

AN EXAMINATION OF THE EFFECTS OF THE U.S. SOCIAL MILIEU OF SCHOOLING ON AFRICAN AMERICAN STUDENTS' EXPERIENCES IN MATHEMATICS

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Abstract

This study investigated two African American students' experiences in mathematics by situating their experiences within a social context. The study employed a phenomenological research strategy and examined the African American students' mathematical histories in the context of schooling processes in the United States. The results suggest that the synergy between "perception and response" was profound in the African American students' mathematical experiences. Further, the results suggest a need to reconstruct mathematics teacher education programs that raise the critical social consciousness of pre-service teachers and prepare them to become agents of change that positively contribute to students' successful experiences in mathematics classrooms.

Keywords: *African American Students, Mathematics Achievement, Phenomenology, Social Justice*

I. INTRODUCTION

As mathematics educators embrace the charge of reform efforts [1-4] that accentuate high standards, expectations, and high levels of achievement for all students, it is important to refocus research efforts that will give us insight into creating equitable and high-quality learning opportunities for all students, including African American students. A proliferation of research documents the low mathematics achievement of African American students. However, what is documented less often in the literature is how social norms in the United States impact African American students' experiences in mathematics and subsequently their mathematics achievement.

Undoubtedly, how students perceive and respond to their experiences in schools is influenced by their viewpoints and their social realities. Thus, it is important to consider the ways in which the nature of students' mathematical experiences is framed in the structure of society as a whole. Rather than locate the problem of poor mathematics performance within what students do not know and cannot do because of their experiences, research may consider how the problem of low mathematics achievement is situated within mathematics instruction [5] and in schooling in general [6-7].

The purpose of this research was to examine African American students' experiences in schools and mathematics classrooms by conceptualizing the social constructs that influence these experiences. This study sought to answer the following research questions:

1. How do social norms and societal propensities in the United States affect African American students' mathematical experiences?
2. To what extent does the notion of "perception and response" play a role in African American students' experiences in mathematics classrooms in the United States?

II. THE SOCIAL EFFECTS OF SCHOOLING IN THE UNITED STATES

In their critiques, educators and social critics have distinguished between the educational opportunities in the United States of middle-class White students and those of African American students [6, 8-9, 7]. In particular, inadequate access to high quality classroom environments [7], a lack of high expectations for student performance and achievement [6, 10], and the pervasive structural inequities in U.S. schools and in U.S. society contribute to the disparities in educational experiences among students in this country [7, 11]. As a consequence, these lead to inequities in school mathematics [5]. Within the school curriculum, mathematics holds a privileged position as a form of cultural capital that is positioned to benefit certain children [5] as not all children are expected to learn mathematics or at least the same mathematics [12].

Mathematics education, viewed as a gateway to high status, privileged positions in classrooms and schools as well as to choice and advancement [13], can also act as a filter, limiting access and opportunities for students who do not succeed in mathematics [5]. The United States school curriculum, largely viewed as *neutral* and assumed to consist of a straightforward, unambiguous form and content [14, 5] can be transmitted to students in a manner that is "unusually narrow and ritualistic, leading able students to reject the discipline as a sensitive stage in their identity development" [13].

III. METHODOLOGY

This study employed a phenomenological research strategy. This study resonates with the writings of Muller [15], Omizo and Omizo [16], and Tesch [17] that described phenomenology as the study of lived experiences and essences that allow researchers to discover that, which makes an experience unique and meaningful for an individual. Further, phenomenology is aimed at interpretive understanding and describes subjective experience from the viewpoint of the individual [15-17]. For example, phenomenologists would not investigate the culture of an integrated classroom of Mexican-American and White American children. Rather, phenomenological research would explore what it is like to be a White or a Mexican-American child in an integrated classroom (i.e., the phenomena of being White or Mexican-American in a particular context) [17]. The author particularly sought to

conceptualize the phenomenon of being an African American mathematics student in the United States and sought to conceptualize this phenomenon from the viewpoint of individuals who had experienced it.

There has been much debate in the literature about phenomenology, its methods, procedures, and what even constitutes phenomenological research [18]. Of the many different writings on and references to phenomenology, scholars have viewed phenomenology as a paradigm, a philosophy or perspective, and it has sometimes been viewed as synonymous with qualitative methods like naturalistic inquiry [18]. Although writers have gone back and forth about the essence of phenomenological research, they do seem to agree that the purpose of phenomenology is to describe the personal experiences of individuals from the perspective of the individual [17-19]. Specifically, phenomenologists reframe from imposing preconceived notions about the experiences of individuals and allow individuals to speak for themselves [15-16] about their experiences.

3.1 Participants

Two African American students participated in this longitudinal study. The selection of participants in this study was a criterion-based selection. "Criterion-based selection requires that the researcher establishes in advance a set of criteria or a list of attributes that the units for study must possess" [20]. The researcher "then searches for exemplars that match the specified array of characteristics" [20]. For this study, the participants had to be college African American students in the United States who were near completion of a mathematics or mathematics education degree. The author particularly sought those mathematics students who had successfully completed a calculus sequence, had completed at least one upper-level mathematics course beyond calculus, and were currently enrolled in an upper-level mathematics course.

3.2 Data Collection

Data were collected in the form of an initial survey, an autobiography, and interviews (including a third and final interview that consisted of a member-check by the participants). The initial survey was a questionnaire that consisted of open-ended questions. The participants were asked to describe the schools they attended from primary school throughout college. They were asked to provide descriptions in their own words of these schools, the mathematics courses they took, their mathematics teachers, and the mathematics classrooms in which they participated. For the autobiography, the participants were asked to write a story of their lives as African American mathematics students in the schools and mathematics classrooms they had described in the initial survey. They were given no instructions on how to write their stories but were asked to describe their interactions with mathematics teachers, peers, and other persons who were important in the telling of their stories. The participants were interviewed three times: once, after the completion of the initial survey, secondly, after the completion of the autobiography, and a third time toward the end of the study. The interviews were audio taped and transcribed for analysis.

3.3 Data Analysis

Phenomenological research involves what is called *reductive analysis* [15]. Reductive analysis involves the identifying, coding, and categorizing of data into meaningful units [15]. Further, the technique of phenomenological reduction has two phases. First, there is a back-and-forth movement between a phase of thinking and analyzing and a phase of data gathering [17]. During this back-and-forth phase, the initial survey and the autobiography were used as data sources, were analyzed, and were then used as stimuli to gather more data during interviews. For example, the author analyzed the initial survey by tagging or coding the raw data and putting the raw data into categories that bore the same codes. Then the author used the categories to develop interview focus questions for the upcoming interview. The same was done with the autobiography. During the final interview, the author shared the initial coding and categories with the participants and sought their input for the initial meanings that were attached to the categories.

In the second phase of reductive analysis, categories are reduced to patterns or recurring themes. In this phase, the author analyzed all the data from the initial survey, the autobiography, and the three interviews by searching for invariant themes. For example, the author looked across data sources, treating each participant as a separate unit of analysis, then re-coded the data, sorted the data according to patterns or recurring themes, and attached a descriptor or meaning to the themes.

IV. RESULTS AND DISCUSSION

The two African American students in this study described their experiences in mathematics quite differently. Although they both would be considered as successful mathematics students in the United States, social norms affected their mathematical experiences in different ways. Further, their perceptions of and responses to their experiences in mathematics classrooms were markedly different.

4.1 Social Norms

To answer research question #1, "How do social norms and societal propensities in the United States affect African American students' mathematical experiences?" the author used reductive analysis (described above) of the participants' initial survey, autobiography, and interviews to conceptualize their socialization in schools and mathematics classrooms. The results are shown in Table 1.

Table 1. The Effects of Social Norms

Social Effects of Schooling on <i>Student One's</i> Mathematical Experiences	Social Effects of Schooling on <i>Student Two's</i> Mathematical Experiences
1. Teachers and school personnel considered <i>Student One</i> to be inadequate to learn mathematics during her primary schooling years and placed her in a low academic	1. Teachers and school personnel considered <i>Student Two</i> to be very capable to learn mathematics during her primary schooling years and placed her in a high-

achievement track.	achieving academic track.
2. Because of her success with school mathematics, other African Americans students accused <i>Student One</i> of <i>acting White</i> during her secondary schooling years.	2. Because of her success with school mathematics, other African American students considered <i>Student Two</i> as one who would most likely succeed during her secondary schooling years and in life in general.
3. Because of her striving for academic excellence in mathematics, other African American students considered <i>Student One</i> to be a <i>sell out</i> during her secondary schooling years.	3. Because of her striving for academic excellence in mathematics, other African American students considered <i>Student Two</i> to be intelligent during her secondary schooling years.
4. Because of making good grades in her collegiate studies, other African American students and White students considered <i>Student One</i> to be very intelligent and to be an “exception” to the rule.	4. Because of making good grades in her collegiate studies, other African American students and White students considered <i>Student Two</i> to be one that worked extremely hard and sought help from others that were usually her White counterparts.

As shown in Table 1, both students were met with challenges in their mathematical experiences. *Student One* was met with many challenges early in her schooling years that she described as *struggles*, *obstacles*, and *barriers* to her succeeding in mathematics. By contrast, *Student Two* described her challenges as content related rather than social related. In other words, her challenge was with learning higher-level mathematics in her collegiate studies when mathematics content seemed to be easy for her to grasp in her primary and secondary schooling years.

4.2 Perceptions of and Responses to Schooling

To answer research question #2, “To what extent does the notion of *perception and response* play a role in African American students’ experiences in mathematics classrooms in the United States?” the author again used reductive analysis of the participants’ initial survey, autobiography, and interviews to conceptualize how they perceived their experiences in schools and mathematics classrooms and how they responded to those experiences. The results are shown in Table 2.

Table 2. Perceptions of and Responses to Mathematical Experiences

<i>Student One's</i> Perceptions and Responses	<i>Student Two's</i> Perceptions and Responses
1. Although teachers and school personnel considered <i>Student One</i> to be inadequate to learn mathematics during her primary schooling years, her mother and one African American teacher encouraged her to do well in mathematics.	1. Recall, teachers and school personnel considered <i>Student Two</i> to be very capable of learning mathematics during her primary schooling years and she responded by striving for excellence in mathematics.

2. Since other African Americans students accused <i>Student One</i> of <i>acting White</i> during her secondary schooling years, she hid her academic striving and pretended not to understand mathematics.	2. Since other African American students considered <i>Student Two</i> as one who would most likely succeed during her secondary schooling years and in life in general, she worked extremely hard to be ranked number one academically in her class.
3. Since other African American students considered <i>Student One</i> to be a <i>sell out</i> during her secondary schooling years, she questioned her loyalty to other African Americans and considered abandoning her quest to succeed in mathematics and in school in general. However, she continued her quest for academic excellence despite these feelings.	3. Since other African American students considered <i>Student Two</i> to be intelligent during her secondary schooling years, she challenged herself to prove to other African Americans just how successful she could be.
4. Recall, because of making good grades in her collegiate studies, other African American students and White students considered <i>Student One</i> to be very intelligent and to be an <i>exception</i> to the rule. This, in turn, positively affected <i>Student One's</i> confidence in her ability to do mathematics and for the first time, she wanted others to <i>see</i> her academic striving and success in mathematics.	4. Recall, because of making good grades in her collegiate studies, other African American students and White students considered <i>Student Two</i> to be one that worked extremely hard and sought help from others that were usually her White counterparts. This caused <i>Student Two</i> to question whether she was <i>smart enough</i> to succeed in higher-level mathematics. However, she continued working hard despite these feelings and ultimately succeeded in higher-level mathematics.

As shown in Table 2, the students in this study perceived their mathematical experiences differently at different times during their schooling, but both employed responses that ultimately contributed to their succeeding in mathematics. For example, *Student One* responded to being accused of *acting White* and *selling out*, by hiding her academic striving. However, she continued to pursue excellence without her African American peers' knowledge of her pursuit. This response ultimately led to her succeeding in mathematics. Further, this response is in contrast to what has been posited in the literature [21-24]. For example, in Solomon's [23] and Willis' [24] work, they found that students who felt as though the school culture was in conflict with their own culture tended to resist school and resist the behaviors necessary to succeed in school. Similarly, Ogbu [22] found in his study that many African American students perceived the ideologies of school culture to be that of White culture. Thus, to resist White culture, the African American students found it necessary to resist school culture and the behaviors that would cause one to succeed in school. In this study, *Student One* chose to hide her acceptance of the ideologies of school culture rather than resist them. However, unlike *Student One*, *Student Two* never considered hiding her academic striving. In

fact, she perceived the ideologies of school culture as congruous with her own culture and wanted others, including her African American peers, to *see* that she could succeed in mathematics.

V. CONCLUSION

This study was limited to two African American mathematics students. Thus, we cannot draw conclusions or make generalizations and apply them to *all* African American students in the United States. In fact, we learn from the two African Americans in this study that students may belong to subcultures and social groups within their dominant culture. Depending on how students view their membership in these subcultures and social groups in relation to the dominant culture to which they belong, their experiences in schools and in mathematics classrooms in the United States may be oppressive.

We also learn from the experiences of the African American mathematics students in this study that schools in the United States are not immune to the stress, prejudices, inequalities, and inequities that exist in the larger society [25-27]. In fact, U.S. schools may participate in maintaining or perpetuating differential economic, political, and cultural power [25-27]. Thus, mathematics teacher education programs must play an *active* role in eradicating differential schooling experiences among mathematics students in the United States by providing pre-service teachers with opportunities to reconsider and reconstruct their beliefs and personal theories about who can learn or do mathematics. Further, pre-service teachers should be given opportunities to reflect on how these beliefs might affect their teaching practices. Hence, mathematics teacher education programs must promote inquiry into the complexity of teaching students from varying cultural backgrounds and social orientations. Further, pre-service teachers must participate in mathematics teacher education programs that raise their critical social consciousness and help them understand the nature of structural oppression in the United States as it affects African American students' mathematical experiences. For example, exploring how schools place students into particular academic achievement tracks and what this means for African American students or how academically tracking students affects the mathematical experiences of African American students, can help pre-service teachers recognize and reflect on schooling practices that impede or contribute to the success of African American students.

Further, examining the notion of *acting White* and other forms of peer criticisms has the propensity of facilitating pre-service teachers' conceptualization of how *stereotyping* can impact African American students' persistence in mathematics. Mathematics teacher education programs must encourage pre-service teachers to reflect on potential barriers that work to engender mathematics failure among African American students and consider what their teaching roles might be to help move students beyond such obstacles. Further, in the instance of stereotyping, teachers can focus on the "task of lifting this situational threat" [28] with their students and employ Freire's [29] notion of an authentic education of critical pedagogy and practice that includes the teacher working as a co-investigator with the student through dialogue to transform any reality that would impede students' mathematics achievement.

As mathematics teacher educators, we must urge pre-service teachers, as well as in-service teachers, to consider the social realities of students while recognizing the complex interactions of processes that affect their experiences in mathematics. Conceptualizing students' mathematical experiences in the context of their social realities is fundamental in cultivating schools and mathematics classrooms in the United States where *all* students can and will succeed in mathematics.

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