NATIONAL FORUM OF APPLIED EDUCATIONAL RESEARCH JOURNAL
VOLUME 19, NUMBER 3, 2006

The National Dilemma Of African American Students: Disparities In Mathematics Achievement And Instruction

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ABSTRACT

A significant number of African American students are failing mathematics courses. Identifying the causes of the students failing mathematics courses will solve a problem that has existed for almost a century. Current research will state that disparities in mathematics exist in American schools. This article will present reasons why African American students are facing the disparities in mathematics achievement and instruction. These disparities translate into real differences in the services that are provided African American students in schools in America. Efforts to rectify these inequalities are aimed at closing the achievement gap between the populations. Consequently, making American schools adequate learning institutions for all students is an on-going challenge.

Evidence of disparities in mathematics achievement continues to show up in students' assessment scores, course enrollment patterns, and allocation of resources in American schools. When examining the achievement disparities and the achievement levels of African American students, as well as other ethnic groups, researchers are becoming increasingly dismayed. Studies show that African American students receive mathematics instruction that is not consistent with mathematics

education reform. The mathematics instruction that many African American students receive is in opposition to their culture styles and learning preferences (Lubienski, 2001).

Disparities in Mathematics and Instruction for African American Students

The purpose of this essay is to present reasons why the disparities in mathematics and instruction for African American students. Studies indicate that African American students' mathematics achievement levels are indicative of the instruction that they receive. Data collected on teachers' instructional practices indicate differences between African American students and their peers. NAEP data suggest that most African American students are not experiencing instructional practices consistent with the recommendations suggested by the National Council of Teachers of Mathematics (NCTM), whereas more white students are experiencing NCTM standards-based instruction (Lubienski, 2001). African American students in grade eight reported that their teachers were less likely to emphasize reasoning and non-routine problem solving when compared to national responses (Strutchens and Silver, 2000). Teachers of African American students reported having as much access to technology as those of white students; however, there are differences in how the technology is used. African American students were more likely to use computers for drill and practice or games, whereas their white counterparts were more likely to use computers for simulations, demonstrations, or application of concepts (Lubienski, 2001). Teachers of African American students were more likely to use worksheets on a daily basis than teachers of white students (Strutchens and Silver, 2000). Fifty-eight percent of African American eighth grade students agreed that mathematics is mostly memorizing facts, which is significantly more than the 40 percent reporting nationally (Strutchens and Silver, 2000). Furthermore, African American students were more likely to have teachers who reported no use of calculators in mathematics class and to have teachers who reported not allowing calculator use on assignments. (Lubienski (2001) reported that the gaps between African American and White students in technology use and instructional practices are not attributed to socioeconomic differences, but to race.

NAEP data have been used to show that several factors, such as socioeconomic status, school policies, allocation of human and material resources, and classroom instructional practices, may account for performances disparities in mathematics (Oakes 1990; Secada 1992; Tate 1997). NAEP results show that, as a group, African American students typically score below their peers in all mathematics content area. Many studies have examined the factors related to academic achievement (e.g., Gross; Reynolds and Walberg, 1992a). Various models of educational productivity have been proposed and examined in efforts to define the major factors related to academic achievement. Although the models vary, research findings reveal some common underlying factors, including exposure to instruction, attitude toward subject matter, and parental support (Reynolds and Walberg 1992a)

Testing Racial Differences in Mathematics Achievement

To test racial difference in mathematics achievement, researchers examined data on 683 African American students and 683 randomly chosen European American students from the United States population who represented age thirteen in the Second International Mathematics Study (SIMS). The first purpose of the researchers study was to determine whether the mean scores of mathematics achievement, exposure to instruction, attitude toward mathematics, and parental support were different for African American and for European American students. The second purpose was to examine a structural model of mathematics achievement, according to which the mathematics achievement of eighth-grade students was considered to be related to (1) exposure to mathematics instruction and (2) parental support (Reynolds and Walberg 1992a), controlling for gender and socioeconomic status (SES) (as measured by the fathers' occupational status). In addition, parental support was considered to be related to attitude toward mathematics (Majoribanks, 1987), controlling for gender and SES. The researchers did not hypothesize, however, that exposure to instruction was influenced by other factors because the eighth graders in the study had not had a choice in the classes they had taken. The relationship between mathematics achievement and attitude toward mathematics was hypothesized to be significant and positive (Tocci and Engelhard 1991).

Race-Related Educational Research – European American Students

One of the most consistent findings in race-related educational research is that European American students tend to perform better on academic tasks than do African American students (Hall, Howe, Merkel, and Lederman, 1986). In the area of mathematics, Matthews (1984) found that African American students consistently scored below the national average on standardized tests of mathematics achievement: according to Hall et al. (1986), they consistently scored below European American students. In National Assessment of Educational Progress data (Owen, 1991), African American students ranked approximately 11 percentage points below the national average at age 9, 15 percentage points below the national average at age 13, and 17 percentage points below the national average at age 17 in mathematics. Although many studies have shown a substantial correlation between race and academic achievement, they did not consider the important factors the researchers are looking at here, exposure to instruction, attitude toward subject matter, and parental support. Furthermore, those studies did not control for SES and gender. The National Assessment of Educational Progress (NAEP) report has shown the positive effects of exposure to mathematics instruction on mathematics achievement (Reynolds and Walberg 1992a). The mathematics scores of high school seniors who took the NAEP mathematics test were positively correlated with the highest course taken and with the number of mathematics courses completed.

National Council of Teachers of Mathematics – Profound Influence on Reform

The National Council of Teachers Mathematics (NCTM) has had the most profound influence on reform in mathematics education with the publications of its curriculum, professional teaching, and assessment documents in 1989, 1991, 1995, and 2000. The documents recommend standards for the mathematics curriculum in grades pre-K to 12, professional standards for mathematics educators, and assessment standards for evaluating the quality of both student achievement and curriculum. NCTM documents acknowledge that cultural experiences, social background, and gender of students have been ignored in mathematics education and that differences among students are not taken into account in the teaching and learning of mathematics. Principles and Standards for School Mathematics (PSSM) (NCTM, 2000) highlighted equity by making it the first principle for reform of school mathematics: "Excellence in mathematics education requires equity; raising expectations for students' learning, developing effective methods of supporting the learning of mathematics by all students, and providing students and teachers the resources they need" (p. 12). PSSM offers a broad view of what it takes to accomplish equity. That includes having high expectations for all students, accommodating for differences, and equitable allocation of human and material resources.

Principles and Standards for School Mathematics Captures Inequities

PSSM captures the essence of some conditions that lead to inequities in a school context by acknowledging that 1) low expectations negatively impact marginalized students in mathematics, 2) access to quality mathematics is not always equitable, and 3) allocation of material and human resources is not always equitable (NCTM, 2000). PSSM addresses equity as it relates to curriculum, instruction, and assessment neither situates equity within the larger societal context nor offers suggestions for building an infrastructure for equity in mathematics education. Like the PSSM, other NCTM Standards documents the Assessment Standards for School Mathematics (NCTM, 1995). Professional Standards for Teaching Mathematics (NCTM, 1991), and Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989) situates equity only within the context of curriculum, instruction, and assessment. These Standards documents also recognize that inequities exist in mathematics education but they fail to address the causes and roots of inequities.

According to PSSM (NCTM, 2000), equity should be a goal for mathematics education. If equity is a goal in mathematics education, then mathematics educators must develop an infrastructure for equity comparable to the infrastructure developed that guided reform in curriculum materials, assessment, and pedagogy Weissglass, 2000). Too often, race, racism, and social justice are relegated as issues not appropriate for mathematics education when actually these issues are central to the learning and teaching

of mathematics for all students. Building an infrastructure for equity in mathematics requires understanding the causes and roots that leads to inequities (Apple, 1999); and is necessary to bring about changes in policies, practices, and people (Weissglass, 2000).

African American Students Lack Access to Qualified Teachers

Curriculum inequalities are exacerbated by Black students' lack of access to qualified teachers, high-quality materials, equipment, and laboratories, among other things. Despite the rhetoric of American equality and the effects of school desegregation and finance reform, the school experiences of African American and other minority students in the United States continue to be substantially separate and unequal. Nearly two-thirds of minority students attend predominantly minority schools, and one-third of Black students attend intensely segregated schools (90% or more minority enrollment) (Orfield, Monfort, & Aaron, 1989), most of which are in central cities.

Disparities and Inequalities Persist

Although some progress has been made since Brown v. Board of Education, dramatic disparities persist. Jonathan Kozol's 1991 Savage Inequalities describes the striking differences between public schools in urban settings; schools whose population is between 95 and 99% non-White; and their suburban counterparts. While Chicago public schools spent just over $5,000 per student in 1989, nearby Niles Township High School spent $9,371 per student. While central city Camden, New Jersey schools spent$3,500 that year, affluent suburban Princeton spent $7,725 per student. Schools in New York City spent $7,300 in 1990, while those in nearby suburbs like Manhasset and Great Neck spent over $15,000 per student for a population with many fewer special needs (p. 236-237).

Savage Inequalities (Kozol, 1991) is replete with familiar yet poignant stories. For instance at MacKenzie High School in Detroit word processing courses are taught without word processors because the school cannot afford them (p. 198). Public School 261 in New York City has no windows in many classrooms and recess is not possible because there is no playground (pp. 85-87). East St. Louis Senior High School's biology lab has no laboratory tables or usable dissecting kits (p. 28). Meanwhile, children in neighboring suburban schools enjoy features like a 27-acre campus (p. 65), an athletic program featuring golf, fencing, ice hockey, and lacrosse (p. 157), and a computer hookup to Dow Jones to study stocks transactions (p. 158).

The disparities in physical facilities are the tip of the iceberg. Shortages of funds make it difficult for urban and poor rural schools to compete in the marketplace for qualified teachers as well as to provide the equipment and learning materials students

need. When districts do not find qualified teachers, they assign the least able individuals to the students with the least political clout. In 1990, for example, the Los Angeles City School District was sued by students in predominantly minority schools because their schools were not only overcrowded and less well funded than other schools; they were also disproportionately staffed by inexperienced and unprepared teachers hired on emergency credentials. Unequal assignment of teachers creates ongoing differentials in expenditures and access to educational resources; including the knowledge well-prepared teachers rely on in offering high-quality instruction. (Rodriguez et al. v. Los Angeles Unified School District, Superior Court of the County of Los Angeles #C611358. Consent decree filed August 12, 1992). In 1999, students in California's predominantly minority schools were 10 times more likely to have uncertified teachers than those in predominantly White schools (Shields et al., 1999). A recent lawsuit brought in California documents the conditions in more than 100 schools serving minority students where facilities are unsafe and inadequate; textbooks and other supplies are unavailable; and most of the staff is untrained and uncertified (Williams et al., State of California, Supreme Court of the State of California, filed June, 2000).

Disparities in teaching quality are a long-standing reality for African American students. In "Closing the Divide," Robert Dreeben (1987) describes the results of his study of reading instruction and outcomes for 300 Black and Whites first graders across seven schools in the Chicago area. He found that differences in reading outcomes among students were almost entirely explained, not socioeconomic status or race, but by the quality of instruction the students received.

Concluding Remarks

In conclusion, we have identified what researchers have documented on disparities in mathematics and instruction for African American students. This article also found that the quality of instruction received by African American students, on average, was much lower than that received by Whites students, thus creating a racial gap in aggregate achievement at the end of first grade. In fact, the highest ability group in Dreeben's sample was in a school in a low-income African American neighborhood. These students learned less during first grade than their lower aptitude White counterparts because their teacher was unable to provide the quality instruction this talented group deserved.

Curricular differences like these are widespread, and they explain much of the disparity between the achievement of White and minority students and between those of higher and lower-income levels (Lee & Byrk, 1988; Oakes, 1985). When students of similar backgrounds and initial achievement levels are exposed to more and less challenging curriculum material, those given the richer curriculum opportunities outperform those placed in less challenging classes (Alexander & McDill, 1976; Gamoran & Behrends, 1987; Oakes, 1985).

Finally, American schools must accept the challenges of instructing African American students. The next century must reflect an upswing in the success of student learning in the African American community. America's schools are equipped to educate all students!

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Formatted by Dr. Mary Alice Kritsonis, Chief National Research and Manuscript Preparation Editor, NATIONAL FORUM JOURNALS, Houston, Texas.
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