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Conceptualizing the Mathematics Education of African American Students: Making Sense of Problems and Explanations

By Vivian R. Moody

This article examines the mathematics education of African American students, focusing on problems and explanations identified by scholars and researchers. The goals of this article are to review literature related to the mathematics education of African American students and to create a dialogue among mathematics educators about improving the mathematical experiences of African American students.

Conceptualizing Problems

Over the past 20 years, empirical studies have analyzed national data provided by the National Assessment of Educational Progress (NAEP) and have reported on the status of African Americans' mathematics achievement. NAEP conducts national surveys of the educational performance of students ages 9, 13, and 17. One of NAEP's objectives is to determine and report the status and progress of mathematics achievement in the United States. NAEP also describes the performance of various major groups identified on the basis of region of the country, sex, race, level of parents' education, and size and type of community (Anick, Carpenter, & Smith, 1981).

From analyses of NAEP data, several reports (Anick, Carpenter, & Smith, 1981; Johnson, 1989; Jones, Burton, & Davenport, 1984; Matthews, 1984; Matthews, Carpenter, Lindquist, & Silver, 1984; Welch, Anderson, & Harris, 1982) indicate that there is a pattern of underachievement and underparticipation of African Americans in mathematics. These reports document that African American students enroll in high school mathematics courses and perform on standardized achievement tests at a considerably lower rate than White students. According to Secada (1992), scholars "take disparities as evidence of deep structural injustices in how the American schooling system distributes opportunities to learn mathematics and hence, in the actual acquisition of mathematical knowledge" (p. 623). In this sense, equality and equity become important issues in mathematics education. Equality in mathematics education refers to equal educational access, opportunity, and chance for learning mathematics regardless of race. Equity in mathematics education can be defined as fair treatment in schooling and in mathematics classrooms and no limits on expectations due to race (Grant, 1989).

With social structures such as desegregation and equal opportunity laws in place, it seems all students, regardless of race, should receive the same mathematics education. In other words, these social structures should ensure equality as well as equity. However, although schools have opened their doors to an increasingly diverse student population, schools differentiate among these students internally (Banks, 1988). Tracking is probably one of the most explicit ways in which schools differentiate among students (Oakes, 1986). Research shows that African Americans students' opportunities to learn mathematics are reduced by tracking (Oakes, 1986, 1990b; Slavin, 1987). General mathematics classrooms contain disproportionate numbers of African American students whereas advanced mathematics courses such as Algebra II and Geometry mainly serve White students (Oakes, 1986). Students in low mathematics tracks have very

different mathematical experiences than students in high mathematics tracks. Low mathematics tracks generally involve students in memorization of basic skills and facts while high mathematics tracks help students to become critical thinkers and problem solvers (Oakes, 1986).

The call of reform efforts (NCTM, 1989, 1991) to engage students in "worthwhile mathematical tasks" or "important mathematics" that will allow them to become mathematical problem solvers, communicate mathematically, and reason mathematically is undermined by tracking: Tracking reduces African American students' access to *mathematical power* . In this respect, mathematics education takes on a political or social agenda--who has mathematical power and who does not. Clearly, those who do not have mathematical power will have limited opportunities for further mathematics education and limited occupational opportunities (Secada, 1989). As a consequence, tracking leads to ethnic and socioeconomic separation and reinforces the stereotypic view that African Americans are inherently intellectually inferior (Williams, 1983). Moreover, "track levels in schools, reflective of the social and economic groupings in society, are provided with differential access to school opportunities that is likely to maintain or increase, rather than erase, the inequities in the larger social structure" (Oakes, 1986, p. 63).

Equal access and opportunities to learn mathematics are significant constructs in the mathematics education of African American students. Oakes (1990a) studied students' opportunities and access by analyzing data drawn from the National Science Foundation's 1985-86 National Survey of Science and Mathematics Education. Oakes examined the distribution of several critical schooling elements in both elementary and secondary schools across the nation. She examined such critical elements as mathematics and science programs, teachers, facilities and equipment, and classroom experiences. She contrasted schools serving students of different racial groups and with varying socioeconomic backgrounds to determine how these particular elements played themselves out in these schools.

Oakes (1990a) found that the science and mathematics experiences of children from low-income families, African American and Hispanic children, children who attend school in the inner-city, and children who have been clustered in low-ability classes were not significantly different than their White peers in the elementary grades. However, their experiences were strikingly different in the secondary grades. Oakes found that children from low-income families, African American and Hispanic children, and inner-city children had fewer opportunities to learn mathematics and science in the secondary grades. She asserted that these students had considerably less access to science and mathematics knowledge at school, fewer materials, equipment, and resources, less-engaging learning activities in their classrooms, and less-qualified teachers than their White peers. It is appropriate to conjecture that if African Americans do not have access to the content of mathematics, then disparities will continue to exist.

Further compounding issues of equality and equity are people's beliefs about who should acquire or have access to mathematical knowledge. According to Usiskin (1993), it is a commonly held belief that "if mathematics does not sort, then it is not real mathematics" (p. 18). Consequently, strongly held views of mathematics as a sorting agent may lead to all students *not* receiving the same mathematics education. Anderson (1990) argued that this view of mathematics as a sorting agent is an elitist view, meaning that only a select few can learn or do mathematics. Consequently, this elitist view leads to Sells' (1978) notion of mathematics as a critical filter. In this sense, mathematics acts as a gatekeeper for particular jobs and opportunities and is an influential factor in determining students' career designations. Those students who do not succeed in mathematics, including a disproportionately large number of African American students, have limited opportunities. Thus, mathematics ability levels may serve as sources of social stratification (Secada, 1989).

Mathematics education metaphorically takes on the form of a scientific pipeline (Berryman, 1983). African American children enter the pipeline at the same time (elementary school) as White school children but usually begin to exit the pipeline during middle school (Berryman, 1983). A more significant number of African Americans have exited the pipeline by the time they reach high school (Oakes, 1990b). Several factors influence African American students' decisions to leave the pipeline. Johnson (1984) argued that these factors include an absence of role models, a lack of significant others who have an interest in mathematics achievement, a failure to receive positive career counseling, a view of mathematics as a subject suited for White males, an inability to see the usefulness and relevance of mathematics, and a lack of success in previous mathematics courses. These factors are perhaps related to one another and may be rooted in how schooling practices have perpetuated unequal or inequitable education for African American students (Johnson, 1984).

Conceptualizing Explanations

Explanations of the disparities between mathematics achievement of African American and White students seem to be couched in biological, psychological, and sociological contexts (Jacob & Jordan, 1993). Three of the most prominent theories that have emerged over the past 30 years to explain the underachievement or underparticipation of African Americans are the IQ deficit theory, the cultural deficit theory, and critical theory (Jacob & Jordan, 1993). The IQ deficit theory proposes that disparities in achievement are results of genetic differences. Advocates of the IQ deficit theory (Garrett, 1971; Jensen, 1969) assert that African Americans' tendency to score at lower levels on IQ tests is largely due to innate intellectual inferiority. The cultural deficit theory focuses on the culture of poverty and, holding middle-class White culture as the norm, denotes that the culture of poverty is deficient in providing the experiences, attitudes, and values needed to succeed in school. Poor African Americans have been the focus of most work that falls under the umbrella of the cultural deficit perspective (Jacob & Jordan, 1993). Advocates of the cultural deficit theory (Deutsch & Associates, 1967; Hunt, 1967) argue that poor African Americans are deficient in child-rearing practices and communication styles that foster academic achievement. Alternatively, critical theory examines the role of society and schools in the educational achievement of African American students (Jacob & Jordan, 1993). Critical theory brings into question schools or schooling practices as complementing agents in maintaining the existing oppressive social structure.

The IQ deficit theory has been largely discredited because heritability, the concept on which this theory rests, "does not take into account the fact that genes can influence test scores indirectly by interacting with the environment in which an individual develops" (Jacob & Jordan, 1993, p. 4). For example, if a nation refuses to send children with red hair to school, then the genes that cause red hair can be said to be the reason for low reading scores. Thus, this notion automatically attributes the entire effect of low reading scores to genes and none to the environment (Jencks et al., 1972).

Critics of the cultural deficit theory argue that the concept of culture is applied inappropriately in this theory by approaching lower-class groups from an ethnocentric, middle-class point of view (Jacob & Jordan, 1993). Further, little attempt is made to understand lower-class groups' behaviors from their own perspectives, and the heterogeneity of ethnicity, language, and culture that exists among people with low incomes is ignored (Jacob & Jordan, 1993).

Placing an emphasis on deficits may lead to contentions such as, "If African Americans do badly in school, we must discover what is wrong with them!" (Boykin, 1986). Ginsburg and Russell (1981) refuted theories focusing on deficits and argued that certain aspects of abstract mathematical competence require no

schooling and appear at about the same age in all cultures. In their study of young African American children, Ginsburg and Russell found that these children had no more difficulty with mathematical reasoning than any other group. Taking more of a critical theory stance, Ginsburg (1972, 1984) argued that the school performance of African American children is affected by social, political, and motivational factors. Moreover, "the academic performance of [African American] children in America has little to do with their race or their genes: it is a consequence of the structure of society as a whole" (Neisser, 1986, p. 4).

African American Culture

Since race and ethnicity are categories laden with cultural beliefs and biases that are often unconscious, it is essential to consider cultural orientations when addressing issues of equity. Some scholars (Boykin 1986; Ogbu, 1986) believe there are characteristics inherent in African American culture explaining race-related differences existing in school performance and explaining the academic success or failure of African American students.

What makes children succeed in learning and demonstrating what schools teach them is not merely the type of genes they bring to school, the type of homes or environment they come from, or their cultural language, interactional or cognitive styles. It is, instead, a combination of two factors: the diligence with which schools teach the children; and how the students perceive and respond to schooling. (Ogbu, 1986, p. 40)

How students perceive and respond to schooling is influenced by their cultures, orientations, and their social realities.

Ogbu (1986) argued that there coexists several minority groups, some of whom succeed in school and some of whom do not. Ogbu suggested that there are three types of minority groups—autonomous, immigrant, and castelike minorities—and the classification of these groups distinguishes those who succeed in school from those who do not. Autonomous minority groups include such ethnic groups as the Amish, the Jews, and the Mormons in the United States. Autonomous minorities are not totally subordinated politically and economically by the dominant group (Whites) and are not forced to play denigrated roles.

Immigrant minorities such as the Chinese, Filipinos, Japanese, and Koreans in the United States have come to America voluntarily to improve their economic, political, or social status. They may be subordinated politically and economically initially, but they view their conditions as much better than the conditions they left behind in their native country. Also, they have the symbolic option of returning to their native country (unless they are political émigrés) if conditions worsen in America.

African Americans, Native Americans, and Mexican Americans are castelike minorities since they were incorporated into the country involuntarily and permanently through slavery or conquest. Specifically, Africans, now African Americans, were brought to America as slaves and were relegated to menial positions and status after emancipation.

Ogbu (1986) asserted that castelike minorities lack political power, and this is reinforced by economic subordination. Moreover, castelike minorities' structural subordination is reinforced by the ideology of the dominant group that rationalizes the menial status of the castelike minorities. As being members of a subordinate group in a stratified racial caste, African Americans face a job ceiling:

> A job ceiling is the result of the consistent pressures and obstacles that selectively assign

> [African Americans] and similar minorities to jobs at the low level of status, power, dignity, and income, while allowing Whites to compete more easily and freely, on the basis of individual training and ability or educational credentials, for desirable jobs above that ceiling. (Ogbu, 1986, p. 30)

Ogbu argued that African Americans usually resist the dominant group's ideology of rationalizing the menial positions of African Americans. In this sense, African Americans tend to resist school and the ideology of school because they view schooling as characteristic of the dominant group. Those African Americans who take this particular stance believe their economic, political, and social problems are due to *the system* . They believe their problems are enduring and see little chance of achieving middle-class positions (Ogbu, 1986). Therefore, schooling and behaving like the dominant culture are not viewed as avenues for self-betterment. Rather, these African Americans believe that manipulating or changing the system gives them a better chance of advancement (Ogbu, 1986).

Fordham (1988) asserted that individual African Americans who manage to break through the job ceiling described by Ogbu (1986) were once deemed by African Americans as representative of the advancement of African American people. Fordham said that in recent years, African Americans in general seem to take a different stance toward social mobility. They no longer take as evidence the accomplishments of individual African Americans as the advancement of the entire group. "Success now means that [African Americans] must succeed *as a people* , not just as individual [African Americans]" (Fordham, 1988, p. 54).

Ogbu (1986) and Fordham (1988) make the case that all African Americans generally have the same orientations to the world and the same social realities. Particularly, Ogbu's and Fordham's arguments do not take into account individual African Americans. It is important to be attuned to African American students' individual orientations in order to understand their mathematics education. It is the author's contention that how African American students view their membership in African American culture may give insight into problems that exist in particular African American students' mathematics education.

Ogbu (1986) contended that African Americans tend to act in various ways (e.g., resistance to school) that are in opposition to dominant culture. He termed this resistance, *cultural inversion* , which may be defined as "a tendency to regard a cultural behavior, event, entity of meanings as *not* [African American] because it is characteristic of Whites or vice-versa" (Ogbu, 1986, p. 48). Ogbu asserted that cultural inversion is manifested in education in the sense that academic success is perceived by some African American students as characteristic of White culture. Thus, those African American students who are successful in school are condemned as "acting White." However, athletics are deemed by African American students as *legitimate* African American activities, and those African American students who excel in athletics are praised. Ogbu stated that cultural inversion is a coping mechanism that some African American students use to coexist with dominant culture.

Boykin (1986) argued that the coexistence of African Americans and White Americans is framed in a *triple quandary* in which African Americans participate. Boykin asserted that in this triple quandary—the mainstream experience, the minority experience, and the African American cultural experience—there is constant interplay among these three realms of experiential negotiation. Boykin explained that all members in the society participate in the mainstream realm of negotiation. African Americans participate in this realm through work systems, judicial systems, and bureaucratic systems. However, their participation is "tempered by concomitant negotiation through the minority and [African American] cultural realms" (Boykin, 1986, p. 66). Boykin argued that this participation is also tempered by the hegemony or social domination of White Americans.

"The minority experience is based on exposure to social, economic, and political oppression" (Boykin, 1986, p. 66). Consequently, the minority experience produces adaptive responses for African Americans. African Americans have developed defensive postures to cope with the predicament created by oppressive forces. From Ogbu's (1991) perspective, these defensive postures are usually manifested in education by resistance to schooling.

Boykin (1986) explained the African American cultural experience as having a culturally indigenous basis from which African Americans interpret and negotiate social reality. Boykin asserted that the African American cultural experience is rooted in traditional African ethos, and interrelated dimensions of African American culture include spirituality, harmony, movement, verve, affect, communalism, expressive individualism, oral tradition, and social time perspective. These dimensions are prominent in the way African Americans interpret and view the world (Boykin, 1986).

The triple quandary that Boykin (1986) posits indicates that the constant interplay among these three realms of negotiation create conflict and struggle. In this sense, African Americans are incompletely socialized to the White American cultural system, the mainstream experience, meaning they share many social aspects with the dominant group that is oppressing them. African Americans are victimized by racial and economic oppression, the minority experience, meaning they constantly deal with the facts of poverty and oppression. Finally, African Americans participate in a culture, African American cultural experience, that is at odds with mainstream ideology, meaning they maintain a cultural identity that is particularly difficult to reconcile the beliefs and values of dominant culture (Boykin, 1986; Neisser, 1986).

Boykin's notion of the triple quandary categorizes African Americans' social orientations. This is problematic in the sense that Boykin speaks of African Americans in generalities which reinforces rather than eradicates stereotypes. It is important that scholars seek to understand individual African American students' social orientations and how they relate to their mathematical experiences.

Several scholars (Boykin, 1986; Prager, 1982) have indicated that African Americans struggle with two cultural systems: what is deemed in mainstream society as ideal—the ideology, values, and beliefs of dominant culture—and traditional African propensities. That is, these scholars believe the African American experience is fundamentally bicultural. Prager (1982) referred to the biculturality of African Americans as trying to fuse two cultural traditions or cultural frames of reference that are incommensurable:

> It is not the mere fact that [African Americans] hold a dual identity which has constrained achievement; to one degree or another, every ethnic and racial group has faced a similar challenge. The [African American] experience in America is distinguished by the fact that the qualities attributed to [being African American] are in opposition to the qualities rewarded by society. The specific features of [being African American], as cultural imagery, are almost by definition those qualities which the dominant society has attempted to deny in itself, and it is the difference between [being African American] and [being White] that defines, in many respects, American cultural self-understanding. For [African Americans], then, the effort to reconcile into one personality images which are diametrically opposed poses an extraordinarily difficult challenge. To succeed in America raises the risk of being told—either by Whites or by [African Americans]—that one is not "really [African American]." No other group in America has been so acutely confronted with this dilemma, for no other group has been simultaneously so systematically ostracized while remaining so culturally significant. (p. 111)

Prager makes the case that African Americans possess special qualities that are completely opposed to White cultural frame of reference. However, it is unclear from Prager's remarks what these special qualities

might be. Although Prager's contentions seem strong, what is important about his remarks is whether African American students perceive their culture as in opposition to White culture. How these perceptions come into play in schooling may be rooted in how African American students view their culture. For instance, if African American students perceive mathematics as a discipline for Whites, then whether or not they perceive their culture as a counter-culture to White culture becomes an important construct in African American students becoming successful with school mathematics.

Boykin (1986) asserted that there are several characteristics of the African American and White American experiences that are sharply at odds. These characteristics respectively African American vs. White American include: spiritualism vs. materialism; harmony with nature vs. mastery over nature; organic metaphors vs. mechanistic metaphors; expressive movement vs. impulse control; interconnectedness vs. separateness; person-to-person emphasis, with a personal orientation toward objects vs. person-to-object emphasis, with an impersonal (objective) orientation toward people. Boykin argued that "this incommensurability makes it difficult to put [African American] cultural reality in the service of attainment in [White] American cultural institutions, such as schools" (Boykin, 1986, p. 63).

Boykin's list of characteristics suggests stereotypes, indicating that African Americans belong to a particular category (including their orientations toward the world) and White Americans belong to a completely opposed category. It is perhaps more advantageous for scholars, namely, researchers, to endeavor to make sense of how African American students perceive themselves as African Americans and how their ethnicity plays a role in their mathematics education.

Along similar lines, Stiff (1990) and Stiff and Harvey (1988) argued that African American students' cultural frame of reference is opposed to the culture of the traditional mathematics classroom. They asserted that the attributes of students who are successful with school mathematics are at odds with the attributes associated with African American cultural frame of reference. Such attributes of successful students include working independently, being direct and concise, valuing direct and efficient methods of obtaining information, using accepted (elaborate) syntactical discourse, and responding in an orderly and structured matter in classroom situations (Stiff, 1990). By contrast, African American cultural frame of reference entails attributes that include working in support groups, telling tangential stories that may or may not relate to the problem, valuing the personal relationship that can be nurtured, using a "conversational style" discourse, and perhaps leaving one's seat to answer a question (Stiff, 1990). These attributes associated with African American cultural frame of reference are usually condemned in traditional mathematics classrooms (Stiff, 1990; Stiff & Harvey, 1988), sending a message to African American students: "You are not the type of mathematics student we want" (Stiff, 1990, p. 156).

Stiff (1990) and Stiff and Harvey (1988) call into question inequities in traditional mathematics classrooms due to the lack of affirming differences in students' social and cultural orientations. Similar to Stiff (1990), Grant (1989) argued that the classroom environment should not accentuate colorblindness, meaning that teachers should accept and affirm learning style differences based on cultural orientations. What becomes tricky is whether this implies that teachers should treat all students the same (equally) or differently based on their culture. Perhaps it is essential to speak in terms of attending to the needs of all students rather than in terms of equal treatment. As such, equity becomes less confusing. Attending to the needs of all students means that teachers must take into account the cultural, socioeconomic, and political realities that students of color face (Gay, 1983). Gay (1983) argued that "without some understanding of ethnic heritage, values, priorities, and perspectives it is impossible for teachers to interact most constructively with ethnic students, or relate subject matter content and schooling processes to their experiential and cultural frames of reference" (p. 81).

The Charge to Create a Dialogue

As mathematics educators embrace the charge of reform documents (NCTM 1989, 1991, 1995) that accentuate "opportunity for all" and "mathematical literacy for all," a monumental challenge for mathematics educators is to question those schooling practices that undermine the charge and work to maintain the existing oppressive social structure. A fundamental challenge for mathematics educators is to question the role that education and schooling play in perpetuating the inequalities and inequities that exist in the mathematics education of African American students. "Education does not simply reproduce the inequality existing outside itself; it plays an active part in reinforcing the differences and inequalities that already exist" (Campbell, 1995, p. 238).

It seems then that a fundamental question for mathematics educators is how to incorporate issues of diversity (e.g., multiculturalism) in mathematics teacher education programs. Mathematics teacher education programs need to embellish educational practices that embody equity and counter oppression. Moreover, mathematics educators should raise the critical social consciousness of preservice teachers and help them reflect on the nature of structural oppression as it affects the culturally diverse student. Consequently, this reflection may lead to ways to improve the mathematical experiences of African American students.

With complex ethnic and social ramifications apparent in schooling, it is important to conceptualize issues of equity and equality and their roles in the mathematics education of African American students. Making sense of problems and explanations is the first step in finding solutions.

Vivan R. Moody is assistant professor of the College of Education at the University of Alabama. She obtained her doctorate at the University of Georgia and is currently working in the area of teacher education in secondary mathematics education. Her research interests are the mathematical experiences of African American students and preservice mathematics teachers' beliefs about cultural diversity. Her email is vmoody@bamaed.ua.edu. This article is based on her dissertation (Moody, 1997), directed by Dr. Patricia S. Wilson.

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