned at first, as far as some lessons I should've gotten.”

I just elected to use all those services. So, once they brought me up to speed on the little things I was actually missing, I was just able to really indulge myself in learning on a college level and I have like a 3.944 right now.

Ada wished that she had been better informed regarding the education provided to her so that she could have been an advocate for herself.

> I wished I had knew what I know now, maybe I would have demanded more. … I was just content knowing that I had my A and I didn’t really question the material. I just knew that I was passing.

Ada felt as if her K-12 experiences prepared her for college. Upon entering college, this notion was not supported. "…when you have to apply that, all those things you should know, you realize like you're at the bottom half of the class. And, I was at the bottom half of the class in math." Upon Ada's enrollment, she was placed in a remedial mathematics class. "My math was actually so bad even though it was okay when I left high … I had to take a 098 class as like a refresher even though I thought I knew it …" This caused a sense of inadequacy in Ada regarding her K-12 mathematics experience:

> It made me feel really bad because it was only time in my life that I felt stupid. Like all these courses that they call honors, that they call AP, I was always sitting at the front of the room in high school – all those things I thought I knew…the world I came from did not actually prepare me for all of the math I needed to know. It only prepared me literally to get by.

Ada had difficulties with trying to decide how to start the process of solving mathematics problems. She exclaimed, "It seemed as everybody else just grabbed their pencils and started, dived right into it. And, I'm sitting there holding my pencil. Like, how do I start this problem?" Ada admitted that, at first, she blamed race as a cause for the lack of college preparation but offered that the lack of preparation "has something to do with how we treat urban education".

In college, Ada indicated that the full time faculty were very helpful in giving assistance outside of the established class times as well as facilitating study groups. Ada shared that she was required only to take two mathematics courses for her bachelor's degree and was relieved that no more mathematics courses were required.

Ada offered the following opinion when asked what educators can do to help students to become more successful in mathematics related fields of study and work:

> We need to put a math teacher in elementary school and have that teacher focus on that math to drill it in early. …I think the children are losing out on a lot of things they can attract themselves to earlier.

Electa

Electa attended elementary school in the 70's. Her elementary school was predominately white and very structured. No more than three of the 20 to 25 students in Electa's classrooms were African American. She attended a ninth through the twelfth grade high school from 1981 through 1985. As of this study, Electa was forty-seven years old and pursuing a doctorate in education. She considers herself to be a good student. Electa commented:

> My experiences of math were very challenging for me. My mother and father had to work with me on math a lot at home. I always had a note on my report card that I could work harder - she's good in class but she could work harder. And, I always said it's too hard, I don't understand. And, my mother became frustrated so then she would have my father help me. … It was always a struggle… I was always tittering back and forth with math, C-level student, always. Go down to a D. Get in trouble, at home; bring it back up to a C.

Mathematics was Electa's least favorite subject. Here is what she said regarding mathematics then and now.

> Math was my least favorite subject. And, I didn't realize until years later why. … Actually, actually, I enjoy math now and I have taught math. … I matured and I realized the analytical thinking part of math and how it helps you and just the fact of maturing and taking your time and put the effort into something. So, then I realized it wasn't that math was too hard for me. I just did not want to put the time into it because it was time-consuming. And, it was something you had to think about, get into and I didn't want to put that time in as a youth. I didn't want to!

Electa mentioned that teachers knew she was very capable of doing mathematics but she just didn't try hard.

Elementary School

Electa indicated that all students got along very well and assistance was given to those in need. Some grading marks used in elementary were N's, S's and O's. "The O's were for outstanding; N for needing improvement; and, S for satisfactory." Electa earned "mostly S's for satisfactory, a few O's but mostly S's, and an N in talking too much." In elementary grades, ability grouping was used for instruction in reading and mathematics. "Students were grouped for instruction by reading levels and math levels. Students who were in the higher math level would change classes."

Most of Electa's challenges in mathematics was due to her not wanting to expend forth the effort. Electa found multi-step and word problems to be challenging to the extent that she tried to avoid them. She stated:

> I like to do my work, get it done, and move on! But with math, you just can't do that. … And, what used to bother me was the steps. You have so many steps to have to remember and then there's this one thing you forget to do and it messes the rest of it up. Do the long division you make one mistake and then it throws everything off. And, so it was the stress of having every single part together - every step.

When asked to elaborate regarding long division, Electa replied, "The long division is just so many steps that you had to do repetitiously. And, make sure you do it right."

Electa said that she "just wanted to be social" while in mathematics class.

> School for me was social. I wanted to talk and listen on what was going on. I didn't want to settle down and hone in on my work in math. It took too much energy, too much effort so that was my challenge. And then, I would have to when it was time for a test, I would have to get myself together.

Middle School

Electa's transition from elementary to middle school was a good transition. Electa, as well as her schoolmates were excited because they were going to be riding the school bus instead of walking to school every day.

Electa's pattern of activities leading up to her studying and preparing for a test were as follows:

> Again, seventh-grade was Algebra 1; eighth grade – Algebra 2. I would do my homework, sometimes not. And then, when I knew there was a test, I would cram the night before and then, hope for the best. And then, interims would come out and I would get on a punishment and then I would get on track. I didn't care later.

Although Electa met the expectations of her parents regarding grades, she stated that she could have done better with a closer monitoring of her progress and with effective studying skills.

> My parents had an expectation of that you are going to go to college but they did not know how to prepare us for it and stay on top of us until the grades came out at midterm and then they would react to that. But, to actually see if you did your homework, it was at report card time, or interim reports then they would react. So, they didn't know how, they didn't give you any tools on how to study, or anything like that. They were working, so it was up to us to do it. So, just handle it. And, don't tell you how, not willing to assist you. I was that teenager that if I didn't have someone on me, assisting me, making sure that I did it, I would say I was going to do it, then I wouldn't do it. So, math was always a struggle because you had to be responsible and I was just not responsible.

Another aspect of expectations could be one of limitations by setting low expectations for others. Electa shared that her parents' expectations of her were not to earn less than a "C". However, she added that if the expectations were higher then she would have met those expectations, "I did what I had to do and I knew I couldn't fail; …

C was the limit. So, I think that it was the expectation. It's like if they expected me to get A's and B's, I would have."

Electa experienced a moment of trepidation when looking at her baby sitter's high school mathematics text book.

> It was kind of scary though – … I looked at her work and thought, oh my God, I'll never be able to do that! And, I asked - how do you do that? That looks so hard! … It looked like it was the hardest thing in the world! It was a foreign language. So I thought, oh my goodness, the math in high school is hard!

High School

In high school, grades were from ninth through the twelfth. Electa attended high school during 1981 through 1985. The high school was housed in a newer building. It was the only high school and was equipped with nice carpeting and air-conditioning.

Electa took the prescribed sequence of mathematic courses set forth by her school district for college preparation. Electa said:

> Although I didn't like math, I took the appropriate courses for college to prepare for college. It was a love-hate relationship. I knew that I didn't like math and I didn't want to do the work but I knew I had to do it.

Electa liked her mathematics teacher but she did only what she had to do in class. Electa said the following of her mathematics teacher and mathematics:

> My math teacher I liked him. He was cool – he was like a Woodstock type of hippie, so laid-back. … I did enjoy him. I liked him as a person. But again, I was not very engaged in math. I just did what I had to do. And, it was always a struggle.

Electa used mathematics outside of the classroom for shopping and fundraisers such as car washes and activities for band. Her extracurricular activities consisted of the

Spanish Club; youth group of Black Professional Women, band, choir, track and field, usher board, attending her brother's sporting events, swimming, and bike riding.

Electa summed her mathematics experience up as being not interesting, didactic, and very boring.

> I just feel that at that time that when I was in school, it was a didactic – we had to memorize everything. It was not very interesting. It did not hold my attention at all. Now, I notice different methods to teaching math are more interesting like hands-on. … It was just not, not interesting to me. For, that was my school experience. I was really not interested in math. I found it to be very boring.

Post-secondary

Electa changed her major several times before deciding on Business Management as her final selection. She did not feel prepared for college but knew that she had to go because it was expected of her. Electa added that no one prepared her. Electa's feelings of not being prepared were supported upon her entrance into college. Electa's ACT and SAT scores were adequate to gain her a conditional admission into college which required her to take some developmental courses. Electa added that she wasn't interested in or engaged in school but wanted to do well. Electa credited her determination as a factor that saw her through academic probation and dismissal from college to graduation.

Electa would study at the last minute and socialize a lot in the evening and on the weekends. And, she would not do her work until the last minute and she would cram for a test because of being out partying. Electa exclaimed that she had the time but didn't put the time into it. She began to improve her academics by applying herself and getting a 3.0 GPA.

Electa said that “the math courses weren’t that hard at first, the college level algebra classes, they were okay they weren’t that hard.” She said college algebra was fine because it was an extension of high school. Electa added that Calculus was a challenge due to the time commitment. Calculus was a requirement for her degree in business and she took the course three times before credit was applied toward her degree requirements. Electa didn’t care about the grade in the class as long as she passed. She first passed calculus with D from a junior college but had to retake and pass it at a four-year institution to transfer credits. Electa received a ‘D’ in the class at the four-year institution before credit was awarded.

Electa had taken some statistics course in college and said that she “absolutely loved it”. She passed the statistics courses with high marks even the one for her master’s degree in curriculum and instruction with a specialization as a master teacher. Electa planned on taking yet another Statistics course for her current doctoral program.

Electa used her four-year degree to qualify for substitute teaching. Substitute teaching, she reasoned, would provide the flexibility for her to be at home. She tried substitute teaching with some assignments being in mathematics for seven years and loved it. After the fourth or fifth year of substitute teaching, Electa had taken advantage of opportunities to gain some experience teaching GED classes at a local college. After the experience of teaching at the college, she did not want to continue with teaching K-12. Electa had become better at mathematics as she taught GED and it had become “a more positive experience”.

When Electa was asked what educators could do to help students to become more successful in mathematics related fields of study and work, she offered the following recommendations:

> Black children need to be educated in the mathematical and scientific accomplishments of their ancestors, past and present. Additionally, they need a cohort even at an earlier age. Also, to integrate board games such as Monopoly to be more creative and interesting.

Phaedrus

Phaedrus is a 63-year-old male and a graduate from an urban public high school in the 1960's. He attended school in the wake of the civil rights movement. At this time in Phaedrus' life, there were a lot of transitional labels with regard to race being applied to those of African descent such as Negroes, Afro-Americans, Black Americans, and African Americans. The previous statement offers a snapshot into the historical backdrop regarding race and identity that might have shaped Phaedrus' attitude towards learning within his cultural setting. Phaedrus graduated from college in the Spring of 1990 with a Bachelor's degree in social work. He was semi-retired at the time of this interview and aspires to return to work as a case manager in mental health. Phaedrus sees statistics being useful to the mental health field in studies to show the effectiveness of methods of treatments and what populations are benefiting from certain kinds of treatment.

Elementary School

Phaedrus said that he was always an A-B student in elementary school. He described an experience as being traumatic while in elementary school as follows:

> When I was in the first grade, I guess that's when we learn how to subtract, and for me, that was an emotionally traumatic experience … I was terrified and I was embarrassed in front of the class … you should've saw how scared I was.

Phaedrus started to understand how to subtract by realizing that adding was another way to approach solving subtraction problems. He credited his mother for helping him get through his difficulties with understanding subtraction problems. He shared:

> And, when I went home and told my mother and … when I talked to my mother to this day I do not remember what she said to me. But when I came back to class, I was able to subtract.

Students were introduced to programs such as Junior Achievement. The Junior Achievement program at his school emphasized banking and banking accounts among many other areas of study. Through this program, students learned how to open and start a bank account.

In the fifth grade, an opportunity to attend a private college preparatory school was presented to him and some of the other students. Phaedrus did not take advantage of the opportunity. This is what he said about not wanting to attend the private school which was also shared by his friend, Sherman.

> They were trying to get us to go basically to an elite school to learn what them kids learned out there. I didn't want to go; Sherman didn't want to go because we didn't want to leave our friends. … I didn't relish the idea of making new friends so much.

When Phaedrus was asked to look back on choosing not to attend the prestigious private high school, his response was:

> I have mixed feelings about, about it. I wish I had gone in terms of what I might have learned. But, I'm interested in the things I learned since then - the things that I know now. But at the same time I am sure that they were only trying to indoctrinate me into a system that I don't particularly agree with.

His response appears to reflect a political and cultural stance regarding his thoughts about the educational system. Additionally, Phaedrus shared that 'he wished he had taken advantage of the opportunity because he would now probably be contemporary with those who set government policy.' However, he concludes: "In the end, I still think I was… All in all, I'm glad I stayed where I was at."

Middle School

When Phaedrus entered middle school, he was placed in Section 1, the highest ability track at the middle school. Although being placed in the highest ability track, there were times when he would be failing a class. In his words: "I was always an "A-B" student. Mostly B's, some A's but I was always fluctuating. There were periods where I was getting F's." Moreover, he said the following regarding his grades: "... but every now and then there would be a glitch where I would get an F or a D but I was never worried about pulling it up." When he was asked how he felt about obtaining D's and F's, his response was:

> Actually, I didn't feel nothing. Some kind or another I just took it all like it was nothing you know. I didn't know what was wrong with me – if there was anything wrong with me. Whatever I got the F or D in, I always managed to pull it up to a B or an 'A' the next marking period. And, I wasn't concerned about it like, like uh, I didn't get concerned about it. To this day, I have no idea why that is. I mean, I just didn't have no problem, you know. I was always interested in my extracurricular activities. The older I got the more interested in them, I was; and, the less interested in school I was, for real, especially when we get to high school.

Phaedrus had some successes in mathematics. One success he mentioned was with quadratic equations. Also, he mentioned that it was one of enjoyment.

> I could never remember the name of the equations but I think, to this day, that they were quadratic equations. … But for some

> reason I had a very good facility for doing those equations. I just could see how they were done. And so, I enjoyed math in the 7B.

His struggles with mathematics was having to do with word problems or thought problems. He provided the following as an objective of word or thought problems:

> We had word problems or thought problems. And, what they were supposed to do was to, we were supposed to be able to take the words we had learned and change the, the thought problems to algebra, to algebraic symbols to be able to do the problem.

He added that thought or word problems were aggravating and tedious.

> Them kinds of problems, I could not do them. It was aggravating to look them up. I did not feel like reading all the things. I will go over the things to make sure that I had everything right. The whole thing was tedious, just aggravating to me.

Phaedrus persevered through his frustrations in class and earned a grade mark of a "B". Furthermore, he learned how to solve word or thought problems later in life.

> I did not understand how to do the thought problem until again much later on after I had got out of school … because what I realized is what we were supposed to be shown how to do is to turn the thought problem to words and then to symbols and do the problem and we would have been able to do it faster had I known that.

Phaedrus asserted that he did not remember being taught the basic arithmetic rules and properties that would have prepared him to be able to solve word or thought problems.

> I don't remember being taught the arithmetic rules like the law of distribution and commutative and association and another one. I think there's four of them. I didn't find out about them, I didn't find out about them while I was in arithmetic and I was wondering: "what, did I miss class or something?

Phaedrus saw mathematics as something that he had to learn and doing so would help him to become an adult.

High School

During Phaedrus' tenure in high school, he was enrolled in a college-bound program. Phaedrus had reservations regarding if Algebra 2 or Algebra 3 was the class where his performance was not good. Finally, he identified Geometry as the class of his poor performance. Although he had some successes in the mathematics class, he indicated that there were other topics in the class that he found difficult.

> That's the one where I, I was not doing so well in, geometry. I had different parts of it I could do well and talk about the, the rectangles and the triangles and rhombuses, and all that; trying to find the area and stuff like that. But then there were other parts I couldn't do so well in.

Phaedrus declared that he stopped taking mathematics thereafter because he was interested in music amongst other things. One of his interests was in drawing. He sought out to be enrolled in the mechanical drawing class because according to him "Major (pseudonym) was cool... I liked Mr. Major. Major was cool. All his classes were cool so I was trying to get in Mr. Major's class because he was cool."

His schedule with mechanical drawing did not allow him to continue his college-bound program because mechanical drawing class required three periods. So, he continued to pursue developing his skills in mechanical drawing with the "cool" class and the "cool" teacher. This was the end to his formal mathematics instruction in high school. Phaedrus expressed concern that if he would have continued in the college-bound program, he would have had to take physics and trigonometry. However, he avoided mathematics after his encounter with Geometry.

> I tried to avoid it because … if I would have stayed in college bound, I would have went to physics and I would have went to trigonometry which is math and physics; the math was trigonometry. I did not want to do trigonometry. Trigonometry, I

> was afraid like, like Chinese or something; … Again, I tried to avoid it not realizing I need this for SAT, ACT tests, and stuff like that.

The previous quote indicated a lack of guidance regarding the necessary mathematics classes needed when preparing for success in college. Phaedrus expressed regrets in not continuing his instructions in mathematics as follows:

> You know you have to take the SAT, ACT … that's when I began to regret I hadn't learned, you know, the method and stuff. …I regret not going to learn the trigonometry, now.

Although Phaedrus avoided taking mathematics classes, he admitted that he liked the feeling he got when he learned how something worked, when manipulating numbers, and understanding abstract concepts. He said,

> The main thing I liked was, I liked was the feeling I got when I was able to learn how something worked, you know … the experience of being able to manipulate those numbers and to understand abstract concepts based on symbols, stuff like powers you know; squares and stuff like that.

He began to use mathematics outside of the classroom for calculating profit/loss and budgeting. He bought watches from a wholesaler and then figured out how much money was needed for rent and meals while traveling. Phaedrus shared the following regarding mathematics:

> Math, the one subject I regret that I didn't study with more enthusiasm than I did … in certain aspects of it, math, is a lot of fun to me. It can be a lot of fun anyway; and, I think it has a lot to do with how it is taught as a subject.

Post-secondary

Phaedrus was enrolled in a college-bound program when he entered into high school but decided not to continue along that path during his tenure in high school. He felt that had he continued in the college bound program then he would have been

prepared to attend the college of his choice, Columbia University. He added that he was fairly prepared for college especially “in terms of writing papers”.

Phaedrus admits that college was a challenge and that his interest was in studying the liberal arts. He shared that he had difficulty with physics and mathematics. He recollected his difficulties with Algebra in junior high school (middle school). He attributed his avoidance of mathematics to that middle school experience which caused him to be discouraged and disheartened. He echoed from his K-12 interview that “it was too much work”.

In college, Phaedrus took a remedial series of mathematics to be admitted to the basic college curriculum. He came to realize that it didn’t take as much work as he had thought. Also, he came to the realization that mathematics can be fun based on how it is presented.

Additionally, Phaedrus mentioned that he had great regrets of not taking the available high school mathematics courses while in high school. He indicated that there was a cultural or social aspect that made him afraid of pursuing mathematics. “And, so the cultural thing or social thing made me afraid of math, made me skittish of math, made me want to avoid it but I shouldn’t have felt that way.”

Phaedrus advocated teaching mathematics within the context of real-world applications. He said:

> What they need to do is to change the whole way math is presented. And, they need to make math somehow or another enjoyable or they also need to include it within the context of real-world work. For example, I didn’t hear nothing about math until I started selling watches and then I had to start doing, figuring out how much, how many watches I was going to buy, what percentages I was going to get, what I needed to make to buy some more watches and have a profit and all of that. So having real-

> world applications forced me without any rancor or aggravation to learn how to do that without dealing with the math itself.

Phaedrus further recommended the following for educators:

> I think math needs to be taught not separately but show students especially early on how math can figure almost in everything that they do in their everyday life and show them the real-world applications, not the abstract; where math comes from and, also deal with that history: what is arithmetic? Where does it come from? Who were the antecedents? What is the difference between arithmetic and algebra? What is the difference between algebra, geometry and trigonometry? And, also indicating the fact that some of the stuff came from other cultures other than Europe. You know like the algebra comes from Arabian culture and stuff like that. And, and so may be, and I think they would. And, maybe they will become more invested in learning.

Jeremiah

Jeremiah started grade school in Birmingham, Alabama but was a graduate of a Northeast Ohio school system. He described himself as being a very good student and that he did well in all subjects including mathematics. He reported that he was "never a student who particularly enjoyed math".

> I feel it was something that I had, I just had to complete, you know, as many of the other students. It was just a subject that we had to do. We had to complete.

Jeremiah described his experiences as just ordinary and rated himself as an average student. He said: "I passed math pretty standardly, I would say."

> I always did pretty decently in math. I was never a standout student but I think I did pretty average. I was an average student in math. … I was a pretty decent student. And then, I can't recall ever falling behind in math or any of my subjects as I was a pretty good student.

Elementary

Jeremiah did not have any difficulty in mathematics and recalled the worksheets and the workbook used in learning mathematics. “I didn’t have any serious struggles in math in my primary grades, not that I can remember. Umm, and it was pretty enjoyable.”

The typical class size was between 20 to 25 students. Jeremiah’s description of his classmates was categorical in nature regarding their academic achievement. He described some classmates as performing below average, others as average, and still others who excelled in mathematics. He achieved mostly B’s and C’s in mathematics. He added that he did not recall any student being excited about mathematics. He posited that most of the students felt as he did regarding mathematics. This sentiment is captured in the following two statements.

> Yes, I think that, I and the majority of the students felt as though this was something that – this was a part of the educational process that we have to do. It’s one of the subjects that we have to take and so let’s just do the best that we can do. … This is something that we have to do so let’s get it done.

In retrospect, Jeremiah felt that the teachers were better prepared in all subjects during the time he attended school as opposed to the teachers whom he had come in contact with through the education of his children.

Jeremiah could not recall ever having any struggles in his primary years. Although he couldn’t recall any specific instances of success in elementary school, he was quite sure that he had some regarding mathematics. Evidence of his achievement can be found when looking through his memorabilia; he reported that his prior report cards indicated that most of the time he did very well in mathematics.

The principals were said to be very caring and excellent educators who were

concerned about students' learning and well-being. Also, they were viewed as having very stern principles. Jeremiah's parents stressed the importance in learning mathematics. Following is an excerpt of the interview regarding his parents' emphasis on the importance of learning mathematics.

> In terms of math, I can remember my parents always stressing to me that all this is where your education in math comes in. We would be going to the grocery store or any merchant facility where you know you would buy things. And … even when I would ask for allowances or ask for money and then you know to go to the store to buy candy and buying of things. And, I can remember my mom say many times to myself and my siblings – this is why it is so important to know math. This is why it is so important to study math. This is why it's so important to excel in math because math is something that you will be using every day in life. And, I can remember my mom saying that as we would – as we would spend money, and spend dollar bills and, we would have to know the exact change we were getting back. So all those, I can remember that about math outside of the classroom in practical real-life settings. The fact is that this is why math is so very important and you need to know math as you progress in life.

At times, Jeremiah had feelings of enjoyment when he performed well on mathematics assignments. He felt especially overjoyed when he would achieve a perfect score on an assignment. Jeremiah did not like missing the majority or half of the problems for any assignment. In this event, he felt as if he was a failure.

> It wasn't a good feeling. I felt as though, as though, I have failed at that point because I felt as though I could've done a lot better than this. I was always encouraged to be a good student, to do the best that I could in my grades so when I would miss the majority or get a poor grade on an exam or on an assignment I would kind of feel like a failure to a certain degree. I felt like I failed this assignment. And, it would encourage me and motivate me to do better.

Jeremiah primarily sought the assistance of his teacher and at times his parents to improve his understanding so that he would do better on upcoming assignments. This is reflective of his desire to do well in mathematics although he did not particularly enjoy

mathematics. A major emphasis in learning mathematics outside of the classroom was in knowing how to operate with money.

Middle School

Jeremiah described his transition from elementary school to middle school as being very pleasant. He added that the transition made him feel older and more responsible.

> Every 30 or 40 minutes we changed classes so it kind of made me feel like an older student, a student that now has more of a responsibility.

During the transition, Jeremiah began to see middle school as being more competitive and he noticed the formation of groups. He categorized the formation of groups as an achievement group and a cool group. He classified himself as being part of the achievement group. He said of the achievement group that they wanted to apply themselves, "cared less about being cool, and were on a mission of continuing to be a good student."

Jeremiah characterized the teachers as very good teachers. He compared the quality of education during his tenure with that of the present day. He asserted that the teachers during his tenure seemed to be better prepared and attributes this difference to the social ills existing in this day and time.

Junior high school grade structure was from seventh through ninth grade. As with Jeremiah's elementary school experience, there were no real challenges that stood out. Jeremiah acknowledged that there were some challenges but he would always overcome them. Once again, he reported that he was a very good student in junior high school.

When asked about successes, Jeremiah replied:

> Well, no extraordinary successes but I was a pretty good student. I was a pretty steady student so I would achieve. I would routinely achieve good successes in math and across the board in my studies.

The typical class size was between 20 to 25 students per class, and in some cases, close to 30 students. Jeremiah described the principals as very caring and supportive of students' success in school.

Understanding the concepts of mathematics was what Jeremiah liked most about learning mathematics in junior high school. And, just like elementary, he did not like not doing well on an exam or an assignment. When faced with difficult problems, he would ask the teacher to provide an example on the board.

Jeremiah used mathematics outside of school primarily when purchasing goods from merchant facilities.

> I really had to be on top of my math skills because I would not have that parental protection there with me. And, if I spent money and I didn't understand how much change I was, I was, supposed to receive back, then I would be at a loss… And so, that was something that I was serious about and I did not enjoy losing money.

High School

During this time, class sizes were approximately 30 to 35 students. The transition from middle school to high school brought about a greater responsibility for Jeremiah. He said the following about his transition from middle school to high school:

> I can remember that transition to high school. Again, have, uh, more responsibility, my parents given me greater leeway in being able to make some decisions. So, it was a good time, it was a good time. I felt that as though, I was growing up, become grown-up, it was a very good time and a good transition.

When Jeremiah was asked about those groups of students he classified as being achievers or as being cool, he thought "it to be even more profound." He shared, "They

called the students who were achievers, nerds." Jeremiah described the group of achievers as: "Students, who were serious about getting their education, moving on, furthering their education, and really making something of themselves in life." Here are some thoughts he shared concerning the cool group:

> I think many of them were, afraid to challenge themselves to achieve … I can see that those students could achieve as well if they would allow themselves to really try and then some of them feared what others may think when they tried. It's that, the students, the students who were in that cool group.

Once again, Jeremiah characterized the teachers as good teachers. He offered that they were caring, knew the content very well, and were concerned about the students' learning and understanding of the content as well. He characterized the principals as being good, as well. The principals were said to be attentive, very stern, and caring in giving assistance when needed.

Jeremiah recollected he had some struggles in mathematics during high school but he was able to overcome the challenges with the assistance of the teacher. It was during his first encounter with Algebra in high school that he decided that his chosen profession or career would not be one that was related to mathematics.

> I think it was at that time in high school that I probably made the determination that I was … it's not going to be a mathematical career that I would be aspired to. I think, as a high school student, I felt like I wanted to take as less math as possible after I get out of high school.

The most enjoyable mathematics class in high school was Business Mathematics. His memories about his Business Mathematics class were as follows:

> For one thing, it came easier to me. Secondly, I enjoyed the teacher who taught the class. He was a very engaging teacher, a comedic teacher, he would keep students laughing, and I think that helped.

> So, I can remember that class that taught us math in high school. It was an enjoyable class.

Jeremiah struggled with learning the concepts and therefore liked that aspect of mathematics the least. However, he felt a sense of enjoyment when he was able to understand the concepts and perform well on examinations or on the final grading.

Jeremiah used mathematics outside of the classroom for making purchases at the mall, catching the bus, summer jobs, and the like. His activities outside of school consisted of skating, swimming, and bowling. Also, he spent time outside of school preparing for what he wanted to study in college. His decision to choose sociology as a college major was greatly influenced by his parents and the subjects he liked most in high school. Jeremiah noted that he received great assistance from guidance counselors in high school as well as in junior high school.

Jeremiah advocated for testing to assess the achievement level of the student but not as a graduation requirement. He opposed graduation tests because "some students clam up and this causes them not to perform well on such tests." He posited that if one matriculates from kindergarten through twelfth grade then they have proven that they can and should be promoted. He added that there are many successful people today who were not required to take a graduation test and if they did then they might not have realized their success.

Jeremiah further suggested that the importance of mathematics and the concepts of mathematics in life and careers should be stressed early on in the primary grades so that the educational outcomes in mathematics might drastically change.

Post-secondary

Jeremiah's father was a major influence in his choice of sociology as a college major. His father was involved in the civil rights movement as an activist in challenging injustices against people of color.

He felt that his K-12 experiences prepared him well for college. "When I graduated twelfth grade, I felt fully prepared. I felt I was fully prepared to, for college... when I entered college, I was able to do college-level work." The mathematics courses Jeremiah took in college were required for graduation. He added that he had gained a lot from those mathematics courses and that mathematics was interrelated to teaching.

He shared that he teaches in a public school system and he also has other entrepreneurial aspirations. Jeremiah pursued a career in teaching because of his enjoyment of working with people. Furthermore, Jeremiah recommended that educators focus on making mathematics lessons more exciting. Jeremiah added:

> I think most students approach math believing that it's a difficult subject to learn. Therefore, I, I feel that they think that it's a boring subject to study. I believe if, if teachers and educational professionals would make math a more exciting subject for students that more students would be, more students would, would want to study math. They would be more inclined to study math if that, if that was the case.

In closing, Jeremiah said he learned that "math is vitally important to everyday life". The next chapter provides an analysis of emerging and connected themes within and across the vignettes.

CHAPTER V

RESULTS

This chapter presents the summative experiences of the participants and then outlines the summative experiences into broader thematic categories and related themes.

Summative Experiences

Refer to Table 3 for a listing of each participant's summative experience on page 98.

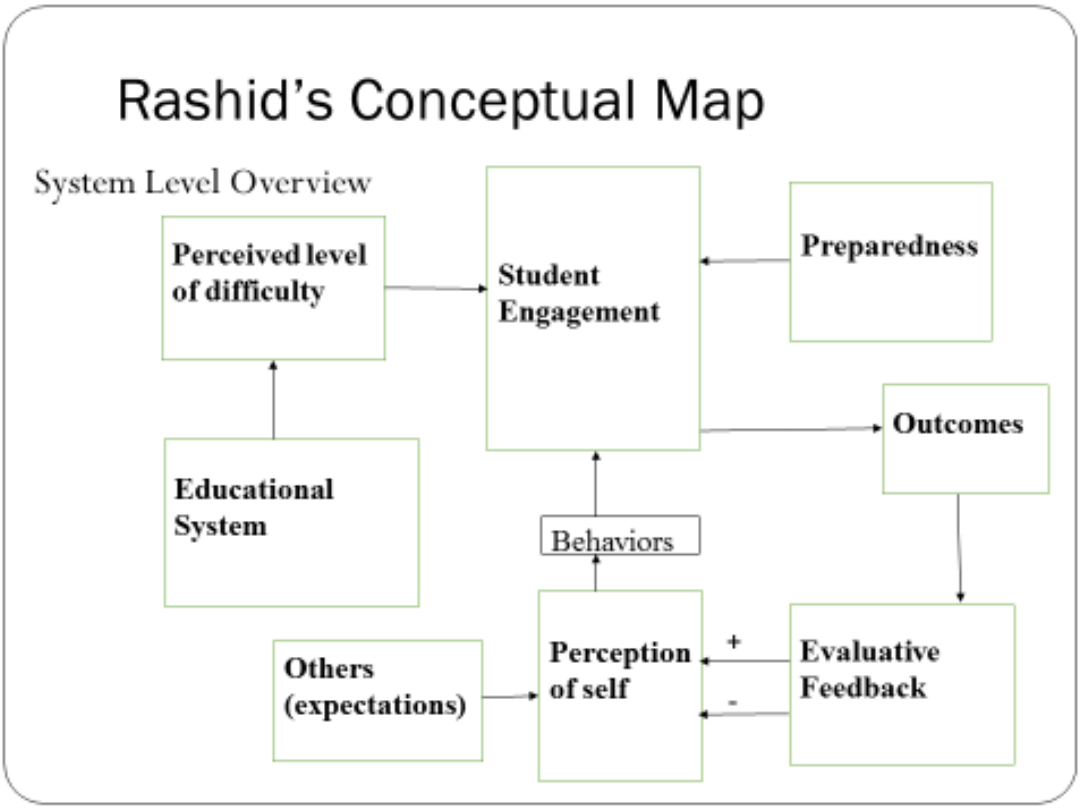
Thematic Categories

The thematic categories related to the summative experiences are perceived level of difficulty, educational system, student engagement, evaluative feedback, perception of self, others, preparedness, recommendations to educators and outcomes. The connected results are best displayed by a system level conceptual map on page 96.

The descriptions of the thematic categories are discussed in the following paragraphs.

Perceived Level of Difficulty

The themes for the perceived level of difficulty are tediousness, challenges in mathematics and mathematics as a foreign language.



Tediousness.

Tediousness incorporates perceptions of a task as one or more of the following: requiring too much effort, time-consuming, too hard, too many steps to remember, too much energy, difficult, or boring concerning multi-step problems. Some participants perceived that multi-step problems such as long division and word or thought problems required "too much effort" and others echoed with phrases such as "time consuming". Phaedrus said:

> I just did not want to put the time into it because it was time-consuming. And, it was something you had to think about, get into and I didn't want to put that time in as a youth. I didn't want to! … The whole thing was tedious, just aggravating to me.

Tediousness provoked feelings of frustration, aggravation, stress, and boredom within participants. Aspects of tediousness were mentioned by five participants. Table 4

on page 99 provides a summary of the incidents and related effect on the choice to continue with mathematics.

Challenges in Mathematics.

Challenges in mathematics is defined as relating to rigorous or demanding assignments where struggles and/or difficulties were expressed by a participant. Elements of some challenges were aspects of mathematics being time-consuming, multi-step problems requiring too much effort, and more specifically long-division. Some challenges were feelings of fear and trepidation as well as mathematics being boring. Another challenge was how to think about how to solve a problem.

In elementary school, long division presented a challenge to Ruth. Similarly, long division presented a challenge to Esther to an extent that Esther hated it. This is supported by her following statement, “I hated long division, fractions. Long division - I just could never remember actually how to like finish it. So, once I got it, it was like easy.” Esther had no apparent challenges in mathematics during middle school. In high school, Esther was challenged with Calculus and in college, she was challenged with both Pre-Calculus and Calculus. Esther said:

> I vowed not to take that class again because I mean the class is hard and the teachers make it even harder. Like, if you went to her during her office hours she would like not help you at all. She didn't explain things clearly. She was like a really terrible teacher. And, like all the students like that had her class said that she was terrible. Like, if I would have known that she was so bad I would have never signed up to take it over. I would have just taken the two with the same one because she was actually good but the pre-calc class had so much material in it and you have to remember all the formula. It's like they don't give you anything. My problem was like actually memorizing it and not the concepts of doing it, just memorizing the formulas. It was like I can't, it's so much.

Table 3.

Summative Experiences

Ruth	**Esther**	**Martha**	**Ada**	**Electa**	**Phaedrus**	**Jeremiah**
• Sense of self/self-concept • Challenges in mathematics • Characteristics of Teachers • School Environment • School engagement • Student learning strategy • Instructional strategies • Educational trajectory • Student Characteristics • Standardized Test	• Sense of self/self-concept • Challenges in mathematics • Characteristics of Teachers • Student engagement • Instructional strategies • Educational trajectory • Student Characteristics • Standardized Test • Peers • Resourcefulness • Reality Check • Persistence • Recommendations to Educators • Outside activities	• Sense of self/self-concept • Challenges in mathematics • Characteristics of Teachers • School Environment • School engagement • Student learning strategy • Instructional strategies • Educational trajectory • Standardized Test • Peers • Outside activities	• Sense of self/self-concept • Challenges in mathematics • School Environment • Instructional strategies • Educational trajectory • Standardized Test • Reality Check (College Reality) • Recommendations to Educators • Outside activities • Student-teacher relationships • Class size • Parental Involvement	• Sense of self/self-concept • Challenges in mathematics • School Environment • School engagement • Educational trajectory • Reality Check • Recommend-ations to educators • Outside activities • Parental involvement • Setting in time • Study habits /skills • Get on track • Get it done	• Sense of self/self-concept • Challenges in mathematics • Educational trajectory • Peers • Reality Check • Recommend-ations to Educators • Parental involvement • Setting in time • Enjoyment of mathematics • Extracurricular activities • Regret	• Sense of self/self-concept • Challenges in mathematics • Characteristics of Teachers • Educational trajectory • Standardized Test • Peers • Reality Check • Recommend-ations to Educators • Parental Involvement • Get it done • Greater Responsibility • Mathematics outside of school

Table 4.

Tediousness Summary

Name	Incident	Effect
Martha	Multi-step problems: "They are tiring sometimes."	Positive – performance approach.
Electa	"It was time consuming." "So many steps to remember." "It was the stress of having every single part together – every step." "So many steps …" "It took too much energy, too much effort …" "Not interested in math … I found it to be boring."	Positive – performance approach.
Phaedrus	"The whole thing was tedious, just aggravating to me." "Too much work!"	Negative – avoidance.
Jeremiah	"Educators need to find ways to make math more exciting to students."	Positive – performance approach.
Esther	Long division – "I just could never remember actually how to finish."	Positive – performance approach.

Also, in middle school, Martha found algebra to be difficult. Martha worked through her struggles with Algebra by "paying attention in class and asking for help when needed." Her challenges in high school mathematics were with multi-step problems. Martha perceived multi-step problems to be tiring.

In the case of Ada, she found mathematics lessons to be fun because they were visual however the lessons did not become challenging until high school. Ada added that in high school, students had to justify their answers. She experienced further difficulties with how to determine the initial step in solving mathematics problems while in college.

Additionally, Electa's overall experiences in mathematics was very challenging. Mathematics was Electa's least favorite subject and she found mathematics to be too hard

for her to understand, it was time consuming, and it required too many steps (multi-step problems) which caused her stress, especially long division. Long division was also a point of contention with Ruth and Esther.

Electa surmised that mathematics took too much energy and effort. Additionally, Electa attributed her struggles with mathematics to her not wanting to be responsible.

> I just did not want to put the time into it because it was time-consuming. And, it was something you had to think about, get into and I didn't want to put that time in as a youth. I didn't want to!

Calculus was a challenge for Electa whereby college credit for Calculus was applied towards her graduation degree requirements only after three attempts at passing the class. At some point, Electa was unconcerned about the grade so long as she passed the class.

Moreover, Phaedrus described his experience in learning subtraction while in elementary school as emotionally traumatic when his teacher called him to the front of the class to solve a subtraction problem on the board. In middle school, Phaedrus further experienced difficulty with word or thought problems. Phaedrus perceived word or thought problems to be tedious, aggravating, frustrating, and just too much work. Although Phaedrus was frustrated in one of his mathematics classes, he persevered to receive a high quality passing mark in the class.

Also, Jeremiah found Algebra to be challenging in high school. It was during Jeremiah's first encounter with Algebra in high school when he decided his chosen profession or career would not be one related to mathematics.

At the college level, four out the seven participants were required to take remedial mathematics courses in college. Electa, Jeremiah and Martha were not required to take remedial mathematics classes while attending college.

Mathematics as a foreign language.

This suggests a high-level of perceived difficulty in the use of this analogy. Electa used foreign language as analogous to mathematics and experienced feelings of trepidation regarding her competency in future high school mathematics classes. “It looked like it was the hardest thing in the world! It was a foreign language.” Likewise, Phaedrus likened mathematics to learning a foreign language.

Educational System

Educational trajectory, school environment, standardized testing, resources for learning, teacher’s perceptions of student’s effort and guidance counseling are components of this thematic category. Educational trajectory will be the first component to be discussed.

Educational Trajectory.

Educational trajectories are representative of the participants’ experiences and milestones. Accordingly, the trajectories can be thought of as opportunities to learn at certain junctures and missed opportunities to learn in the participant’s educational journey. This is reflective of the teaching and learning exchanges or delivery of curricula (implicit and explicit). As such, these experiences can either enhance or inhibit the progress along the participant’s educational trajectory through elements of student engagement. Table 5 on page 103 provides examples of educational trajectories.

Opportunities to learn enhanced the trajectories while missed opportunities to learn inhibited the trajectories.

Also, educational trajectory is reflective of the student's goals as set forth by the respective curriculum. However, it is important for the students to accept the goals as being meaningful and relevant with feedback on their progress to obtain high performance. In short, the goals can help the student to learn the significance between effort and achievement (Barry, 2007).

In this study, the educational trajectories of Ruth exemplify an enhancement and a hindrance. A hindrance is represented by her high school mathematics experience where crossword puzzles and Sudoku were used extensively for classwork as well as homework assignments. This approach to learning was not meaningful nor relevant to her educational goals. Therefore, she enrolled in a PSEOP program that was meaningful and relevant to her educational goals. Her enrollment in PSEOP is representative of an enhancement.

Phaedrus choosing not to attend a private school and his preference to the "cool class" with the "cool teacher" instead of continuing in the college-bound track was categorized as a hindrance (missed opportunity).

Table 5.

Educational Trajectories.

Opportunities to learn	**Missed opportunities to learn**
More rigor	Lost one year of instruction (not learning – ineffective teaching at high school, Sudoku, etc.)
Access to special curriculum (Gifted, honors)	Did not learn anything (substitute for 1-year)
Educational alternatives, such as PSEOP, TRIO, etc.	Change in disposition regarding learning mathematics
Graduation from college	Not awarded credit for course even though passed the course
ACT Scores/ GPAs	Extracurricular activities
High sense of self as a capable student (passed CLEP)	Turned down University School – due to cultural implications
Internships	Not seeing himself as committing to doing mathematics during his 1st encounter w/Algebra
Cohort	Take less mathematics as possible
College bound track versus vocational track	
Ability tracking	
Junior Achievement	

Phaedrus gave the following account for not wanting to attend the private school:

> We had lots of fun and for those kinds of reasons, those were the reasons I did not want to go to Private School. I wanted to be

> around my friends. I didn't you know; I didn't relish for some reason; I didn't relish the idea of making new friends so much.

Phaedrus added:

> They were only trying to indoctrinate me into a system that I don't particularly agree with … The cultural thing or social thing made me afraid of math, made me skittish of math, made me want to avoid it.

Moreover, Phaedrus was introduced to Junior Achievement in his early schooling, placed in a high ability track during junior high school, and was initially enrolled in a college-bound program while in high school. During Phaedrus' high school tenure, he decided to change from the college-bound program to a career and technical education program that specialized in mechanical drawing. Also, he expressed feelings of ambivalence and regret regarding possibilities of his future self in retrospect.

In elementary school, Ruth did not have any problems with mathematics and credited her success to cultural capital. She recalled, "in elementary, you learned pretty much the same things that you were taught at home." As Ruth transitioned into middle school, the teacher gave more challenging work that attributed to her not being disruptive in class. She sought assistance from her middle school mathematics teacher even while attending high school. In high school, Ruth had specialized training in CAD (Computer Aided Drafting) and CNC (Controllable Numerical Controls) in which she was able to apply mathematical concepts. However, her mathematics class was not challenging and she was dissatisfied with the lack of demand/rigor. She offered the following, "I felt like I didn't learn anything and it was a complete waste of time." While attending high school, Ruth enrolled in PSEOP (Post-Secondary Educational Options Program) as an educational alternative to resolve her dissatisfaction with high school mathematics. She

expressed, “I felt like there was nothing that they could offer me that would help me to get to where I want to get in life as far as educational goals.”

Esther experienced a cohort of classmates from the first grade to the end of the eighth grade in an Honors’ program. She said,

> My classmates were like… I guess the smarter ones. It was an honors class; it was called SCOPE. It was like basically they took all the smart kids and put them in that class so basically we had the same classmates since first grade all the way to eighth grade until we got to High School unless people transferred out. But, basically I knew them since I was six.

She took Algebra 1 in the eighth and ninth grade but only one course was awarded credit for high school. Additionally, in the eleventh grade, she missed a year of learning due to having a substitute for most of that year. Esther said, “And then, like we had a sub for almost the whole year and we did not learn anything.” Also, she participated in a TRIO program sponsored by a local university. Initially, her choice of a college major was Pre-med with the intention of becoming a neurosurgeon.

Similarly, Martha’s Algebra 1 class in middle school did not count towards her high school credits for graduation. Whereas, Ada was enrolled in some accelerated courses as well as advanced placement classes during her phases of K-12 mathematics education. In comparison, Electa took college preparatory courses in preparation for college.

Jeremiah did not see himself as being identified with mathematics during his first encounter with algebra and decided that his career would not be one related to mathematics. He said,

> I probably made the determination that … it’s not going to be a mathematical career that I would be aspired to. I think, as a high

> school student, I felt like I wanted to take as less math as possible after I get out of high school.

School Environment.

School environment addressed the general atmosphere of the school and the classroom environment including the size of the class and ability grouping. Also, included are teacher-student relationships, peers, and students' on-task behaviors. Regarding the school environment, Ruth shared that "at times the classrooms throughout the school would be chaotic." Whereas, Ada shared that during the transition from elementary school to middle school, there was a deterioration of caring - loss of "family environment" as experienced in elementary school. Ada's school environment in high school was chaotic due to it being the home of many rival gangs. Ada asserted that this was when the quality of education started to erode.

Ability grouping was used for instruction in reading and mathematics in Electa's elementary school. Moreover, Electa added that students who were in the higher mathematics level would change classes. Additionally, according to Ada, large class sizes negatively affected the opportunities to learn.

Standardized Testing.

Some participants were required to take and pass high stakes tests as a graduation requirement from high school as required by the state of Ohio. Ruth, Esther, Martha and Ada were required to pass high-stakes tests in mathematics administered by the state of Ohio. Ruth, Esther, and Martha were administered the Ohio Graduation Test (OGT) while the Ohio Proficiency Test (OPT) was administered to Ada. Ruth reported that she had no problem passing the test. Esther reported that she had done well on the test.

Although Martha passed the OGT, she felt the OGT was unfair because everyone is not good at taking tests however she expressed her belief that if a person goes to school, pays attention and does the work then she/he should pass. Additionally, Martha added that she knew some people that did very good in school but did not pass the test.

Moreover, Ada passed the Ohio Proficiency Test (OPT) in mathematics as required by the State of Ohio for graduation from high school. Ada said that she prepared for the test by "just doing and finishing the work". She also added that she "never had any trouble with doing the work. I passed all four parts on the first try in the ninth grade - I was done with it."

In contrast, Electa, Phaedrus and Jeremiah were not required to pass any high-stakes tests to graduate from high school. Jeremiah opposes graduation tests because "some students clam up which causes them not to perform well on such tests." He critiqued the tests as follows: "There are many successful people today that were not required to take a graduation test and if they did then they might not have realized their success."

Resources for Learning.

Resources for learning included books, computers, computer programs, peers and certificated staff. Having a brand new book in middle school aided Esther in the understanding of mathematical concepts. In some instances, schools were under-resourced by not having textbooks and/or inadequate faculty. In other instances, Jeremiah recalled the use of worksheets and workbooks, and Ruth's encounters with crossword puzzles and Sudoku for instructions in mathematics.

Teacher's Perception of Student's Effort.

This refers to a teacher's opinion of a student's level of ability versus their observed performance. In elementary school, Electa's teacher felt Electa wasn't giving her best effort to her studies. She shared the following statement from her teacher, "She's good in class but she could work harder."

Guidance Counseling.

This refers to any mention of guidance received from the counselors or resources from the guidance office. Jeremiah acknowledged receiving great assistance from guidance counselors. Also, Electa used the guidance office as a resource to select the courses that would prepare her for college.

Student Engagement

Student engagement was comprised of the following cluster of themes/codes: student characteristics such as learning styles, teaching methods consisting of instructional strategies and practices, the skill and effectiveness of the teacher in scaffolding and motivating students. An example of scaffolding to promote understanding was stated by Ruth as follows: "He knew how to break things down in a way to help me understand." Other components of student engagement are characteristics of teachers, student/teacher relationships and positive experiences in mathematics.

In elementary school, Ruth typically finished with the class assignment before class and needed something else to do to keep her from being disruptive in class. "I was finished with what I was supposed to do, so I needed something more to do and if they didn't give me something else to do, I found something to do."

Esther viewed the principal as an advocate and an instructional leader that advocated for programs and activities to engage students in learning while in middle school. Esther said, “Algebra was the best part of middle school because it was easily understandable.” However, Esther’s tenth grade geometry class was not very engaging and no one ever paid attention. In the twelfth grade, Esther found Calculus to be very challenging, and during college, she had remembered a lot from her high school AP Statistics class that allowed her to perform well in a college statistics course.

Martha expressed that explanations of mathematics concepts were clearer in high school than middle school. She offered this take: “Maybe it was just the teacher that I had in high school explained things better.” One of her noted successes in high school was being the only one to receive a 100% on a test. Martha concluded that “it was just nice to be finished with it.”

Electa was not an engaged learner in mathematics. She felt that the teacher’s approach was boring and didactic. She said, “It was just not, not interesting to me. For, that was my school experience. I was really not interested in math. I found it to be very boring.” Furthermore, she liked her high school mathematics teacher but only did the bare necessities to pass the class.

Student Characteristics.

Student characteristics provided aspects of participants’ interpersonal interactions, goal-orientations as well as learning styles. Ruth was goal-oriented as evidenced by her enrolling in PSEOP to reach her educational goals. She liked challenging problems but took exception to being put on the spot. Additionally, she helped a younger sibling with mathematics.

In comparison with Ruth, Esther disliked challenging classes and she had a high preference for learning visually. When she was asked about new books helping in her understanding of mathematics, she replied: “Yeah, because you can actually see it.” Additionally, Esther helped tutor others in mathematics.

On the other hand, Phaedrus was more interested in the extracurricular activities than academics especially during high school. He provided the following perspective: “The older I got the more interested in them, I was; and, the less interested in school I was, for real, especially when we get to high school.”

Similarly, Electa thought of school as being more social than academic. She shared the following, “School for me was social. I wanted to talk and listen on what was going on. I didn’t want to settle down and hone in on my work in math.”

Resourcefulness.

Resourcefulness goes beyond asking the teacher and using the textbook for solving problems. Some participants’ toolboxes expanded to the use of online resources and comparing their approach to their classmates’ approaches in solving problems.

Characteristics of Teachers.

The characteristics of teachers reflect the attitudes of teachers in a supportive or non-supportive role in a participant’s mathematics education. This includes the quality of the teacher as categorized by the participant. Teachers were categorized as good, bad, indifferent, caring, skilled, unskilled, and yes, terrible. Ruth saw good teachers as passionate allies and willing to help students to understand. Alternately, she shared the following regarding teachers categorized as bad:

> Those who were indifferent to kids learning, either you got it or you didn't. … If you got something wrong, the teacher would mark it wrong and wouldn't give any assistance in correcting the errors.

In the case of Esther, she characterized K-12 teachers as okay, good, and pretty good. Esther considered one teacher not be the best teacher but indicated she still learned. While in college, one of Esther's professors were very uncooperative in not giving her any assistance during office hours. "Like, if you went to her during her office hours she would like not help you at all."

Martha indicated that her teachers were good and that they did their jobs. Additionally, she added that teachers gave her work to better understand the lesson and her teachers explained things well.

Jeremiah said teachers were caring and knowledgeable of the content, concerned about students learning, attentive and very stern. He evaluated the teachers during his tenure as a student as being better prepared when compared to present-day teachers.

The characteristics of teachers that helped participants were caring and concern, content knowledge, preparedness and providing good explanations. Those characteristics of teachers that hindered participants were uncooperative, lack of giving assistance and showing indifference.

Student/Teacher Relationships.

This refers to the quality of how students and teachers relate to one another in their respective roles. Martha believed student/teacher relationships were good. In one class, liking the mathematics teacher played a part in Martha liking the mathematics class and an increase in her paying attention. As a contrast, Electa liked her mathematics teacher but this fact did not encourage her to pay attention in class. Electa said:

> My math teacher I liked him. He was cool – he was like a Woodstock type of hippie, so laid-back. … I did enjoy him. I liked him as a person. But again, I was not very engaged in math. I just did what I had to do.

An example of a not so good relationship was with Esther and a college professor. Esther's college professor would not make themselves available to assist Esther after class nor during the professor's published office hours. No teacher-student relationship seemed to have been established as Ada articulated that she felt unnoticed because the students who received attention were mostly those who were disciplinary problems.

Teaching Methods (Instructional Strategies/Practices).

This included the instructional strategies and/or practices used by the teacher. Phaedrus offered the following regarding teaching methods. "Math is a lot of fun. It has a lot to do with how it is taught as a subject." Electa was more specific in articulating her preferences of teaching methods. Electa disliked the didactic approach to learning mathematics and had a preference towards a hands-on approach to learning mathematics.

> I just feel that at that time that when I was in school, it was a didactic – we had to memorize everything. It was not very interesting. It did not hold my attention at all. Now, I notice different methods to teaching math are more interesting like hands-on.

Ada asserted that mathematics lessons were fun to her because they were visual.

During Ruth's elementary education, teachers used props and manipulatives to help in the presentation of lessons. Homework was also required. The lessons in middle school were easier for Ruth to grasp because the teacher knew how to scaffold. She said, "He knew how to break things down in a way to help me understand."

In contrast, Ruth's high school mathematics class lacked rigor and was deemed ineffective. She stated, "There were no lessons, there were, was no homework outside of

crossword puzzles, word searches for credit, for grades. I did not do anything in that class the entire year." Her desire for more rigor was satisfied by enrolling in a PSEOP for mathematics. Additionally, relevance of mathematics was seen in applying mathematical concepts in Ruth's high school career and technical education class. Whereas, Esther was required to do mathematics for homework. Also, note taking skills was a strategy for learning. Besides taking notes, a workbook was used instead of the use of a textbook.

Martha experienced computations by hand in elementary versus the use of calculators in middle school. Moreover, she experienced ineffective computer-based tutorial programs in high school.

> We had to do like little computer programs to help us learn which it really didn't help us that much. …I didn't really want to do it but I did it anyways. It was part of my grade so.

Ada found the use of manipulatives for learning to be fun while attending elementary school. In high school, the lessons were not challenging as they were basic one-size fits all lessons. As such, Ada was able to do the work without incident and not be noticed.

Positive Experiences in Mathematics.

This relates to feelings of joy when engaged in mathematical activities especially when one has achieved success. Electa has had experience teaching K-12 mathematics as a substitute teacher and developmental mathematics and GED classes for a post-secondary institution of higher learning. She had become better at mathematics as she taught GED classes and mathematics had become "a more positive experience." She has grown to love teaching mathematics.

Phaedrus enjoyed his 7B mathematics class because he had an exceptional facility for solving equations. He felt good whenever he was able to understand and solve problems. Additionally, he thought that mathematics was a lot of fun depending on how it was taught. He reasoned that learning was something that helped one become grown so he needed to learn mathematics to become grown. Also, he used mathematics while attending high school for budgeting, traveling, and calculating profit/loss from a business venture.

Jeremiah enjoyed mathematics when he understood the concepts, when he performed well on examinations, and at the end of final report card grades. He particularly enjoyed his business mathematics class in high school because his teacher was very engaging. He said, "I didn't have any serious struggles in math in my primary grades, not that I can remember. Umm, and it was pretty enjoyable." What he liked most about learning mathematics was understanding the concepts.

Furthermore, when Jeremiah did not understand the concept and did not perform well on examinations, he had feelings of failure. However, he asserted that feelings of failure were a motivation for him to do better.

Evaluative Feedback

Involves one's interpretation and internalization of information received from others and behaviors that result from the interpretation. Included in this category are reality check, attributions and behaviors.

Reality Check.

This relates to the participants' feelings of how their K-12 experiences had prepared them to enter college – college readiness.

During the post-secondary interview, participants were asked: (1) How well prepared for college did you feel at the end of twelfth grade? And, (2) were these feelings supported or challenged by your experience once you got to college? According to the participants, some feelings were supported and others were challenged through remediation in mathematics at the college level. The remediation in mathematics served as a "reality check" regarding K-12 mathematics experiences in preparation for college level mathematics classes.

Ada was assigned a remedial mathematics class in college even though she passed the mathematics section of the OPT, completed honors and advanced placement courses while in high school. She availed herself of the plethora of tutoring services offered at the university to prepare herself for college level coursework. In retrospect, Ada concluded that: "I wished I had known...I just knew I was passing." She further reflected concerning systemic issues concerning urban education and not withholding race as a factor. She implored, "The lack of preparation has something to do with how we treat urban education." She stated:

> "All these courses that they call honors, that they call AP, I was always sitting at the front of the room in high school – all those things I thought I knew! … I realized I was kind of behind...as far as some lessons I should've gotten."

These declarations convey a sense of betrayal. The sense of betrayal can be thought of as a realization of utility not realized in educational opportunity.

Regarding another "reality check", Martha said the following about her assumption that she was academically prepared: "I thought I was but they thought otherwise!" Martha was an honor's student throughout her K-12 education. As such, she obtained very good grades in mathematics. Moreover, she reported that her score on the

ACT was very good. She expressed disappointment in having to be placed in a remedial mathematics courses in college.

Electa's K-12 experience was adequate in making the transition to college. This is what she said of her college algebra experience: "… the math courses weren't that hard at first; the college level algebra classes, they were okay; they weren't hard." She added that college algebra was an extension of high school. She felt prepared for college through her college preparatory courses. However, initially Electa's success was hampered by her tendency to cram before taking test. In contrast, Phaedrus was required to take a series of remedial mathematics classes before being admitted to a basic college curriculum.

Jeremiah felt that he was fully prepared for college and able to do college-level work upon entering college. Jeremiah's feelings were confirmed.

Attributions.

This relates to how a participant attributes their success or failure. Ada attributed "race" and the treatment of students in urban education as reasons for her being placed in remedial mathematics. She had come to the realization that she was not adequately prepared for college level mathematics. Initially, she had feelings of anger. However, she did not let her state of preparation deter her in realizing achievement. She applied herself in class and attended tutoring sessions to achieve success. According to Dweck (2010), Ada's success is an example of one who fostered growth mind-set by attributing her ultimate success to effort.

Phaedrus did not attribute his lack of preparedness to external forces. Phaedrus had made a conscious decision not to participant stemming from what he said had to do

with cultural issues. This differentiation, I believe was due to the decade in which he attended school when the social identity of people of color was going through transitions.

Behaviors.

This consists of both task-approach and task-avoidance behaviors. Task-avoidance involves finding reasons not to attempt to perform a task.

Task-approach Behaviors.

Students using learning strategies to understand the concepts and/or checking the reasonableness of answers is an example of task-approach behaviors. Ruth liked checking the reasonableness of her answers to problems. There was a sense of enjoyment in Ruth "checking her work to see if it was correct by working backwards."

Whereas, in middle school, Martha would look in a book for an example, or ask the teacher for assistance when faced with difficult problems. In high school, Martha's strategies for solving difficult problems were to go through the steps, compare her process or answer to another student's process or answer, or ask the teacher.

Task-avoidance Behaviors.

Phaedrus attributed his avoidance of mathematics to a middle school experience which caused him to be discouraged and disheartened. Mathematics was seen as a subject that Jeremiah as well as his classmates did not particularly enjoy; so, it was something that they had to do. The sentiment was: "so let's get it done."

Likewise, Electa liked to do work without any rigor so that she could just be done. She exclaimed that as a child she did not want to apply herself to the demands of the rigor in mathematics. This attitude was related to participants adopting maladaptive

performance-avoidance behaviors such as a “notion of passing”, “nonchalant approach”, and “get on track”.

- Notion of passing: Doing well enough to pass a class or passing a class to meet someone else's demand for you.
- Nonchalant approach: Not caring about performance or consequences of one's action as a result of not performing to one’s potential.
- Get on track: Adjust behavior/effort to obtain desired results/grade.

Perception of Self

This category is comprised of sense of self, self-concept of ability and growing up. These components will be discussed in the following paragraphs.

Sense of Self / Self-concept.

Sense of self refers to a high regard of one’s self while self-concepts alludes to an individual’s ability in mathematics which can be erroneous. Initially, Ruth’s sense of self and her self-concept in mathematics were good, however her self-concept in mathematics diminished after taking a college placement test for mathematics. Ruth expressed disappointment in having to take remedial mathematics. “I thought I was good in math until I took the test and then I was in remedial math, at first.”

Regarding her self-concept of mathematics during high school, Ruth provided the following, “I don't know if I was any more advanced or if you were to compare me to anybody else in the school...I was just advanced in the environment that I was in.”

Like Ruth, Esther had a high sense of self and self-concept in mathematics. Esther was the salutatorian of her eighth-grade class and an honors’ student. Esther reported that she did well on the OGT, graduated with a 4.01 GPA from high school and scored a 26

on the ACT exam. In college, Esther was placed in a special program that consisted of a review of algebra and some trigonometry. Esther was not in agreement with the placement and successfully tested out of the program for college credit (CLEP: College Level Equivalency Program). Esther exclaimed that mathematics was easy! "Math was like one of the easiest subjects to me… In elementary school, I loved math, Multiplication, Algebra. Now, not so much."

Similarly, Martha had a very good sense of self and a good self-concept in mathematics even though mathematics was not her favorite subject. Martha was a very serious honor/merit roll student who always followed the rules thereby not causing any trouble. Martha said: "Well, English was actually my favorite subject. Math, I was pretty good at it." Martha wished that more time were spent on mathematics during her fifth and sixth grade years. Even prior to those years, Martha explained that there was not a lot of focus on mathematics. Her seriousness about school is evidenced in electing to attend tutoring for enrichment purposes, not out of necessity. Martha's high sense of self and self-concept of ability in mathematics continued throughout her phases of education. She was concerned about keeping up in middle school because of the increased expectations. Martha said: "more was expected of me than what I had been used to … I needed to keep up. I didn't want to be left behind."

Additionally, Ada had a high sense of self as a student and a good self-concept in mathematics. Ada considered her school experiences as normal although she was enrolled in some accelerated courses. Ada described herself as quiet and able to follow directions when given the first time. Although, Ada did not consider mathematics her favorite subject, she said she "could get it done and move on without struggling." Ada's sense of

self as a student and self-concept in mathematics diminished when placed in remedial mathematics in college. “It made me feel really bad because it was only time in my life that I felt stupid.”

Moreover, Electa’s self-concept in mathematics was faltering in elementary school but she had a good sense of self as a student. Electa said that she “considered herself to be a good student.”

Like Electa, Phaedrus initially experienced some challenges to his self-concept of mathematics while in elementary school. Later, while in middle school, he was nonchalant while demonstrating sub-par performance. Phaedrus was not very concerned about grades because he would always be able to pull the grades up. He provided the following:

> I didn’t feel nothing. Some kind or another I just took it all like it was nothing you know. I didn’t know what was wrong with me – if there was anything wrong with me. Whatever I got the “F” or “D” in, I always managed to pull it up to a “B” or an “A” the next marking period.

Also, Jeremiah had a pretty good sense of self as a student and he would achieve good grades. He always performed well in mathematics even though he did not particularly enjoy mathematics. Jeremiah described himself as an average student who did well in all subjects including mathematics. He stated, “I was a pretty decent student. And then, I can’t recall ever falling behind in math or any of my subjects as I was a pretty good student.”

Greater Responsibility (Growing-up).

Both, middle school and high school, were a juncture in age and responsibility. Jeremiah indicated the transition to middle school was said to invoke the following: “It

kind of made me feel like an older student, a student that now has more of a responsibility, you know." Moreover, the transition to high school was similar to that of the middle school. Additionally, Jeremiah felt that he was growing up and that the transitions were good.

Others

Peers and parents including the expectations of parents and parental involvement are discussed in this section.

Peers.

This addresses how one interacts with and/or the perceptions one has of their peers. Esther categorized students into three groups. She said:

> "Some were like smart and actually wanted to do right; those who would go to classes half the time; and then others, who just wanted to hang out in the hallways and not go to class or hang out outside."

Esther added that the hardest part of school was not the academics but making friends. "I guess the more challenging part was not really the academic work but more like social stuff. Making friends but that was like the hardest part to me."

Additionally, Esther's transition from middle school to high school required her to interact with other grade levels and others who were not a part of her first through eighth grade cohort. This required Esther to interact with others outside of her usual cohort. Moreover, Esther having to stay in classes longer because of block scheduling in high school versus period scheduling in middle school could be significant, not in the statistical sense, to her dislike for high school. Esther indicated, "We had to stay in there for an hour and a half and that was a long time to stay in one class."

Overall, Esther did not like high school due to the younger students. She shared the following, “I did not like high school. It was, like I guess, the younger generation – they just got on my nerves so much that I did not want to be there.”

Whereas, Martha described her peers as follows: “take school very seriously and, some were described as smart while others took a little longer to catch on.” Martha’s “notion of being smart” was “being able to complete a lesson pretty much on your own without confusion or help.” In middle school, Martha began to see students maturing into two different directions (got into other things or actually cared more about school). In high school, Martha noticed there was more intensity on both ends of the spectrum where some students “started to care less” and others were “serious and cared about their grades.”

Additionally, Jeremiah categorized the formation of groups in middle school as an achievement group and a cool group. Moreover, in high school, Jeremiah stated that the groups became more profound. “It was even more profound.” What is even more profound is, in high school, Phaedrus not only thought certain students to be “cool”, but also thought a certain teacher to be “cool” and if you were in the “cool” teacher’s class then you were considered to be “cool”.

Parents.

The expectations of parents and parental involvement are discussed in this section.

Parental Involvement.

Included is any mention of the parents’ concern and active involvement in the participant’s education and their well-being. Ada received extrinsic rewards from her

parents, such as money, for obtaining good grades. Her receipt of money was complemented by her father's teachings about budgeting. Whereas, in elementary, Electa's parents helped her with mathematics problems. In middle school and afterwards, the level of involvement changed because her parents expected her to be more responsible for her learning.

> "They were working, so it was up to us to do it. So, just handle it. And, don't tell you how, not willing to assist you. They didn't give you any tools on how to study, or anything like that."

Moreover, Phaedrus' mother helped him to cope with learning how to solve subtraction problems. In the case of Jeremiah, his parents stressed the importance in learning mathematics and they were a major factor in his choice of Sociology as a major in college. Jeremiah's parents stressed, "Math is so very important and you need to know math as you progress in life."

Expectations of Parents.

This alludes to a parent's wish for their child's performance or achievement level. Electa's parents had an expectation that she was going to college. She stated, "I did what I had to do and I knew I couldn't fail; … C was the limit. So, I think that it was the expectation. It's like if they expected me to get A's and B's, I would have."

Preparedness

Preparedness relates to everyday life skills and activities outside of school.in applying mathematics. Examples would include using mathematics outside of school such as spending money, budgeting and entrepreneurship. Mathematics outside of school, study habits and study skills are discussed in the following paragraphs.

Mathematics Outside of School.

These are activities outside the borders of school that are related to mathematics. Electa used mathematics outside of school for homework, shopping and fundraising activities. Whereas, Jeremiah felt that he really had to be on top of his mathematics skills for making purchases, catching the bus, and working at summer jobs. “A major emphasis in learning mathematics outside of the classroom was in knowing how to operate with money.” Phaedrus used mathematics in his entrepreneurial endeavors, budgeting, and traveling while in high school.

Study Habits/Skills.

These are strategies that are practiced to assist oneself in preparing to acquire knowledge and/or understanding. In middle school and in college, Electa’s approach to preparing for a test was to cram. “When I knew there was a test, I would cram the night before and then, hope for the best.”

Outcomes

Outcomes are consequences resulting from the choices that one makes. In the context of this study, outcomes refer to academic outcomes. Eccles list three academic outcomes as performance, persistence and achievement. There where cases in this current study where achievement and performance were realized. However, persistence was an emerging theme in this study. Although only one participant expressed regret, it represents a consequence of their choice to not take advantage of the opportunities at hand. Persistence and regret are discussed in the following paragraphs.

Persistence.

This current study reflects the notion of "persistence" as defined by Eccles (2011) as the learner's decision to continue and complete tasks that are seemingly challenging and/or difficult. Persistence was illustrated when participants (Esther and Electa) successfully passed a high level mathematics course (calculus) after initially failing the class.

Similarly, in a study examining the perceptions of African American students' perception of their mathematics education, mathematics knowledge and their interaction with peers, persistence was a theme that emerged (Powell-Mikels & Berry, 2007). Also, persistence was evidenced in the Powell-Mikels and Berry study by the participants passing Calculus classes after initially failing the classes.

Another example of persistence is that of Esther having difficulty performing operations and solving problems with logarithms. Eventually, she used Excel to help her in solving logarithm problems. She said, "But, I made it through." Moreover, persistence was evidenced through Phaedrus' encounters with learning to perform subtraction while in elementary school.

Regret.

Phaedrus expressed regret that he had stopped learning mathematics and did not approach it with enthusiasm. He avoided taking mathematics classes hinging from an experience in mathematics while in middle school. This was illuminated when Phaedrus had to take the ACT and SAT college entrance examinations. He said,

> You know you have to take the SAT, ACT … that's when I began to regret I hadn't learned, you know, the method and stuff. …I regret not going to learn the trigonometry, now.

The aforementioned summative experiences included emerging themes from the individual interviews and focused on each theme across the participants. The next chapter, chapter six, provides a summary of the study and a discussion.

CHAPTER VI

SUMMARY AND DISCUSSION

This chapter provides a brief summary of the study and a discussion divided into five major sections. The first section of the discussion includes a conceptual model that provides a way of thinking about the experiences of the participants. The second section of the discussion addresses how the experiences of the participants may have played a role in the participants continuing their mathematics education. The third section of the discussion uses Eccles' Model of Academic Choice (MAC) as a theoretical framework to help understand the experiences of the participants concerning their mathematics education. The chapter concludes with a discussion of the limitations of the study and recommendations for future research.

Summary

A basic interpretive qualitative study was used to examine the lived experiences of seven African American urban high school graduates concerning their K-12 mathematics education through the transcription of semi-structured interviews. This study was developed to understand the mathematics experiences of the participants rather than prove some hypothesis or to evaluate some program for policy concerns. Therefore, a basic interpretive approach was best suited for this study.

The expectancy-value theory as espoused by Eccles' Model of Academic Choice (Eccles et. al., 1983; Eccles, 2010; Eccles & Wigfield, 2002) was a central focus of the literature review with other relevant literature regarding the exploration of African American experiences in mathematics education. Some researchers have called for further qualitative investigations regarding the educational outcomes of African Americans in STEM-related courses of study (Ali et al, 2011; Foster, 2005; Snipes & Snipes, 2005).

The qualitative nature of this study, although not generalizable to others outside of the particular participants, can illuminate the choices of students regarding their mathematics education as they reflect upon their respective experiences in mathematics education. As such, it offers transferability as readers might consider the implications of this study to their particular settings.

The seven participants of this study shared their experiences in mathematics education through semi-structured interviews. Five of the seven participants completed both interviews, K-12 interview and a post-secondary interview. Two participants did not respond to a request for the post-secondary interview. The participants had varying educational backgrounds from a 1st-year undergraduate student to a doctoral student. The ages of the participants spanned 45-years. Additionally, employment status varied from unemployed to employed with one being semi-retired. As such, some participants were currently not attending school, while others were either part-time or full-time students. Occupations consisted of teachers (3) and social workers (2).

Although, the variations of the participants were not intentional in the design of the study, variations are desirable to help in achieving maximum variation in the

participants of a study (Creswell, 2007). Maximum variation in the participants "increases the likelihood that the findings will reflect differences or different perspectives – an ideal in qualitative research" (Creswell, 2007, p. 126). All participants were African American and graduates from a high school located in an urban school district having similar characteristics in keeping within the scope of the research questions. Additionally, all participants had successfully completed a high school mathematics course equivalent to Algebra 2/Trigonometry or higher and were attending or had attended the same university located in an urban setting.

Data were collected through semi-structured interviews that explored the participants' kindergarten through post-secondary mathematics experiences. Vignettes chronicled and highlighted each of the participants' mathematics experiences from elementary, middle, high and through post-secondary schooling as available. Also, analyses of emerging themes from within and across vignettes were conducted and presented. Major themes emerging from the study were tediousness, student engagement, educational trajectory, reality check, persistence, classroom environment, feelings, behaviors, expectations, attributions, and sense of self/self-concept.

The following discussion answers the first research question of the study.

Research Question 1

What were the K-12 experiences of successful African American urban public high school graduates concerning mathematics?

The perception of various tasks is an on-going analysis that influences one's engagement in the task and the value attached to the task. These tasks are an integral part of the participants' experience along their educational trajectories. Educational

trajectories are representative of the participants' experiences and milestones. Accordingly, the trajectories can be thought of as opportunities to learn at certain junctures in the participant's educational journey. This is reflective of the teaching and learning exchanges in the delivery of curricula. As such, these experiences can either enhance or inhibit the progress along the participant's educational trajectory through elements of student engagement.

Figure 2 on page 131 incorporates the major findings of this study as discussed in Chapter 5 and highlights them in a general process flow. Further, the diagram synthesizes the major connected findings to provide a single interpretation that enhances the ideas presented by the individual interviews (Creswell, 2007). Following is a discussion regarding the key themes and related experiences.

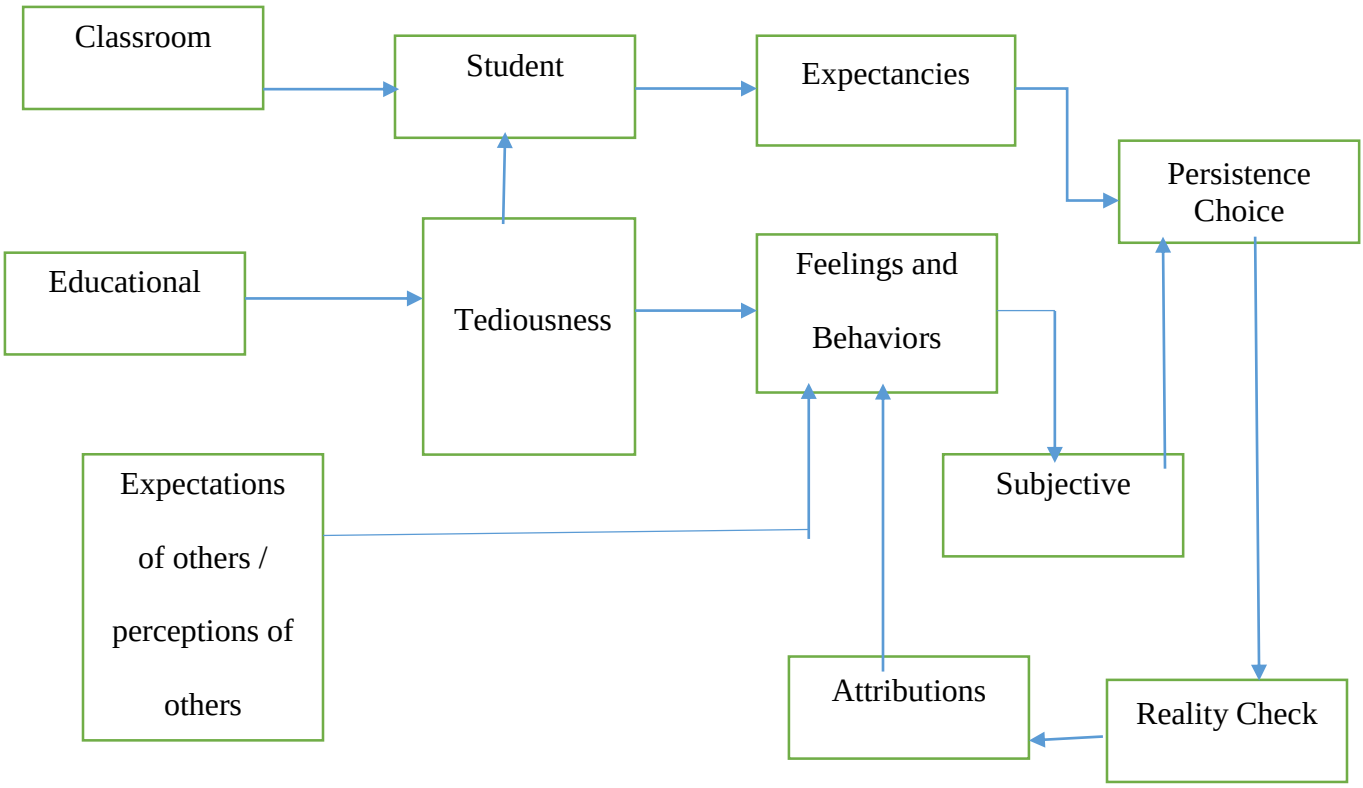
Educational Trajectory

As previously stated, educational trajectory encompasses aspects of opportunities to learn or missed opportunities to learn. Ruth's trajectory was at times influenced by conditions in the system such as mathematics instruction not having a level of rigor to her satisfaction. Another trajectory can be seen influenced by student choice. In this later case, Phaedrus chose not to attend a private school and his preference to the "cool class" with the "cool teacher" instead of continuing in the college-bound track. This decision was categorized as a hindrance (missed opportunity). Additionally, there is an aspect of resource inequality where Phaedrus does not have the option to attend a school in his neighborhood that is challenging and resourceful as the private school.

Tediousness

Tediousness is representative of participants' perception about certain aspects (tasks) of mathematics requiring too much effort and/or time consuming. Tediousness was connected to feelings of aggravation, stress, boredom, and frustration. Consequently, attitudes of some participants were nonchalant, followed by a sense of urgency to make the grade because of parents' expectations. Tediousness confirmed the cost construct of Eccles' MAC which signifies the amount of effort needed to achieve a goal or to be successful at a task.

Figure 2. Major Connected Findings



Tediousness, in this case, was task specific and not necessarily domain specific. The behaviors related to tediousness were influenced by the expectations of others and

the perception that the participants had regarding the extent their parents were involved in the participants' education.

The concepts of individual tasks and domain specific tasks can be theoretically distinguishable but they are indistinguishable in practice because they are very highly related (Eccles & Wigfield, 2002). As such, tediousness reflects a perception of task demand/difficulty that relates to one's feelings and behaviors. In this sense, one's perceptions influence one's feelings and behaviors. Feelings and behaviors of the participants are discussed in the following section.

Feelings/Behaviors

Task-avoidance strategies lead to maladaptive outcomes whereas task-approach strategies lead to some positive adaptive outcomes, and when combined with mastery goals, it optimizes motivation (Harackiewicz et al., 2002). The sentiment of some participants fostered an attitude that was boring. This attitude was related to participants adopting maladaptive performance-avoidance behaviors such as a notion of passing, nonchalant approach, get on track and task-avoidance. These behaviors were influenced by the expectations of others and the participant's perception of the extent others are involved in the participant's immediate or future goals.

Conversely, those participants not harboring the aforementioned attitudes are more likely to adopt performance-approach behaviors to realize positive adaptive outcomes. Esther persevering to solve problems involving logarithms is an example of a task-approach behavior. The behaviors were related to the perceptions of the task demand/difficulty and influenced by the expectations of others as well as the perceptions of participants

Eccles' affective memories and reactions components were confirmed through the frustration, aggravation, stress, boredom, and enjoyment experienced by the participants of this study. Moreover, feelings and behaviors were connected to attributions and the subjective task value of participants. The subjective task value is connected to the affective reactions of the learner and then the worth or value (positive or negative) assigned to the task determines why one may choose or choose not to engage in the task. The decision that the learner makes can be directed with creative strategies employed by the teacher.

Expectations of Others/Perception of Others

The expectations of others are instrumental in influencing the learner's self-concept of ability and perceptions of task difficulty (Eccles & Wigfield, 2002). Others include peers, teachers, and siblings as well as parents. Expectations of others and perception of others influenced the behavior(s) of participants. An expectation is "a belief that someone will or should achieve something." This includes setting a bar for performance, behavior or achievement for someone else.

Expectations of Others.

Expectations of Electa's parents were a grade of not less than a "C" and that she attends college. Electa acknowledged that if the expectations were greater then she would have met those expectations. The expectation of obtaining a "C" could have negatively affected her self-concept of ability and perceptions of task difficulty.

Electa's parents' expectations for Electa regulated her 'notion of passing' in this study. Her parents' expectations were a grade of not less than a "C" and that she attends

college. Electa acknowledged that if the expectations were greater then she would have met those expectations.

Perception of others.

Electa's perception of her parents' involvement was that they were not willing to help her in studying to achieve good grades. Electa's parents lack of assistance might have influenced her to adopt the attitude of just passing. Her perception of parents not willing to assist could be attributed to the parents' assistance in her primary years of education and later diminishing as she grew older and expected take on more responsibility. The parents could have a lack of understanding the importance of mathematics as a gateway to post-secondary or college success.

These perceptions help to form the learner's goals that interact with the learner's task specific beliefs to influence the learner's perception of task value (Eccles et al., 1985).

Classroom Environment

The environmental conditions of classrooms must be both safe and conducive to learning. The classroom environment is of importance because it is where the educational exchange typically takes place. In this study, some participants experienced classrooms that were at times chaotic as well as the overall school environment being hostile due to rival gangs. Others experienced overcrowded classrooms which negatively affected the learning environment. Additionally, off-task classroom behaviors such as sleeping in class were reported.

Learners are not always going to be intrinsically motivated so the classroom environment including classroom management must be considered in the planning of

instruction to help support motivation (Ali et al., 2011). Moreover, the classroom environment is directly related to student engagement. As such, student-teacher relationships are important because the teacher delivers the intended curriculum to the students.

Student Engagement

Student engagement directly impacts one's expectancies (beliefs about how one will perform on upcoming tasks) because student engagement encompasses the methods of instruction delivery. Student engagement was comprised of themes such as teacher content knowledge and teaching methods used in the educational trajectories of the participants. Moreover, individual considerations such as learning styles and perception of task difficulty were included to address the dynamics of the exchange between the participants and their educational trajectories.

The skill and effectiveness of the teacher is of most important because the teacher must be skilled in implementing effective strategies in the delivery of instruction. Effective engagement of students helps to eliminate students sleeping in a classroom as reported by Esther. Students sleeping in class was an indictment of teaching that lacked student engagement. This is representative of a task-avoidance behavior that could have been connected to tediousness.

Additionally, accountability (high-stakes) testing may play a role in a lack of student engagement in mathematics instruction. Esther advocated for educators to focus more on teaching mathematical concepts for understanding versus teaching to the test to improve the mathematics educational outcomes of African American students. Her advocacy supported prior research findings where students believed that instruction and

instructional content promoted materials on the test while narrowing other aspects of learning (Lattimore, 2005). The narrowing of the coverage of material may be attributed to the weight of the test toward teacher evaluations and school district graduation rates that may have an adverse effect reflected on the District's State Report Card.

Researchers have suggested adjustments or interventions in the context of the learners' home or community (Irvine, 1991) and Culturally Relevant Pedagogy (Ladson-Billings, 1995) as strategies for engagement and to improve the educational outcomes of African American students.

Additionally, Campbell (2003) suggested that motivation is culturally influenced and any attempt to encourage academic effort should incorporate culture. Incorporating culture may make a difference in how students might experience mathematics and their choice to pursue a mathematics education and/or mathematics-related careers. Implementing these strategies will require some creativity of the teacher and has further implications for teacher education programs.

An example of a creative pedagogy approach is the Algebra Project. The Algebra Project uses experiential learning that is culturally relevant in the construction of the learner's knowledge (Moses & Cobb, 2001). The Algebra Project and its proponents assert that learning algebra is a civil right and that all should have access to a college preparatory curriculum to effect social change/justice especially in this technologically rich world (Moses & Cobb, 2001). I see this approach as one that would also build positive student/teacher relationships in meeting the students where they are in using life's activities to help conceptualize mathematics and its applications.

Student/Teacher Relationships.

Brand et. al. (2006) found that a student's level of academic performance is influenced by the student's relationship with their teacher. In this current study, Martha's experience confirmed this finding while Ada's experience refuted this notion. Liking the mathematics teacher played a part in Martha liking the mathematics class and an increase in her paying attention. In contrast, Electa shared that she liked her mathematics teacher and she thought he was cool but it did not help her in paying attention.

Martha's experience supports prior research that concluded that positive student-teacher relationships have a positive effect on the effort and learning outcomes of the student. On the other hand, although Electa liked her teacher, she still was not engaged in her mathematics class and did just enough to satisfy the expectations of her parents. Positive teacher-student relationships help to set the stage for student engagement.

Teaching Methods.

Learning mathematics was fun when manipulatives were used as a strategy. Other instructional strategies experienced were homework, note-taking, and scaffolding. For example, Ruth was able to understand the mathematics concepts with a teacher skilled at scaffolding.

Instructional practices such as worksheets, computer-aided tutorials, and puzzles were deemed ineffective by some participants. In some cases, there were no lessons, crossword puzzles assigned for homework and word searches for classwork credit.

Perception of Task Demands/Difficulty

Perception of task demands/difficulty is representative of participants' thoughts about performing mathematics and mathematics-related tasks such as tediousness. These

thoughts are connected to feelings that consequently provoke a response or reaction regarding the generated thoughts.

The perception of tasks is an on-going analysis that influences one's engagement in the task and the subjective value attached to the task. Therefore, tasks are an integral part of the participants' experience along their educational trajectories.

The perception of task difficulty can be influenced by one's self-concept of ability and the teacher's consideration of an individual's preferred learning style. A careful consideration of an individual's preferred learning style in the designing of tasks or activities can improve the learner's confidence, engagement and achievement.

Self-Concept of Ability

In this current study, the participants' self-concept of ability and perceptions of task difficulty were influenced by past experiences, expectations of others, and an interaction of the participant's goals. Self-concept of ability refers to how a person thinks about his/her abilities to perform a task (Eccles & Wigfield, 2002).

Subjective Task Values

The four aspects of subjective task value are cost, intrinsic, attainment, and utility.

Cost.

Cost is the negative aspects of not doing something. Phaedrus' choice not to attend Private School resulted in a loss of opportunities. Eccles and Wigfield (2002) conceptualized loss of opportunities resulting from making one choice rather than another as cost. Phaedrus shared that he did not relish the thought of making new friends as a reason for not attending a private school. His decision not to attend a private school confirms Ladson-Billings (1995) finding that in many cases African American students'

academic success comes at the expense of their cultural and psychological well-being such as loss of friends and loss of connection to a social identity.

Furthermore, Phaedrus felt that "they were trying to indoctrinate him into a system that he did not particularly agree with". This could be connected to a lack of critical mass of students of color in high level mathematics classrooms as participants were being recruited for this current study. Also, White (2001) indicated students were not willing to trade away their culture by conforming to public schooling.

Tediousness is an aspect of cost that reflects the amount of effort needed to be successful at a task or achieving a goal (Eccles & Wigfield, 2002). Both the affective memories and affective behaviors of the participants shaped their subjective task value of cost that participants attached to performing long division and word or thought mathematics problems. Also, Electa choosing to party and cram rather than plan a reasonable regiment for test preparation unknowingly exemplified cost and the unintended consequences.

Intrinsic.

In this study, an example of intrinsic value was seen over time as evidenced by Electa growing to like mathematics and teaching mathematics after graduating from college. However, intrinsic value was largely absent from the participants of the study. In fact, a majority of the participants indicated that mathematics was not their favorite subject during their interviews. In the context of Eccles' MAC (Eccles & Wigfield, 2002), intrinsic value is the notion that one values a task because it is enjoyable and engaging.

Attainment.

In this study, an example of attainment value was evidenced in Electa admitting that she wasn't interested in or engaged in school but wanted to do well. Eccles and Wigfield (2002) defined attainment value as "the personal importance of doing well on a task" (p. 119). Additionally, it is posited that attainment value is "linked to the relevance of engaging in a task for confirming or disconfirming salient aspects of one's self-schema" (p. 119).

Utility.

Utility value "refers to the practical significance of a task and how it can be instrumental in fulfilling other pursuits" (Durik, 2006). Electa experienced a college-prep curriculum in high school that required her to take a progression of certain mathematics courses whether or not she thought she would use it in a career. This is an example of utility even though Electa was not interested in learning mathematics she took the necessary courses to prepare her for college-level mathematics courses upon her entrance into college. Eccles and Wigfield asserted (2002) that a task can have positive value to a person even though he or she is not interested in the task to facilitate reaching important future goals.

Expectancies

In Phaedrus and Jeremiah's narrative, we see connections to Eccles' concept of expectancies as the level of confidence that one will be successful now or in the future (Eccles & Wigfield, 2002). Phaedrus and Jeremiah exhibited expectancies of not aspiring to have a career related to mathematics.

This study confirms the definitions expounded by Eccles. Expectancies (beliefs about how one will perform on upcoming tasks) are influenced by the student's engagement because engagement encompasses the method(s) of instruction delivery to effect learning outcomes, such as persistence.

Persistence

This current study reflects the notion of persistence as defined by Eccles (2011) as the learner's decision to continue and complete tasks that are seemingly challenging and/or difficult.

Reality Check

Reality Check represents feedback resulting from a learning outcome. The feedback is assigned some type of attribution (positive or negative) before it is evaluated for further action. Reality check is synonymous to past events and related experiences construct of the MAC (Eccles et al., 1985).

Attributions

Attributions align with Eccles' construct of participant's interpretation of past events. The following is a summary of the experiences of African American urban public high school graduates as reported in this current study.

In summary, all participants attended a school located in a school district having similar characteristics. As such, the school districts (educational system) set forth a curriculum for students to learn as well as requirements for high school graduation. The delivering of the curriculum and the goal of graduating from high school can be represented by the educational trajectories. In the elementary years, cultural capital helped Ruth to navigate the curriculum. Ruth experienced PSEOP as an alternative to

ineffective instruction and Esther was enrolled in a gifted/honors program during her K-12 mathematics experience. Other trajectories experienced by the participants were advanced placement courses, college-bound programs, career and technical education and high-ability track as well as general education programs.

The curriculum design must be such that students are prepared to take and pass the required standardized tests for the appropriate grade level. All participants that were required to pass a test for high school graduation were successful. However, Martha alluded to some of her experience in mathematics as being taught to the graduation test. Student miss out on developing a love for learning and critical thinking skills when the teaching is limited to passing a test. Also, recall and focus may not be at its best because of performance anxiety.

Additionally, in the delivery of the curriculum, one would expect adequate resources to be available for effective instruction. In this study, some participants experienced inadequate resources both in material and in personnel. There were cases of not having textbooks and of having a substitute teacher for almost an entire school year. This is especially difficult in schools that are under-resourced because it can breed feelings of inferiority, and that the society does not care, and negatively impacts ones' desire to participate. An argument that separate but equal does not work.

Furthermore, inside of the classroom at the school is where the curriculum is delivered. As such, both are required to be safe and conducive to learning. Ada and Ruth reported chaotic conditions in the school in general and in the classroom. Implications are lack of concentration and focus because of distractions and safety is a consumed priority instead of learning. A more inviting atmosphere would allow one to better embrace

learning.

Throughout the participants' educational trajectories, multi-step problems were at times perceived as challenging and likened to learning a foreign language as well as being tedious. These perceived levels of difficulty presented opportunities for teachers to engage the students through positive student/teacher relationships as well as teaching methods such as scaffolding, chunking and aligning the lesson to the respective learning styles to affect some positive learning experiences. Some learning experiences led to participants being persistent while others led to regret.

Some participants having to take remedial mathematics courses while in college felt betrayed by their K-12 experiences in mathematics. This reality-check of college readiness prompted a participant to attribute their plight to racism and urban education. Ultimately, their persistence led them to graduation from college.

The following section discusses how the experiences of the participants may have played a role in the participants continuing their mathematics education.

Research Question 2

How might these experiences play a role in students' choice to further their mathematics education?

Reality Check (College Readiness) – Attributions – Affective Memories/Reactions

If an objective of K-12 schooling is to prepare all students to fully participate in college level classes, then there is more work to be done according to this study. In this study, students required to take remedial mathematics in college felt betrayed because they thought they were adequately prepared for college level mathematics only to find out otherwise.

The failure of K-12 experiences to prepare students to be college ready could be related to structural issues such as overcrowded classrooms and accountability measures for principals, teachers, and students. Students can be successful by applying themselves and taking advantage of tutorial services offered at college. Ada is an example of this case. Ada, at the time of the study, was enrolled in graduate school to obtain a principal's license.

Educational Trajectory (Alternative Options) - Student Engagement

The No Child Left Behind (NCLB) Act of 2001 required teachers to be knowledgeable and skillful in classroom management skills, competent in content knowledge as well as effective teaching strategies so that all students can meet their maximum potential in the least restricted environment.

Effective instructional strategies are necessary for moving all students towards positive academic outcomes. Ineffective teaching practices (crossword puzzles and Sudoku) could lead students to seek outside alternatives such as the Post-Secondary Enrollment Options Program (PSEOP) to fulfill the students' goals and their desire to learn.

The failure of these experiences to meet the needs of students could be related to structural issues such as overcrowded classroom, accountability measures for principals, teachers, and students. These needs could be met through alternatives such as dual enrollment and PSEOP. Ruth is an example of this case. Through PSEOP, Ruth's needs were met. At the time of this current study, Ruth was enrolled in graduate school pursuing a degree in social work.

Moreover, missed opportunities to learn could be related to having substitute teachers for almost an entire school year in a prerequisite class for a more advanced mathematics class. This missed opportunity could be related to under-resourced schools and students not having access to highly qualified teachers in classrooms as required by the State. Esther is an example of this case. Calculus was found to be her most difficult subject in high school as well as college. At the time of the study, Esther was enrolled in college pursuing an undergraduate degree in environmental studies.

Classroom Environment (teacher-student relations) - Student Engagement

Research on teacher-student relationships suggests that liking the teacher leads to academic performance (Brand et. al., 2006). Although students may not like a particular mathematics topic, they may want to do well, and so, they pay greater attention in class because of liking the teacher. Martha's experience confirms that body of research. At the time of this current study under investigation, Martha was in her first year of undergraduate studies at the university.

In contrast, Electa's reactions refute or run contrary to the research regarding teacher-student relationships and student's academic performance. Electa indicated that she liked her mathematics teacher but was not engaged and did the bare necessity to pass the class in meeting the expectations of her parents. Electa's disengagement could be related to her propensity to talk. Electa viewed school as strictly social and did not give her best in academic studies. She liked to talk and was even given the honors in elementary school of being in talkers' row to be monitored more closely by the teacher.

At the time of this study, Electa was teaching developmental mathematics at a community college and also a doctoral student. She has found her voice and has had

positive experiences as a substitute teacher and a teacher of developmental mathematics at the college level. Over time she has developed an appreciation for mathematics and loves teaching mathematics.

Educational Trajectory (Missed Opportunity to Learn) - Subjective Task Value – Cost

Phaedrus' opting not to attend a private school because he did not want to leave his friends is an aspect of cost as defined by Eccles (2010). Earlier studies have found African American students' academic success comes at the expense of their cultural and psychological well-being, such as loss of friends, loss of connection to a social identity (Ladson-Billings, 1995). Fordham and Ogbu (1986) referred to this phenomenon, while being ostracized by peers, as "acting white". The notion of "acting white" through ridicule and being ostracized is a real phenomenon that points to the schools being separate but equal does not work and has not worked. Culture is important in the transmission of knowledge but whose culture is being valued or devalued at the expense of education. It is important to have schools that offer high rigor in neighborhoods where people of color reside to help students like Phaedrus not to have regrets.

Phaedrus' decision not to attend Private School was in opposition to his achievement. Phaedrus expressed regret for not taking the advantage of attending Private School. Irvine (1991) acknowledged that some characteristics and behaviors of African American students were sometimes in opposition to school and to their own achievement. This decision was categorized as a hindrance (missed opportunity) amongst educational trajectories.

Irvine (1991) asserted that no model of academic achievement should ignore the fact that certain behaviors and attitudes are viewed as negative and, as such, greatly deter African American students' achievement. Campbell (2003) suggested that any attempt to encourage academic effort should incorporate culture. Incorporating culture may make a difference in how students might experience mathematics and their choice to pursue a mathematics education and/or mathematics-related careers. Research Question 3 is discussed in the following section.

Research Question 3

How might using the Model of Academic Choice (MAC) as a theoretical framework help in understanding choices of successful African American urban public high school graduates concerning mathematics?

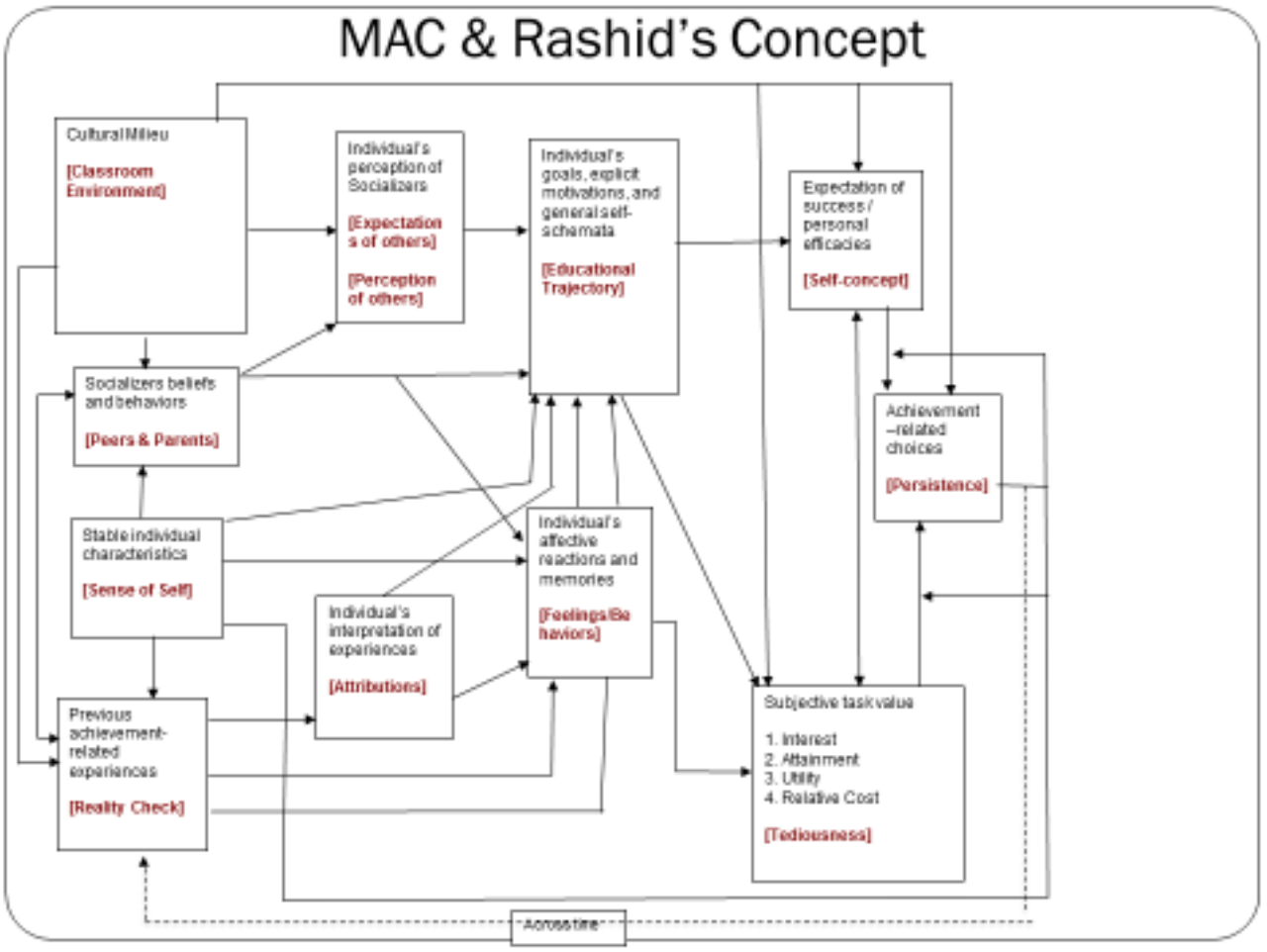
This section discusses how the MAC processes may help in understanding the choices of the participants and if the study findings confirmed, refuted, or complicated constructs of Eccles' MAC. The MAC proved to be a good theoretical framework for explaining the participants' experiences. Figure 3, MAC & Rashid's Process Blocks, is provided on page 148 as a reference to illustrate the parallel between the findings from this current study and Eccles' MAC.

Major connected themes emerging from this study were tediousness in learning mathematics concepts, student engagement in the classroom including the delivery of instruction, educational trajectory, reality check regarding the effectiveness of one's K-12 experience in preparation for college, persistence, classroom environmental conditions, feelings about learning mathematics, behaviors resulting from feelings about learning

mathematics, expectations of self and others, attributions of success and/or failure, one's sense of self as a student and one's self-concept of ability in mathematics.

These themes parallel with the MAC constructs of cost, participant's task specific beliefs, participant's goals and general self-schemata, past events and related experiences, persistence, cultural milieu, affective reactions and memories, expectancies, participant's interpretation of past events, and self-concept of ability, respectively.

Figure 3. MAC & Rashid Concept Blocks



Note: […] Represents Rashid's Conceptual Map parallel to the MAC.

Cultural Milieu (PB1)

In this study, classroom environment represents the cultural milieu process block of Eccles' MAC. The classroom environment can be a conduit where gender role stereotypes, cultural stereotypes of the subject matter, and occupational characteristics are introduced or reinforced. Additionally, the classroom influenced the participants' perceptions of the socializers' beliefs, expectations, attitudes, and behaviors. Moreover, the classroom influences the task demand. This corroborates this process block of MAC. Eccles included family demographics in this process block. In this current study, family demographics were not used as a factor for comparison nor as inclusionary or exclusionary criteria. This could be an area for further research.

Previous Achievement-Related Experiences (PB4)

Reality Check corresponds with this process block of MAC. Reality check is a participant's reflection of the effectiveness of their individual K-12 collective experiences in preparing the participant for post-secondary studies. Some participants reality check were confirmed as being college ready while others were not. Those who were not had to take remedial classes at the college. Yet still, at least one participant continued to avoid mathematics classes. This construct is a culmination of previous achievement-related experiences such as grades, standardized test scores, unique historical events, and other related experiences of the participant as defined by Eccles. The participant's interpretation of reality check is connected to the participant's affective reactions and memories.

Individual's Interpretations of Experience (PB6)

Attributions in this study correspond to this process block of MAC. MAC incorporated elements of attribution theory as a process that contributes to the academic behaviors of the participants. Ada attributed her reality check of remedial mathematics to racism and aspects of urban education.

Individual's Goals, Explicit Motivation, and General Self-Schemata (PB7)

Educational trajectory and sense of self / self-concept correspond to this process block of MAC. Educational trajectories are structural goals that are representative of the transmitted curriculum. These goals are essentally imposed on the participants. Due to structural issues, Ruth enrolled in a PSEOP class at a local university. Additionally, Phaedrus was not able to capitalize on a rigorous curriculum at his school that would be on par with that of the private school. Moreover, sense of self and self-concept of ability are both related to the curriculum regarding one's feeling of competence. This process of MAC is useful in explaining these aspects of the current study.

Socializer's Belief and Behaviors (PB2)

This process block relates to student/teacher relationships, peers, methods (e.g., effort-based grading) and parents in this current study. This process block of MAC aligns with the findings of the current study.

Individual's Perception of Others (PB5)

Expectations of others / perceptions of others in this study correspond to this process block of MAC. The participant's perception of tediousness or perceived level of difficulty (task demands) were influenced by interactions in and/or expectations of the

classroom. This process block of MAC is useful in explaining the experiences of this current study.

Individual's Affective Reactions and Memories (PB8)

Feelings and behaviors of this study correspond with this process block of MAC. Some feelings of this current study were frustration, aggravation and boredom when concerning the aspect of tediousness. Task-avoidance and task-approach behaviors were connected to these feelings.

Expectation of Success / Personal Efficacies (PB9)

Expectancies in this current study aligns with this process block of MAC.

Achievement-Related Choices and Performances (PB10)

Persistence in this current study aligns with this process block of MAC achievement-related outcomes. Some participants in this current study realized persistence in passing classes they had previously failed.

Subjective Task Value (PB11)

Tediousness is an example of the subjective task value of cost emerging from this study. In this current study, intrinsic value was not prevalent. Electa showed aspects of intrinsic value over time as she acquired more positive experiences in mathematics. Attainment value was not very evident in this current study. Utility was seen as cost not realized in some aspects of the current study. This process block of MAC is useful in explaining aspects of motivation in choice.

Participant's Task Specific Beliefs (PB5 and PB7)

Student engagement corresponds to task specific beliefs. Student engagement includes elements of teaching methods consisting of instructional strategies and practices

including student characteristics such as learning styles and the skill and effectiveness of the teacher in scaffolding, and motivating students. As such, tediousness can also be representative of task demands as well as cost. The combination of these two blocks in MAC confirmed task specific beliefs.

Stable Individual Characteristics (PB3)

This construct was not a focus of this current study. Although, the data suggest that the females had greater self-regulating learning strategies. Whereas the males where more concerned with the practical use of mathematics for making purchases and budgeting as a course in financial literacy.

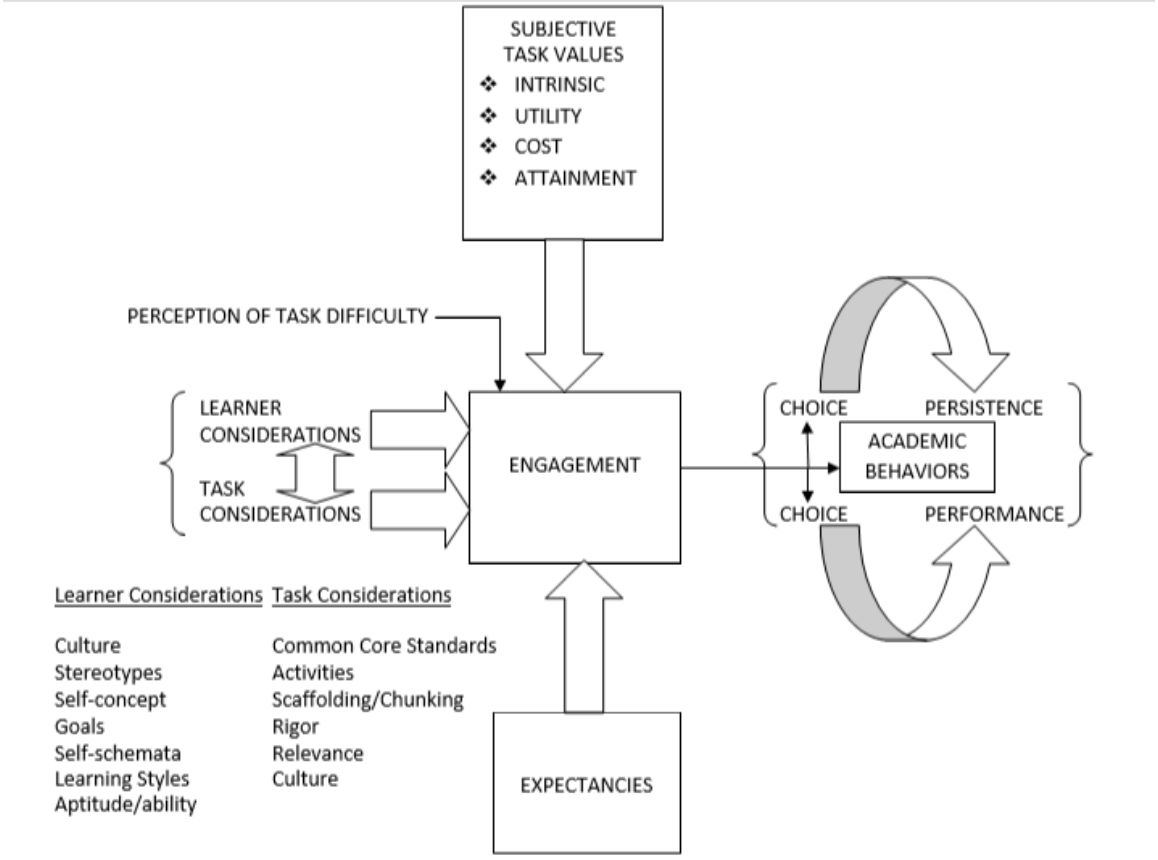
The previous discussion focused on constructs of the MAC and how they might be instrumental in explaining the mathematics experiences and choices of African American urban high school graduates within the context of high-poverty and low income neighborhoods. Additionally, the findings of this study were shown to parallel the constructs of the MAC. Ultimately, the MAC asserts that the academic choices/behaviors are predicated on the subjective task values of the learner for motivation and the expectancies of success as a matter of competence.

In this current study, Engagement, was a major emerging distinctive theme as the participants interacted with their environment. Figure 4 (see page 153) illustrates Engagement as a key concept in facilitating academic behavior and choice. In this diagram, an inventory of the learner and task considerations are important in engagement. This is where the knowledge, skills and creativity of the teacher are key in addition to the design of the curriculum for effective engagement. The perception of task difficulty is a regulator in the strength of the engagement. The subjective task values and the

expectancies of success are connected to student engagement to produce academic behavior and choice.

The remaining sections this paper will provide limitations of the study, recommendations for further research and concluding remarks.

Figure 4. Synthesis of Rashid/MAC.



Limitations of the Study

Limitations of the study are as follows and any interpretation of the results should consider these limitations. The family structure (1-parent vs. 2-parent household) was not included on the demographic intake sheet. The nurturing and support received by participants regarding educational pursuits may be related to the family structure. Also, the parents' occupation was not included on the demographic intake sheet. The parents' occupation might have influenced the participants' perspective about learning and, more specifically, learning mathematics. Additionally, a more targeted comparison involving a creation of categories by potential demographic factors such as gender was not performed. Moreover, this study is only representative of the participants herein and is not meant to be generalizable to any population outside of the participants.

Recommendations for Further Research

The following are recommendations for further research related to this study. One recommendation would be to investigate how initiating focused guidance counseling at the middle school might be instrumental in increasing the educational outcomes of African American students. This recommendation is based largely on some participants lack of awareness of options for college and career readiness. Phaedrus did not understand how mathematics played a part in the testing for admission into college. Initially, he was in a college preparatory curriculum and then he switched to a career and technical curriculum. Another recommendation would be an inquiry into Post-Secondary Educational Option Programs and student achievement. Ruth was challenged in her high school mathematics with the level of rigor she expected and desired. She satisfied her desire by enrolling in a PSEOP at a local college. Also, a recommendation for further

research would be an investigation of instructional strategies that would yield the highest academic results for classes of African American students with a wide range of varying abilities. Ada found herself ready to move on to the next level or assignment while others were struggling trying to finish the first assignment. She appeared to be highly focused but she was kind of unnoticed and not serviced to reach her full potential because of the varying degree of abilities in the classroom. Also, an investigation of socio-emotional learning strategies in relation to student achievement is recommended. Lastly, a longitudinal study on academic achievement by comparing the achievement of students taking Algebra 1 at an earlier grade level versus students taking Algebra 1 in the 8th grade or later is recommended for further research.

Conclusion

Rates of academic success for African Americans and other marginalized groups lag behind their Caucasian counterparts (Teel et. al, 1998). By the end of high school, African American and Latino students' mathematics and reading skills are, on average, about on par with those of white eighth-graders (Books, 2007). Over the past two decades this gap has more than doubled (Books, 2007).

This study reflects the voices of students thereby providing a rich insight into students' thoughts and beliefs as well as a means for educators and policy makers to continue a dialogue that will improve the educational outcomes of African Americans in mathematics education. Specific factors related to students' mathematics experiences offer insight into what hinders and what engages these students in relation to learning mathematics. Access to special curriculums such as gifted programs, educational alternatives such as PSEOP and cohorts enhanced the participants' educational

trajectories while long periods of substitute teachers and a curriculum that lacks rigor hindered the educational trajectories.

Additionally, the results of this study might be instrumental in career guidance and contribute to enhancing the instructional practices of teachers to improve students' learning outcomes in mathematics. Focused guidance counseling in middle school could help students to set goals that will connect to their future aspirations through high school and beyond. School districts must meet the students where they are regarding their everyday lives and put less emphasis on testing. Typically, the test does not reflect any part of the students' everyday lives. School district should focus on developing critical thinking skills and problem-solving strategies other than teaching to the test. State governments need to make policies that are culturally sensitive and consider those who are socially and economically disadvantaged.

Educators and policy makers alike should reflect upon their practices to improve the academic outcomes of African Americans in mathematics education. This research contributes additional lived experiences of African Americans to the bank of qualitative research to help in understanding factors that may promote or hinder the participation of African Americans in STEM-related courses.

REFERENCES

Aarts, H., Gollwitzer, P. M., & Hassin, R. R. (2004). *Journal of Personality and Social Psychology*, 87(1), 23–37.

Ali, R., Akhter, A., Shahzad, S., Sultana, N. and Ramzan, M. (2011). The impact of motivation on students' academic achievement in mathematics in problem based learning environment. *International Journal of Academic Research, 3(1)* 306-309.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Barry, N. H. (2007). Motivating the reluctant student. *American Music Teacher,* 56(5), 23 – 27.

Bembenutty, H. & Karabenick, A. (2004). Inherent Association Between Academic Delay of Gratification, Future Time Perspective, and Self-Regulated Learning. *Educational Psychological Review*, 16(1), 35 – 57.

Bembenutty, H. (2009). Academic Delay of Gratification, self-regulation of learning, gender differences and expectancy-value. *Personality and Individual Differences,* 46, 347 – 352.

Bong, M. (2001). Role of self-efficacy and task value in predicting college students' course performance and future enrollment intentions. *Contemporary Educational Psychology*, 26, 553 – 570.

Books, S. (2007). What are we talking about when we talk about "Closing the achievement gap"? *The International Journal of Learning,* 14(2), 11 – 17.

Brand, B. R., Glasson, G. E. & Green, A. M. (2006). Sociocultural factors influencing students' learning in science and mathematics: An analysis of the perspectives of African American students. *School Science and Mathematics, 106(5)* 228-236.

Campbell, S. (2003). Using expectancy theory to access group differences in student motivation: A replication in the Russian Far East. *Issues in Accounting Education,* 18 (2), 125 –136.

Catambis, S. (1994). The path to math: Gender and racial-ethic differences in mathematics participation from middle school to high school. *Sociology of Education*, 67(3), 199 – 215.

Creswell, J. W. (2007). Qualitative inquiry & research design: Choosing among five approaches. Thousand Oaks, CA: Sage Publications.

Day, T. & Tosey, P. (2011). Beyond SMART? A new framework for goal setting, *The Curriculum Journal*, 22(4), 515 – 534.

DeBruyn, R. (2008). Tapping the power of flow. *The master teacher, 40(12).*

Deci, E. L. (1995). *Why we do what we do: Understanding self-motivation.* New York: Penguin.

Denzin, N., & Lincoln, Y. (2000). Introduction: The discipline and practice of qualitative research. In N. Denzin & Y. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 1-28). Thousand Oaks, CA: Sage.

Dweck, C. S. (2010). Mind-sets and equitable education. *Principal Leadership*, 10(5), 26 – 29.

Durik, A. (2006). Task values and ability beliefs as predictors of high school literacy choices: A developmental analysis. *Journal of Educational Psychology*, 98(2), 382 – 393.

Eccles, J. S. (2011). Understanding educational and occupational choices. *Journal of Social Issues*, 67(3), 644 – 648.

Eccles, J. S. (2010). Gendered educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *International Journal of Behavioral Development,* 35 (3), 195 – 201.

Eccles, J. S. (2005). Chapter 2: Studying gender and ethnic differences in participation in Math, Physical Science, and Information Technology. *New directions for child and adolescent development,* 110, (pp. 7 – 14). Hoboken, NJ: Wiley Periodicals, Inc.

Eccles, J. S. & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*: 109 – 132.

Eccles, J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgeley, C. (1985). *Self-perceptions, task perceptions, socializing influences, and the decision to enroll in mathematics.* In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), Women and mathematics: Balancing the Equation (pp. 95 – 121). Hilladale, NJ: Lawrence Eribaum Associates.

Flora, K. (2010). Motivating factors influencing college students' choice of academic major, *American Journal of Pharmaceutical Education*, 74(3), Article 46.

Fordham, S., & Ogbu, J.U. (1986). Black students' school success: Coping with the burden of "acting white". *The Urban Review,* 18(3), 176-206.

Foster, H. (2005). Those already left behind: Low achieving high school mathematics students get active. Lloyd, G. M., Wilson, M., Wilkins, J. L. M., & Behm, S. L. (Eds.), *Proceedings of the 27th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education.*

Galletta, A. (2013). Mastering the semi-structured interview and beyond. NY: New York

University Press.

Grolnick, W. S., Ryan, R. M., & Deci, E. L. (1991). The inner resources for school performance: Motivational mediators of children's perceptions of their parents. *Journal of Educational Psychology*, 53, 508 – 517.

Halstead, J. M. and Taylor, M. J. (2000). *The development of values, attitudes and personal qualities: A review of recent research*. Slough: National Foundation for Educational Research.

Harackiewicz, J. M., Barron, K. E., Pintrich, P. R., Elliot, A. J. & Thrash, T. M. (2002). Revision of achievement goal theory: Necessary and illuminating. *Journal of Educational Psychology*, 94(3), 638 – 645.

Hardre, P. & Reeve, J. (2003). A motivational model of rural students' intentions to persist in versus drop out of high school. *Journal of Educational Psychology*, 95, 347 – 356.

Harper, S. R. (2006). Peer Support for African American male college achievement: Beyond internalized racism and the burdens of "Acting White". *The Journal of Men's Studies,* 14(3), 337 – 358.

Irvine, J. (1991). *Black students and school failure: policies practices, and prescriptions*. Westport, CT: Praeger Publishers.

Kaufman, A. & Dodge, T. (2009). Student perceptions and motivation in the classroom: Exploring relatedness and value. *Social Psychology of Education: An International Journal*, 12(1), 101-112.

Kunjufu, J. (1988). *To be popular or smart: The Black peer group.* Chicago: African American images.

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Research Journal*, 32, 465-491.

Lattimore, R. (2005). African American students' perceptions of their preparation for a high stakes mathematics test. *The Negro Educational Review*, 56(2)(3), 135 – 146.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Newbury Park, CA: Sage Publications.

Matusovich, H., Streveler, R., & Miller, R. (2010). Why do students choose Engineering? A qualitative, longitudinal investigating of students' motivational values. *Journal of Engineering Education*, 289 – 303.

Meece, J. L. & Eccles [Parsons], J. et al. (1982). Sex differences in math achievement: Toward a model of academic achievement. *Psychological Bulletin*, 91(2), 324 – 348.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation.* San Francisco: Jossey-Bass.

Metallidou, P. (2010). Children's self-regulated learning profile in language and mathematics: The role of task value beliefs. *Psychology in the Schools*, 47(8), 776 – 788.

Mitchell, A. (1998). African American teachers - Unique roles and universal lessons. *Education and Urban Society*, 31, 104-122.

Moje, E.B., & Martinez, M. (2007). The role of peers, families, and ethnic identity

enactments in educational persistence and achievement of Latino/a youth. In A. Fuligni (Ed.), *Social identities and educational participation.* (pp. 209 – 238). NY: Russell Sage Foundation.

Moody, V. (2004). Sociocultural orientations and the mathematical success of African American students. *The Journal of Educational Research,* 97(3), 135 – 146.

Moses, R. P. & Cobb, C. E. (2001) *Radical equations: Civil Rights from Mississippi to the Algebra Project,* MA: Beacon Press

Muhammad, S. (2003). *How to teach math to black students.* African American Images, Chicago, IL.

Ohio Department of Education (2007). *District Profile Report FY12.* Retrieved on November 3, 2013 from http://www.ode.state.oh.us/.

Powell-Mikle, A. & Berry, R. (2007). Chapter Eleven: Achieving Success. In Brown II, M. Christopher (Ed.), *Still not equal.* (pp. 167 – 175). New York, NY: Peter Lang Publishing, Inc.

Reeve, J. (2006). Teachers as facilitators: What autonomy- supportive teachers do and why their students benefit. *The Elementary School Journal, 106*(3), 225-236.

Reeve, J. (2002). Self-determination theory applied to educational settings. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research.* (pp. 183 – 203). Rochester, NY: The University of Rochester Press.

Saldana, J. (2009). *The coding manual for qualitative researchers.* SAGE Publishing, Inc., Thousand Oaks, CA.

Snipes & Snipes (2005). The Call: The Importance Research on African American Issues

in Mathematics and Science Education. *The Negro Educational Review*, 56(2)(3), 103 – 104.

Steele, C. M. & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology*, 69(5), 797 – 811.

Strayhorn, T. (2010). The role of schools, families, and psychological variables on math achievement of black high school students. *The high school journal*, 93(4), 177 – 194.

Teel, Debruin-Parecki & Covington (1998). Teaching strategies that honor and motivate inner city African-American students: A school/university collaboration. *Teaching and Teacher Education*, 14, 479-495.

Tseng, V. (2006). Unpacking immigration in youths' academic and occupational Pathways. *Child Development*, 77(5), 1434 – 1445.

White-Johnson, A. F. (2001). "Peas 'n rice" or "rice 'n peas" – Which one are we really ordering? The plight of African American male students engaged in educational exchange processes. *Urban Education*, 36(3), 343-373.

Wigfield, A. (1994). Expectancy-value theory of achievement: A developmental perspective. Educational Psychology Review, 6(1), 49 – 78.

APPENDICES

APPENDIX A

RECRUITMENT EMAIL

Hello,

My name is Lorenzo Rashid. I am a Doctoral Candidate at Cleveland State University in the College of Education and Human Services. I would greatly appreciate 10-15 minutes of your time to complete a survey. This survey will help me in identifying participants meeting the criteria for my dissertation. Please click on the following link for further information and for completing the survey. https://www.surveymonkey.com/s/x6h65d6

African American Urban Public High School Graduates' Experiences Concerning Mathematics Survey

Thank you for opening the survey link. My name is Lorenzo Rashid, a Doctoral Candidate at Cleveland State University, College of Education & Human Services.

Read more...

Thank you in advance for your assistance.

Lorenzo Rashid

Doctoral Candidate

College of Education & Human Services

Cleveland State University

APPENDIX B

RECRUITMENT FLYER

Help us learn more about African American students' experiences with mathematics learning!

- The purpose of the study is to better understand the experiences of African American urban public high school graduates concerning mathematics.
- 3-5 minutes of your time is needed to complete a survey to help in identifying and selecting possible participants for the study.
- If you are eligible to participate, we would then interview you for 60 minutes two times at a date/time convenient to you – at Cleveland State University or near our campus.
- The risks of participating in the survey are minimal; the greatest of which is the short time required to complete the survey, and later, the interview.
- Should you be selected and you agree to participate through completion of the study, the results will be made available to you at the conclusion of the study, if you are interested.
- Your participation in the survey is voluntary. You may exit the survey at any time without penalty. Your responses will remain confidential. The same holds for the interview.
- If you have any questions, you are welcome to contact me at 216-xxx-xxxx or l.rashid@csuohio.edu, or Dr. Anne Galletta, co-principal investigator of the study, at 216-xxx-xxxx.
- If you have any questions about your rights as a participant in the survey, you may contact the Cleveland State University Institutional Review Board at 216-xxx-xxxx.

Thank you for interest and your participation in the survey. To access the survey, use the

following link: https://www.surveymonkey.com/s/X6H65D6

Lorenzo Rashid
Doctoral Candidate
College of Education & Human Services
Cleveland State University

APPENDIX C

URBANICITY

Table 6.

Districts with similar characteristics for urbanicity.

District	District Black Students as % Of Total FY12	District Percent of Students in Poverty FY12	District Total Property Tax Per Pupil FY13	District Median Income TY10
Alliance City SD	0.2197	0.7334	$2,925.39	$24,290.00
Campbell City SD	0.2879	0.7978	$1,786.03	$23,174.00
Canton City SD, Stark	0.3581	0.8241	$2,855.92	$20,910.00
Cleveland Municipal SD	0.6766	0.9999	$3,227.76	$22,343.00
Dayton City SD	0.6571	0.9405	$3,144.97	$22,493.00
East Cleveland City SD	0.9878	0.9181	$3,030.98	$20,031.00
Elyria City SD	0.3059	0.7138	$3,439.58	$24,648.00
Euclid City SD	0.4194	0.7568	$3,315.82	$23,360.00
Garfield Heights City SD	0.5483	0.6675	$3,716.29	$28,386.00
Hamilton City SD	0.2512	0.6805	$3,839.78	$25,389.00
Lima City SD	0.4069	0.7734	$1,694.26	$20,747.00
Lorain City SD	0.2883	0.8831	$1,933.12	$22,509.00
Mansfield City SD	0.3007	0.8361	$3,767.45	$21,862.00
Maple Heights City SD	0.9287	0.7515	$3,978.33	$28,087.00
Middletown City SD	0.2995	0.7341	$3,240.37	$24,597.00
Mount Healthy City SD	0.699	0.7648	$3,375.21	$29,347.00
North College Hill City SD	0.7383	0.7373	$2,533.24	$27,885.00
Painesville City Local SD	0.3971	0.7633	$2,877.62	$23,575.00
Sandusky City SD	0.3162	0.7205	$3,502.24	$24,290.00
Springfield City SD	0.379	0.7791	$3,119.75	$23,360.00
Steubenville City SD	0.2742	0.6782	$1,892.57	$23,217.00
Toledo City SD	0.4212	0.7697	$3,047.06	$24,558.00
Trotwood-Madison City SD	0.8879	0.7793	$2,887.89	$24,290.00
Warren City SD	0.4032	0.63	$2,307.36	$21,438.00
Whitehall City SD	0.3259	0.7945	$3,250.06	$23,360.00
Youngstown City SD	0.6711	0.9265	$2,548.49	$19,844.00

APPENDIX D

RECRUITMENT EFFORTS

12/8/14
Memo was received from the IRB approving application for project #30177-GAL-HS.
- Notify the IRB of any revisions to the protocol, incl. the addition of researchers, prior to implementation.
Notes from the prospective hearing drafted by my committee chairperson highlighted the importance of me being present while recruiting participants. Additionally, reconnecting with students from the high school of my employment was suggested as a way to start a snowball sampling. Various programs operating at my university were highlighted as a means of recruitment.
12/10/14
Survey link created: https://www.surveymonkey.com/s/X6H65D6
12/10/14 thru 12/12/14
Tested link
12/15/14
Met w/Director of a program at the university → Left flyer; the director offered to place information in weekly newsletter.
Met w/Interim Director of another university program → Left flyer; the interim director offered to place information on the program's Facebook page.
12/10/14 thru 12/27/14
High School Commencement programs were used to compile groups of students from the graduating classes of 2010, 2011, 2012, 2013, and 2014 that indicated the University as a college of acceptance.
12/27/14 thru 12/28/14
Group emails were sent to the respective students according to their year of graduation to inform them of the study including the survey link.
Emails were sent to individual High School graduates and other familiar students as a list was accessed through the university's email system.
12/22/14
Two survey responses were completed. Thank you reply was sent within two days.
12/29/14
One survey response was completed. Thank you reply was sent within two days.
1/ 12/15
One survey response was completed. Thank you reply was sent within two days.
1/29/15
5:45 Pre-calc I classroom → Met w/professor after class - he extended an offer for me to visit on the following Monday.
2/2/15
Upon arrival → left flyer w/professor and it was suggested that I coordinate activities w/head of mathematics department and another professor.
12:15-1:15 Pre-calc. I classroom → Distributed flyers to 2 males, left flyers w/professor for his Wednesday class.
1:30-2:20 Pre-calc. I classroom → Spoke w/professor after class & left flyers.

4:30-5:45 Pre-calc. II classroom → Distributed flyers to 3 males. This was a follow-up from meeting the prior Thursday with professor. Left flyers w/professor & TA. TA is a former High School student I taught.
1:30-2:20 Calculus I classroom → 4 flyers distributed to males before start of class & prior to arrival of professor.
2:35-3:25 Calculus I classroom → Distributed 5 flyers prior to the start of class (1 female and 4 males) & prior to the arrival of the professor.
1:30-2:20 Calculus II classroom → Class not in session on this day.
4:00-5:50 Calculus II classroom → Class had started - one African American male was in attendance.
2:40 → Mathematics Department Chair's office - not in office.
2:50-3:00 Met w/professor in their office → left 3 flyers.
3:10-3:15 Black Studies department → left flyers.

2/2/15

Two survey responses were completed. Thank you reply was sent within two days.

2/3/2015

Follow-up email was sent to two professors regarding the distribution of flyers to students in mathematics classes. I made a telephone call to the Mathematics Department Chair to discuss the flyer.
Email sent to Mathematics Department Chair listing the targeted courses and sections.

2/4/2015

Mathematics Department Chair sent an email notification of approval for mathematics teachers to distribute flyers.

2/6/2015

Email sent to instructors of record for the targeted courses and sections asking their assistance in providing a place/space for distribution of flyers. The targeted courses and sections were:

MTH 167 Precalculus Mathematics I/Sections: 3319-3321
MTH 168 Precalculus Mathematics II/Sections: 3322-3325
MTH 181 Calculus I/Sections: 3326-3329
MTH 182 Calculus II/Sections: 3330-3335
MTH 182H H: Honors Calculus II/Section 3336

2/10/15

Reply received from one professor offering support but there weren't any African Americans enrolled in their class. On 2/10/15, a thank you reply was sent.

2/17/15

Visited another university program department – Solicited assistance for dissemination of flyers. Sent email to the Graduate Assistant asking for assistance. Spoke w/Graduate Assistant in Doctoral Lab re: flyer/dissertation.

2/20/15

A direct appeal via email was sent to two High School graduates who were former students of mine.

Following is a table of survey respondents' answers to provide an overview for analyzing how the criterion set forth in the prospectus might be adjusted or redefined for the selection of study participants.

Table 7.

Minimum Mathematics & Qualification – College Pre-calculus

Respond	**High School Mathematics**	**College Mathematics**	**Age**	**College attend**	**Ethnicity**	**1st Generation**	**Qualify**
1 (Ruth)	Alg. II	*MTH 104*	24	5 yrs	Black or AA	Yes	No
2 (Esther)	AP Stats	Urban Data Analysis	21	3 yrs	Black or AA	Yes	Yes
3 (Female)	Statistics	*Applied Math for Nursing*	20	1 yrs	Black or AA	No	No
4 (Martha)	Alg. II	*MTH 116*	18	0 yrs	Black or AA	Yes	No
5 (Male)	Calculus	Pre-calc.	20	2 yrs	Black or AA	No	No
6 (Male)	Pre-calc	MTH 323, 311	25	4 yrs	Black or AA	No	No
7 (Ada)	Trig	*Trig*	34	8 yrs	Black or AA	No	No

Success in mathematics, for this study, was originally defined as a student who qualified to be eligible to enroll in a pre-calculus or higher-level mathematics class upon entering a two-year or four-year institution of higher learning. The level of mathematics

courses enrolled in was a salient academic category. Additionally, all eligible participants were enrolled in a mathematics class equivalent to pre-calculus or above at the post-secondary level.

The following table provides an overview for analyzing how the suggested change in the salient academic category (high school mathematics level equivalent to Algebra II/Trigonometry or above) changed the qualification of participants for the study. Table 8.

Minimum Mathematics & Qualification – High School Algebra II/Trigonometry

Respondent	**High School Math**	**College Math**	**Age**	**College Attend**	**Ethnicity**	**1st Generation**	**Qualify**
Ruth	Alg. II	*MTH 104*	24	5 yrs	Black or AA	Yes	Yes
Esther	AP Stats	Urban Data Analysis	21	3 yrs	Black or AA	Yes	Yes
3 (Female)	Statistics	*Applied Math for Nursing*	20	1 yrs	Black or AA	No	Yes
Martha	Alg. II	*MTH 116*	18	0 yrs	Black or AA	Yes	Yes
5 (Male)*	Calculus	Pre-calc.	20	2 yrs	Black or AA	No	No
6 (Male)*	Pre-calc	MTH 323, 311	25	4 yrs	Black or AA	No	No
Ada	Trigonometry	*Trigonometry*	34	8 yrs	Black or AA	No	Yes

*Respondent does not qualify because the school district is not an urban district or located in the United States of America.

APPENDIX E

DEMOGRAPHIC INTAKE SHEET

African American Urban High School Graduates' Experiences Concerning Mathematics

Thank you for considering participating in this study. As indicated on the Informed Consent Form, your participation is completely voluntary and your responses will be kept confidential between you, me and my research advisor, and will be anonymous for purposes of reporting the findings. You have the right at any time to withdraw from the study, and or/to refuse to answer any question. However, I do encourage you to respond to the demographic sheet as completely as you feel comfortable doing.

I am a Ph.D. candidate at the Cleveland State University College of Education. My research focus is on African American urban high school graduates' experiences concerning mathematics. I appreciate your time and your willingness to help with my dissertation topic.

Demographics:

Name: _____

What is the best contact phone number for you? _____

What is the best contact email number for you? _____

Name of high school attended_____

Name of college/university: _____

What is your highest level college mathematics course completed? _____

What is your highest level of high school mathematics course completed? _____

Number of years attending a college/university: _____ Age: _____

Ethnicity: African American Caucasian Latina/o Native American Mixed Asian

Gender: Female Male

Educational level of parents:

Mother	High School Diploma	Bachelors	Masters	Ph. D.
Father	High School Diploma	Bachelors	Masters	Ph. D.

Are you a 1st generation college student? Yes No

APPENDIX F

INTERVIEW GUIDE

First Interview (K – 12 Mathematics Experiences)

The interview will focus on the following questions/prompts:

1. Could you talk to me about your experience of math as you grew up and went through school?

Elementary School Experience

2. [To help facilitate this discussion, I will draw a circle with the 1st period of interest (K – 5) at the center of a circle or have it drawn in advance.] What were your experiences of math at the elementary level?
    a. tell me about the students/your classmates
    b. tell me about the teachers
    c. in-class challenges
    d. in-class successes
    e. methods of coping
    f. what do you remember about the Principal(s)?
    g. activities outside of school (home, community, faith-based); in general: growing up.
    h. grades
    i. tutoring or other help?
    j. typical daily routine (before school, during school, after school, weekends)
    k. opportunities to learn; probe for class size, adequate resources, quality of facilities.
    l. Tell me your feelings about a previous math class.
    m. What did you like most about your math classes? Please, tell me more.
    n. What did you like least about your math classes? Please, tell me more.
    o. What were some of your struggles in your math class?
    p. When you faced or came across a hard math problem, what did you do?
    q. Who did you ask for help when you found math problems difficult?
    r. Tell me about a time that you used math outside of the classroom.

Middle School/Junior High Experience

3. What were your experiences in math at the middle school or Jr. High level? [I will draw a circle with the 2nd period of interest (6 – 8) at the center of a circle or have it drawn in advance.]
    a. What was it like for you when you went from elementary to middle school?
    b. What changes were more pronounced in these two environments?
    c. How did you feel about the changes?

d. Repeat probes a through r in 'question 2' of this interview guide.

High School Experience

4. What were your experiences in math at the high school level? [I will draw a circle with the 3rd period of interest (9 – 12) at the center of a circle or have it drawn in advance.]
    a. What was it like for you when you went from middle school to high school?
    b. What changes were more pronounced in these two environments?
    c. How did you feel about the changes?
    d. Repeat probes a through r in 'question 2' of this interview guide.
    e. Probe for experience or thoughts about standardized testing (e.g. OGT)

Probes

Participants will be probed for clarification in cases of ambiguity. Examples of probing would be in the form of a question or a statement, such as follows:

1. Please explain ….
2. Please, tell me more.
3. In this case, what did you do?
4. Remember when ….
5. Remember how ….
6. Explain what happened when …
7. How did you feel about your peers'/teacher's/parents' reaction to …...?

8. What were your peers'/teacher's/parents' reaction to…?

9. What are your thoughts about ….?

The following question will be asked when the interviewer perceives that the experience has been fully articulated:

What else would you like to add that we haven't already discussed?

Any further descriptions will be explored and then the interview will conclude.

Second Interview (Post-Secondary Mathematics Experiences)

After the transcription of interview one, the researcher will consider what is unclear and what answers are of need of further clarification and then adopt questions/probes in preparation for the second interview. Also, member checks with the participants will be implemented to explore the accuracy of the coding in the context of

their mathematical experiences (Moody, 2004). This will serve to insure that the responses of the participants are accurate and that the participants are not misrepresented.

Additionally, this interview will focus on the following questions/prompts:

1. Who/What influenced you to choose the college major of your choice?
2. How well prepared for college did you feel at the end of 12th grade?
3. Were these feelings supported or challenged by your experience once you got to college?
4. Reflect back over your mathematics experiences as you continued through high school and into college. What was the academic, social and emotional cost of you continuing in mathematics?
5. Describe your experiences in the mathematics class(es) you are now taking in college.
6. What are or was your reasons for taking the class(es)?
7. What are your career interests?
8. How did you come about choosing your career interest? [Probe for Schools/Families/Personal traits/other variable(s)]
9. How do you see math as it relates to your chosen field of study?
10. What can educators do to improve the numbers of minorities in mathematics related fields?

The following question will be asked when the interviewer perceives that the experience has been fully articulated:

What else would you like to add that we haven't already discussed?

Any further descriptions will be explored and then the interview will conclude.

APPENDIX G

INFORMED CONSENT FORM

Overview: My name is Lorenzo Rashid and I am doing research about African American urban public high school graduates' experiences concerning mathematics and how these experiences may play a role in the choice to further study mathematics in a post-secondary educational institution. The author proposes to use a basic interpretive qualitative design to examine the experiences of the participants by using semi-structured interviews to collect data. The interviews will be conducted in two separate 60-90 minute sessions at an agreed upon public establishment for a period of three months. Data will be organized using qualitative data analysis software. The experiences will be highlighted emphasizing the participants' responses to inquiry regarding their experiences concerning mathematics. Results of the study will report the ways in which students respond to schooling influences and their success in mathematics.

Purpose: As a graduate student, Lorenzo A. Rashid will conduct a basic interpretive qualitative study regarding African American urban public high school graduates' experiences concerning mathematics to partially fulfill the requirements for the Doctor of Philosophy in Urban Education (Learning & Development) at Cleveland State University (CSU).

Procedure: Between 10/15/2014 and 12/01/2014, Lorenzo A. Rashid will gather information using semi-structured interviews. Each participant will be interviewed twice for 60-90 minutes at an agreed upon public establishment. A pseudonym will be used to protect the participant's privacy. Additionally, other identifiable information and characteristics will not be included in any written report.

Benefits to Participants: Risks associated with participation in this study are no greater than those experienced during the course of everyday life. Possible risks, while highly unlikely, might include some discomfort from questions related to the participant's feelings about learning mathematics. There are no real direct benefits to participants.

Rights of Participants: Participation in this study is voluntary. The participant will be free to ask questions, to clarify statements; to not answer particular questions and to withdraw from the research project at any time, at which point all data will be destroyed upon request.

If you have any questions about your rights as a research subject, you should contact the CSU Institutional Review Board at (216) 687-3630. For questions about the study, please contact one of the persons listed below.

Your signature indicates that: (1) you have read and understood the purpose and procedures outlined above; (2) you agree to give your consent to participate in the study outlined above; and (3) you are satisfied that all data will be held confidential and that your privacy will be protected.

Name of Participant (please print) _____
Yes, I give permission (signed)_____ Date: _____
No, I do not give permission (signed)_____ Date: _____

Lorenzo A. Rashid	Dr. Joanne Goodell
Mathematics Teacher/Researcher	Professor of Mathematics Education

Shaw High School
216.268.6374 ext. 7420
Email: l.rashid@csuohio.edu

Cleveland State University
216.687.5426
Email: j.goodell@csuohio.edu

APPENDIX H

CATEGORIES – MASTER LIST

Table 9.

Categories - Master List

Sense of self	**High regard of one's self being capable**
Characteristics of Teachers	Attitudes, supportive or non-supportive
Student engagement	Attentiveness in class/on-task
Student learning strategy	Ways of knowing
Instructional practices	Plans/activities for transferring the curriculum to the learner
trajectory/pathway	Curricula, missed opportunities and opportunities to learn including milestones
Struggles in mathematics classes	Difficulties such as environment, teacher, peers, task, topics, etc.
Resourcefulness	Looking beyond the textbook and teacher for solving problems
Cultural capital.	Knowledge and understandings that are acquired from home that transfers to an institution of learning
Student characteristics	How students learn, shy, outgoing, inquisitive, laid back, active,
Assisting others	Tutoring, group work
Composition of high school	Demographics
Opportunities to learn	Access to specialized curriculum
Standardized Test	High stakes testing (OPT, OGT, OAA), ACT, SAT, GRE, etc.
Quality of teacher –	Good (skilled), bad (unskilled), indifferent, caring, etc.
Challenges in mathematics	Topics including how to think about how to start a problem
Helping others	Tutoring, group work
Social stream	Socializing being more important than academic achievement
Principal as an advocate	Principal as an instructional leader
Likes mathematics	enjoyment of mathematics
Learning style	Any of the learning styles. e.g. visual, auditory, hands-on, Gardner's Eight, etc.
issue of resources -	Under-resourced, e.g. no books, inadequate staffing, etc.
Resource for learning	Books, computers, computer programs, others,
Solving difficult problems	perseverance/persistence

Transition: Middle-to-high school	Smooth difficult, good, bad, etc.
Structure of school	Partition of grade levels for each stage
Feelings about school	good, bad, or indifferent
Weak teaching - not engaging	missing rigor/relevance
Engaged learning	Students are able to give attention to task
peer relations	How does one get along with their peers
Descriptions of teachers.	good, bad, or indifferent
Classroom environment.	chaotic, conducive to learning
Difficult class	Comprehension, lack of help
methods of coping	avoidance, nonchalant, task-avoidance, task-approach
Dislikes	teacher, peers, topic, effort, etc.
Need for more engaging curriculum	Recommendations from participants
Trajectory/pathway: Changing majors.	Changed majors while in college.
college readiness	Remediation needed or not needed.
CLEP - Testing out of class	College Level Examination Program
Demanding and stressful experience.	affective reactions
Uncooperative teacher.	Not helpful/no feedback
Persistence	To continue to complete seemingly difficult task/assignments.
Scope and sequence	Breadth and order of topics presented or covered for a class.
Groups of students/Fork in the road	Groups - cool group vs. achievement group
Notion of being smart.	Being able to follow directions the first time and complete task/assignment w/o help
Out-of-school activities	Engage in activities that are not school-related.
Liked least	lowest preference for something of choice
Strategies for answering mathematics problems	Individual strategies for approaching/solving math problems systematically.
Elementary-to-middle school transition	Smooth difficult, good, bad, etc.
Keeping up	Being on point w/expectations of the class
Student/teacher relationships	How students and teachers relate in their respective roles
Middle school-to-high school transition	Smooth difficult, good, bad, etc.
Clearer explanations	Suggests scaffolding or chunking
“Getting it done”.	Just do it and be done with it w/o regard to learning.

Multi-step problems	Problems that require at least three or more steps to process and then solve.
Resolve difficult problems. Enhancing her learning.	Tutoring to enhance learning and not out of necessity.
after-school activities	Events that are school related but are engaged in after the regular school day has ended.
Ohio Graduation Test – Mathematics	A series of high stakes test that determined if an individual would receive a high school diploma issued from the state.
Normal school experiences	Experiences that are mainstream.
Not favorite subject	Not at the top of the list regarding preference. Not on the list at all as a preference.
Self-concept in mathematics	Individual's thoughts about their ability which can be erroneous
Ohio Proficiency Test (OPT)	A series of high stakes test that determined if an individual would receive a high school diploma issued from the state.
Increased rigor	Task/assignments that are higher on bloom's taxonomy and requires more thought than customary.
Fell into the background/kind of be unnoticed	Needs of the student are not met.
Extrinsic rewards	Rewards received as a token for motivation purposes.
School environment	Classroom, hallway, lunchroom, school grounds, safety, etc.
Erosion of education	Comparatively speaking not as good as it had been.
On-task	Being able to follow directions and focus on the task/assignment at hand.
Analogy of mathematics	Comparing mathematics to some other phenomenon
Reasonableness of answers	Self-check answers to see if it makes sense - numeracy
Parent involvement	Parents' concern and active role in their child's education and well-being.
College Readiness/Betrayal	Feelings of betrayal upon remediation of mathematics at the college level.
Passing	Doing just enough to pass or just enough to meet the expectations of others.
College readiness/remedial class	Remediation was needed upon entry to college.
Common core process standard/approach mathematics problems	How to start problems is a process common core standard
College readiness/remedial class/lack of preparation	Lack of preparation to enter college taking a college level mathematics class.
Helpful faculty	Teachers being responsive to students' needs.

Relieved that no more mathematics courses were required.	Relaxed and happy that the graduation requirements in math were met.
Recommendations for educators	Suggested recommendation as presented by participants in this study.
Mathematics is challenging.	Mathematics requires both effort and thought. Rigorous or demanding.
Teacher's perception of student's effort.	Teacher's opinion of student's level of ability versus observed their performance.
Struggling w/mathematics	Trying to understand concepts of mathematics/reasons for learning mathematics
Least favorite subject.	Low on list of preference regarding subjects.
Mathematics is time-consuming.	Problems in mathematics demands too much time to complete.
Setting and time.	The duration of schooling in what era.
Ability grouping.	Group students according to like-abilities.
Multi-step problems/Long Division	Long division as a multi-step problem.
School was social.	School was seen as purely a place to socialize and not necessary to apply one's self to learning.
Too much effort	Task demands required too much effort.
Homework	Homework assignments were given.
Study habits/skills	Knowledge and /or strategies to assist in preparing oneself to acquire knowledge and understanding.
Get on track.	Adjust behavior/effort to obtain desired results/grade
Expectations of parents	Parents' wish for child's performance or achievement level
Children's perception of parent's involvement.	A child's view-point of their parents' involvement in their education and well-being
Expectations	A wish that someone has for others. Setting a bar of performance or achievement for someone else.
Scary/Trepidation	Fear
Fear	False evidence appearing real
Teaching methods	Didactic, problem-based, etc.
Mathematics is boring	No fun/lack of excitement
Feelings of college readiness/preparedness	Feelings that k-12 preparation was sufficient for entry into college level course.
Determination/Perseverance	To continue to press on in the face of difficulty.
Study skills & cost.	Lack of study skills. Traded study for other activities.
Success by effort.	Success finally realized through putting forth effort.

Passing/Making the grade	Doing well enough to pass a class or passing a class to meet someone else's demand for you.
Future mathematics classes.	Mathematics classes you anticipate taking in the future.
Love teaching mathematics	Enjoyment of teaching mathematics.
Grow to like mathematics	Maturity in mathematics
An emotionally traumatic experience	An event that cause extreme discomfort
Opportunity to learn.	An occasion to further one's knowledge/understanding
Cost	Negative aspects of moving along an educational path
Cultural implications.	Cultural ramifications of actions
Ambivalence	a state of vacillation
Regret	remorse regarding a response
Tracking	practice of separating students according to cognitive ability
Self-confidence	An assurance that one has in their own regard
Nonchalant.	Not caring about performance or consequences of one's action
Trajectory/pathway – Cost	An opportunity that results in negative aspects in one's educational journey
Success in mathematics – Enjoyment	Feelings of joy when realizing success in mathematical activities
Effort, time consuming, tedious, aggravating	a set of affective reactions experienced
Frustration and perseverance.	Experienced frustration but ultimately persevered.
Epiphany. Perseverance.	Epiphany through perseverance
Learning helps one become grown.	Perceived as an activity that grow-ups do
Cross curricular connection.	Making connections across subjects
Feelings	Emotional or effective experiences
Mathematics outside of school	Activities outside the confines of school that are related to mathematics
Cost - fear & avoidance	Negative aspects of learning stemming from fear and avoidance
Performance self-rating	Objectively rank one's self according to some formal or informal rubric
Grades	Mark that indicates one's academic achievement or social competence
Past accomplishments in mathematics.	Previous successes in mathematics

Parental involvement and encouragement.	Parents' active participation and assistance in educational endeavors. Parental support.
Feeling of failure.	Emotional response to not having success
Failure as motivation to do better.	Positive motivational response
Middle school - formation of groups	Cool group versus the Achievement group; those who became more serious and others cared less
Skill and effectiveness of teacher	Ability to scaffold/chunk
Liked most about mathematics	Ranked as the highest aspect among choices in mathematics
Group identities	Cool group versus the Achievement group; those who became more serious and others cared less
Guidance counselors	Make mention of guidance school counselors being of some assistance
Critique of graduation tests	An analysis of high stakes testing for high school graduation
Reasons for taking mathematics courses	Motives for taking mathematics courses
Parental influence	Encouragement

APPENDIX I

REFLEXIVE MEMO

March 16, 2015 – Reflections w/RS8 → scheduled for 4PM.

We did not meet. We will have to reschedule. This was the first day of the series of OGT for students at the high school. Today's classes at the high school were modified due to OGT testing. As I was departing from the high school, there were police and security guards out near the back parking lot, more than usual. There seemed to be an altercation that they just diffused. I left approx. at 3:30 PM to go meet with RS8 at the library on University's campus. I drove the city to the freeway. I circumvented dead man's curve by continuing on RTE 2 to East 9th Street. I finally arrived at the South Parking Garage. I arrived at the Library at approximately 4:08. Scurried around to find RS8 to no avail. Set in a chair near the lobby facing the library entrance around about 4:15 so that I could see entrance/egress. I powered-up my computer so that I could email RS8 regarding our scheduled meeting and to apologize for my tardiness. RS8 replied and volunteered to come to the interview but time would have not permitted the interview to be completed due to a 6:10 PM engagement at my place of business. However, I did take out time to schedule a day off on Tuesday March 17, 2015 because my wife is scheduled for outpatient surgery which requires for someone to be there for transportation. RS8 replied, in another email that she would be available on Tuesday, March 17 between 9AM and 3PM and left a contact number. I replied that I would be with wife b/c of her surgery and that I would need to see how the outpatient procedures went. After requesting a substitute teacher for 3/17 and sending the emails to RS8, I left for the parking garage. I returned home and walked the dog and thereafter installed Dragon software on my computer.

APPENDIX J

ECCLES' MODEL OF ACHIEVEMENT-RELATED CHOICES

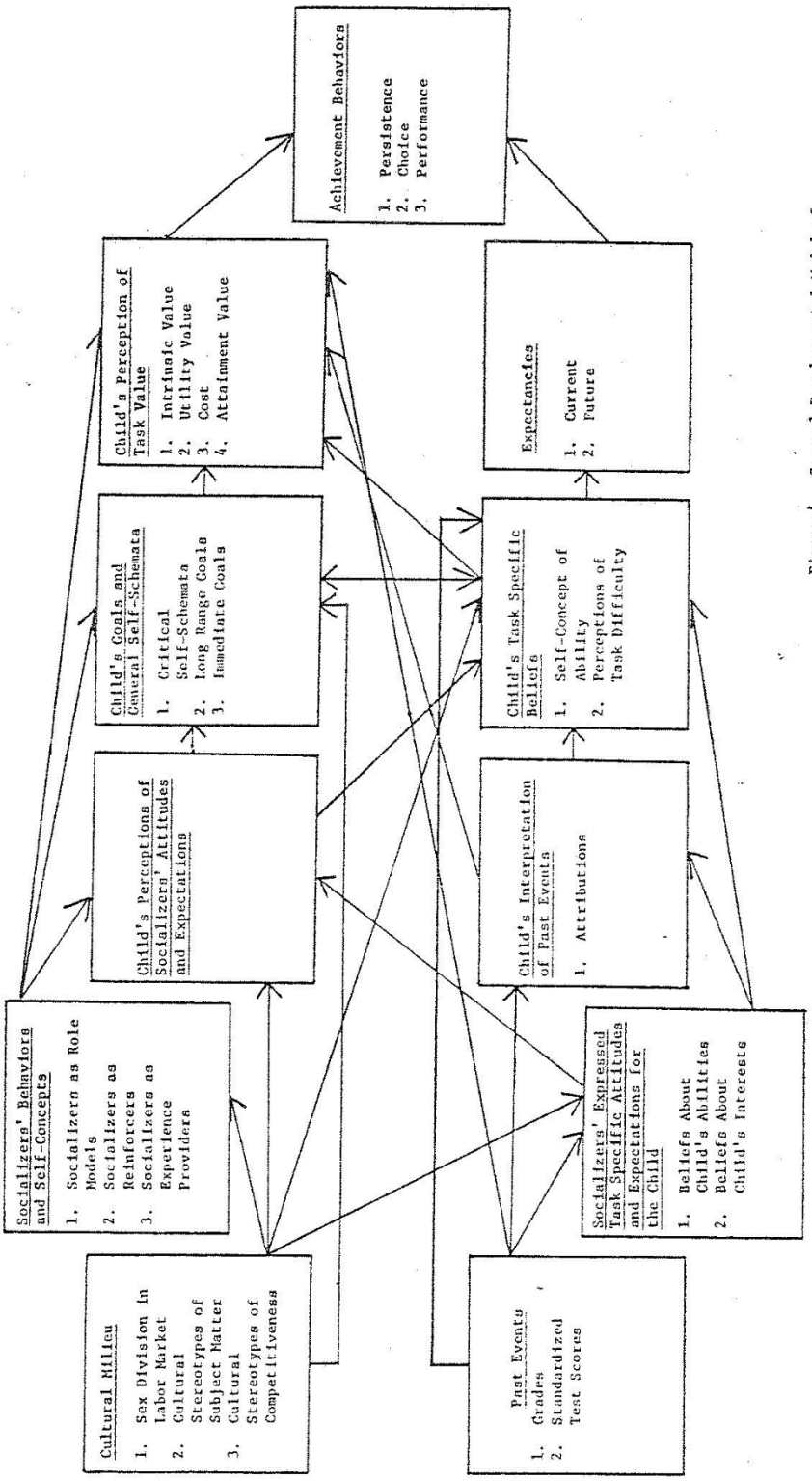


Figure 1. General Developmental Model of Achievement Behaviors.

Figure 5.1985 Eccles et al. Model of Achievement-Related Choices (Eccles et al., 1985)

APPENDIX K

MODEL OF ACADEMIC CHOICE FRAMEWORK DEFINITIONS

Table 10.

MAC Conceptual Framework Definitions.

Conceptual Framework	Definitions	Researcher (s)
Cultural Milieu	Sex division of labor market; cultural stereotypes of the subject matter; gender and competitiveness	Eccles & Wigfield (2002)
Participant's Perception of Socializer's (parents, teachers, peers, & media) Attitudes and Expectations	Supportive and/or high expectations or unsupportive and/or low expectations or indeterminate	Eccles et al. (1985)
Participant's Goals and General Self-Schemata: 1. Relevant Self-Schemata; 2. Long range goals; 3. Immediate goals.	Passing a current class, graduation, obtaining a job or degree, a sense of self	Eccles et al. (1985)
Participant's Perception of Task Value:		
1. Intrinsic Value	Interest; enjoyable and engaging. Examples: I find many topics in mathematics to be interesting; solving Mathematics problems is interesting to me; mathematics fascinates me; I am interested in doing mathematics problems; it is fun to do mathematics; learning new topics in mathematics is interesting; I find mathematics intellectually stimulating.	Durik (2006)
2. Utility Value	Usefulness; "practical significance of a task & how it can be instrumental in fulfilling other pursuits". Examples: There are almost no benefits from knowing mathematics; I have little to gain by learning how to do mathematics; after I graduate, an understanding of mathematics will be useless to me; I do not need mathematics in my everyday life; understanding mathematics has many benefits for me.	Durik (2006)
3. Cost	Negative aspects of engagement (performance anxiety; fear: failure & success; loss of opportunity; ostracized). Examples: Mathematics exams scare me; trying to do mathematics causes me a lot of anxiety; taking mathematics classes scares me; I worry about getting low grades in my	Eccles & Wigfield (2002) Kunjufu, X. (1988) Irvine, J. (1991) Ladson-Billings, G. (1995)

	mathematics courses; I have to study much harder for mathematics than for other courses; mathematical symbols confuse me; solving mathematics problems is too difficult for me; acting white; lack of cultural congruence, not culturally relevant, cultural synchronization.	Fordham and Ogbu, 1986 Moje & Martinez. (2007)
4. Attainment Value	Importance; importance of doing well on a task. Examples: Earning high grades in mathematics is important to me; it is important to me to get top grades in my mathematics classes; if I do not receive an "A" on a mathematics exam, I am disappointed; only a course grade of "A" in mathematics is acceptable to me; I must do well in my mathematics class; I would be upset to be just an average student in mathematics; doing well in mathematics courses is important to me.	Eccles & Wigfield (2002)
Past Events and Related Experiences	Grades, standardized test, and other related experiences	Eccles et al. (1985)
Participant's Interpretation of Past Events (casual attributions)	Luck, effort, own ability, others (ease of task)	Kunjufu (1988; p.45)
Affective reactions and memories	Emotional responses; one's history of success and failure; responses and behaviors of socializers; causal attributions; levels of confidence; anxiety.	Eccles (2010)
Participant's Task Specific Beliefs		
1. Self-concept of Ability	Questions relating to if they can perform the task or pass the class, or graduate? (Positive/Negative); Erroneous belief(s).	Eccles et al. (1985)
2. Perceptions of Task Difficulty	Questions or statements relating to how well will they perform?	Eccles et al. (1985)
Expectancies (Current and Future)	Level of confidence in being successful now or in the future.	Eccles & Wigfield (2002)

APPENDIX L

ALIGNMENT OF INTERVIEW QUESTIONS, RESEARCH QUESTIONS AND THE MAC

RQ1: What are the K-12 experiences of successful African American public urban high school graduates concerning mathematics?

RQ2: How might these experiences play a role in students' choice to further their mathematics education?

RQ3: How might using the Model of Academic Choice (MAC) as a theoretical framework help in understanding choices of African American urban public high school graduates concerning mathematics?

Table 11.

Interview Items/Research Questions/MAC Framework

Interview Question/Statement	Research Question	MAC Framework: Process Blocks (PB)
1. Could you talk to me about your experience of math as you grew up and went through school?	RQ1, RQ2, RQ3	PB3
2. Who/What influenced you to choose the college major of your choice?	RQ1, RQ2	PB1, PB2, PB3, PB5, PB8, PB9, PB10, PB11
3. What kind of job did the K-12 experience do to prepare you for college?	RQ1, RQ2	PB5, PB6
4a. Tell me about the students/your classmates.	RQ1, RQ2, RQ3	PB3, PB5, PB8
4b. Tell me about the teachers.	RQ1, RQ2, RQ3	PB3, PB5, PB8
4c. In-class challenges?	RQ1, RQ2, RQ3	PB3, PB4, PB5, PB6, PB7, PB8, PB9, PB11
4d. In-class successes?	RQ1, RQ2, RQ3	PB3, PB4, PB5, PB6, PB7, PB8, PB9, PB11
4e. Methods of coping?	RQ1, RQ2, RQ3	PB3, PB5, PB6, PB7, PB8
4f. What do you remember about the Principal(s)?	RQ1, RQ2, RQ3	PB3, PB5, PB8
4g. Activities outside of school.	RQ1, RQ2, RQ3	PB1, PB3, PB5, PB7, PB9, PB11
4h. Grades?	RQ1, RQ2, RQ3	PB3, PB4, PB5, PB7, PB8, PB9, PB11
4i. Tutoring or other help?	RQ1, RQ2, RQ3	PB1, PB3, PB5, PB7, PB9, PB11
4j. Typical daily routine?	RQ1, RQ2, RQ3	PB1, PB3, PB5, PB7, PB9, PB11

4k. Opportunities to learn?	RQ1, RQ2, RQ3	PB1, PB3, PB5
4l. Tell me your feelings about a previous math class.	RQ1, RQ2, RQ3	PB5, PB6, PB7, PB8, PB9, PB10, PB11
4m. What did you like most about your math classes?	RQ1, RQ2, RQ3	PB6, PB7
4n. What did you like least about your math classes?	RQ1, RQ2, RQ3	PB6, PB7
4o. What are or were some of your struggles in your math class?	RQ1, RQ2, RQ3	PB5, PB6, PB7
4p. When you faced or came across a hard math problem, what did you do?	RQ2, RQ3	PB3, PB5, PB6,
4q. Who did you ask for help when you found math problems difficult?	RQ2, RQ3	PB3, PB5, PB6
4r. Tell me about a time that you used math outside of the classroom.	RQ1, RQ2, RQ3	PB1, PB5, PB7, PB11
5a. What was it like for you when you went from elementary to middle school?	RQ1, RQ2, RQ3	PB5
5b. What changes were more pronounced in these two environments?	RQ1, RQ2, RQ3	PB4, PB5, PB6, PB9
5c. How did you feel about the changes?	RQ2, RQ3	PB8, PB11
5d. See 4a. – 4r.	RQ1, RQ2, RQ3	See 4a. – 4r.
6a. What was it like for you when you went from middle school to high school?	RQ1, RQ2, RQ3	PB5
6b. What changes were more pronounced in these two environments?	RQ1, RQ2	PB4, PB5, PB6, PB9
6c. How did you feel about the changes?	RQ2, RQ3	PB8, PB11
6d. See 4a. – 4r.	RQ1, RQ2, RQ3	See 4a. – 4r.
6e. Probe for experience or thoughts about standardized testing (e.g. OGT)	RQ1, RQ2, RQ3	PB4, PB6, PB7, PB8, PB9, PB11
7. Describe your experiences in the mathematics class(es) you are now taking in college.	RQ1	PB5, PB6, PB7, PB9, PB11
8. What are or were your reasons for taking the class(es)?	RQ2	PB7, PB9, PB11
9. What are your career interests?	RQ2	PB1, PB3, PB5, PB7, PB8, PB9, PB11
10. How did you come about choosing your career interest?	RQ2	PB1, PB3, PB4, PB5, PB6, PB7, PB8, PB9, PB11
11. How do you see math as it relates to your chosen field of study?	RQ2, RQ3	PB7, PB11
12. What can educators do to improve the numbers of minorities in mathematics related fields?	RQ2, RQ3	PB5, PB6, PB7, PB11

APPENDIX M

RECRUITMENT SURVEY

African American Urban Public High School Graduates' Experiences Concerning Mathematics

Thank you for opening the survey link. My name is Lorenzo Rashid, a Doctoral Candidate at Cleveland State University, College of Education & Human Services. I am conducting research to complete my doctoral dissertation and am requesting your assistance. My dissertation proposes a qualitative study to better understand the experiences of African American urban public high school graduates concerning mathematics learning.

I would greatly appreciate 10-15 minutes of your time in completing the following survey. The survey will assist in identifying possible participants meeting the criteria for my dissertation.

Should you be eligible and elect to participate in the study, we would then interview you two times for 60 minutes at a date/time convenient to you at Cleveland State University or at a place near our campus.

The risks of participating in the survey are minimal; the greatest of which is the short time required to complete the survey, and later, the interview! The benefits of the survey will assist me in selecting participants for my dissertation.

Should you be selected and you agree to participate through completion of the study, I am willing to make my results available to you at the conclusion of my dissertation process, if you are interested.

Your participation in the survey is voluntary. You may exit the survey at any time without penalty. Your responses will remain confidential. The same holds for the interview.

If you have any questions, you are welcome to contact me at xxx-xxx-xxxx or l.rashid@csuohio.edu, or Dr. Anne Galletta, co-principal investigator of the study, at xxx-xxx-xxxx.

If you have any questions about your rights as a participant in the survey, you may contact the Cleveland State University Institutional Review Board at 216-687-3630.

Thank you for interest and your participation in my survey.

Lorenzo A. Rashid
Doctoral Candidate
College of Education & Human Services
Cleveland State University

1. Contact Information

Name:
Address:
City/Town:
State:
ZIP:
Email Address:
Phone Number:

2. Name of High School?

3. What is your highest level of college mathematics that you have completed?

4. What is your highest level of high school mathematics course you have completed?

5. Number of years attending a college/university?

6. Age

7. What is your ethnicity? (Please select all that apply.)

- ☐ American Indian or Alaskan Native
- ☐ Asian or Pacific Islander
- ☐ Black or African American
- ☐ Hispanic or Latino
- ☐ White / Caucasian
- ☐ Prefer not to answer

8. What is your gender?

Female
Male

9. Highest educational level of parents?

	High School Diploma/GED	**Some College**	**Bachelor's**	**Master's**	**Doctorate (J.D., MD., Ph.D.)**	**Other**
Mother	○ Mother High School Diploma/GED	○ Mother Some College	○ Mother Bachelor's	○ Mother Master's	○ Mother Doctorate (J.D., MD., Ph.D.)	○ Mother Other
Father	○ Father High School Diploma/GED	○ Father Some College	○ Father Bachelor's	○ Father Master's	○ Father Doctorate (J.D., MD., Ph.D.)	○ Father Other

10. Are you a 1st generation college student? Yes No

APPENDIX N

APPROVAL: USE OF MODEL OF ACADEMIC CHOICE DIAGRAMS

Re: Model of Academic Choice Framework
Jacqueline Eccles <jeccles@umich.edu>
9/29/2014Lorenzo A Rashid
You have my permission

On Sep 28, 2014, at 11:48 PM, Lorenzo A Rashid <l.rashid@vikes.csuohio.edu> wrote:

Greetings Dr. Eccles,

My name is Lorenzo Rashid. I am a doctoral candidate attending Cleveland State University located in Cleveland, Ohio. My proposed dissertation topic will look at experiences of African American urban high school graduates concerning mathematics using your model of academic choice as a lens of inquiry. What would be the procedure(s) for permission to use diagrams as illustrated in your journal publications?

Thank you in advance for your assistance.

Lorenzo A. Rashid, M. Ed.

Mathematics Teacher

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