Examining Disparities in Mathematics Education: Achievement Gap or Opportunity Gap?

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The so-called achievement gap in mathematics is reframed as a problem of unequal opportunities to learn experienced by many low-income students and many Latino and African American students. First, data are presented showing striking and persistent differences on standardized tests among students of different ethnic groups, and socioeconomic levels. Then evidence is presented demonstrating that opportunities to learn mathematics are not equally distributed among all students. Specifically, data show that African American, Latino, and low-income students are less likely to have access to experienced and qualified teachers, more likely to face low expectations, and less likely to receive equitable per student funding. The final section discusses how teachers and schools can provide more equitable opportunities to learn mathematics for all students.

Finding a proper way to frame a problem gives us not only a better understanding of it but also impacts the ways in which we address the problem and make efforts to solve it. For example, in medicine it is important not only to address the symptoms of a person's illness, but also to treat the underlying cause. When a child has a high fever due to an infection, it is not enough to give the child treatment to bring the temperature down; it is crucial to give the child medicine to combat the infection. Likewise in education, while it is important to recognize a symptom such as low achievement, it is even more critical to understand and address its underlying causes. Changing the way in which the disparity of performance in mathematics among different groups of students in our schools is framed as a problem can lead to a productive investigation into understanding the causes for these disparities and how to address them.

There are considerable differences in performance on national and state mathematics tests between different groups of students, the most commonly examined comparisons being by ethnic group and income level. Often the unequal performance of Latino and African American students compared to European

American students is described as an achievement gap. It is not uncommon to see statements like the following:

> Students of color continue to lag behind white students and some Asian students, and the so-called academic achievement gap still exists. (A state superintendent of public instruction, as quoted by Heffter, 2006)

> Across the U.S., a gap in academic achievement persists between minority and disadvantaged students and their white counterparts. (National Governors' Association, 2005)

What kind of images do we form about the students who lag behind after reading such statements? What kind of assumptions, conscious or subconscious, do we make about their capacity for learning? Do we ask why their performance is worse? Stopping with only an examination of the symptoms often leads too easily to a focus on student characteristics as the cause.

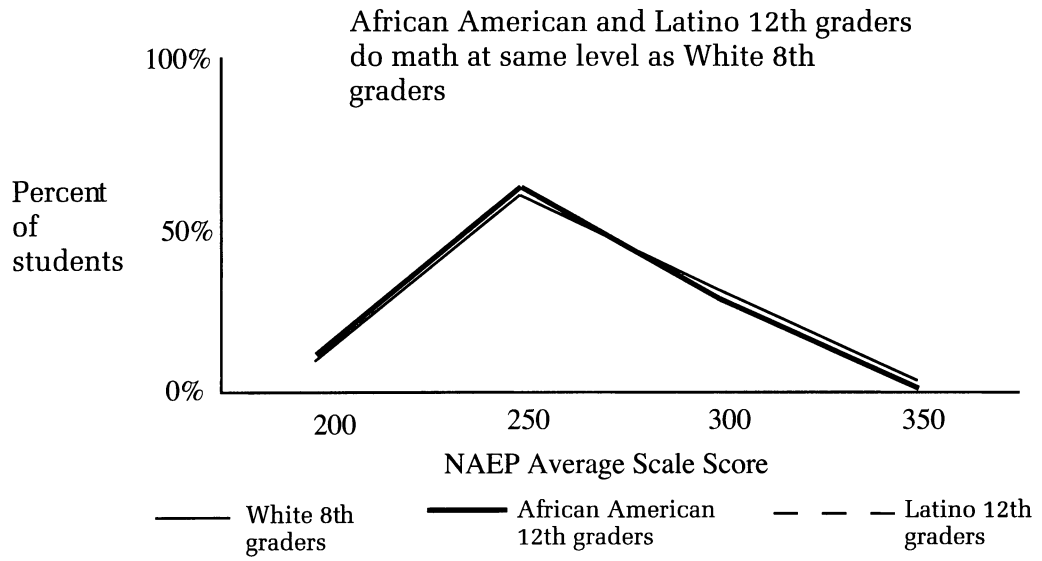
Blanket statements about the low performance of certain groups of students in our schools without mentioning the underlying causes may reinforce prejudices and stereotypical images. Unfortunately, such prejudices are not uncommon, with some authors even claiming that Latino and African American students are less teachable. For example, Greene and Foster (2004) state that being *minority* is a disadvantage students bring to school and claim that as the percentage of White (non-Hispanic) students decreases in a school, the "teachability index" decreases, too.

In developing a better understanding of the problem of low achievement in mathematics, I first present data that show striking and persistent differences in performance on state and national assessments between different groups of students in our schools. Following this description of the symptom, I examine data related to opportunities to learn in an effort to better understand the underlying causes of the "achievement gap." These data show that Latino, African American, and low-income students are not as likely to have the same opportunities to learn in our schools as other groups. Having identified inequitable opportunities, I suggest ways in which teachers and schools can provide better access to opportunities to learn mathematics for all our students.

The Achievement Gaps

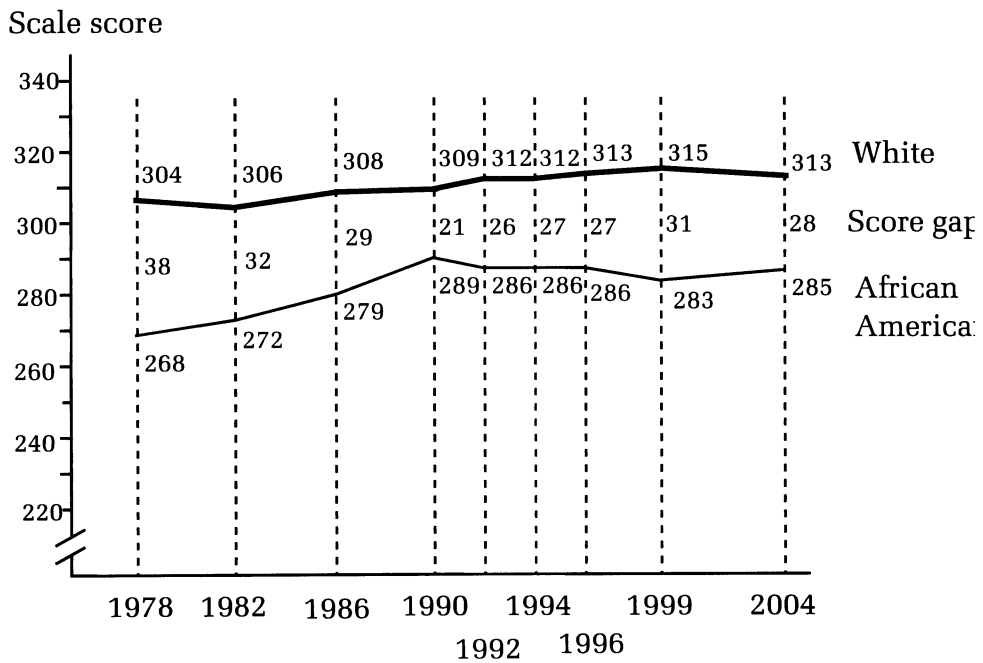
In this section, I present data that show significant gaps in mathematics achievement that have not closed considerably over the last three decades. By eighth-grade, 91% of African-American and 87% of Latino students are not proficient in mathematics, as measured by the National Assessment of Educational Progress (NAEP). This stands in stark contrast to the lower proportions of Asian American (53%) and White (63%) students who are not proficient (Haycock, 2006). In fact, 12th grade Latino and African American students perform as well as 8th grade White students on NAEP's mathematics assessment (see Figure 1) (Wilkins et al., 2006). When assessing the depth of students' understanding of mathematics, the disparity is even greater than for multiple-choice items. For example, on the 2000 NAEP mathematics test the average score of African American eighth-grade students for multiple choice items was 72% of the average score of European American students; for extended constructed-response tasks the average score of African American students was 32% of that of European American students (Strutchens, Lubienski, McGraw, & Westbrook, 2004, p. 279).

This gap in mathematics performance has been very slow to close. Despite some narrowing of the gap in the 1970s and 1980s, since 1988 the gap has widened somewhat or remained about the same (Figure 2). There is also a considerable gap in test performance between students from poor families and those from non-poor families. Only 13% of students from poor families are at the proficient or advanced levels compared to 38% of students from non-poor families (Wiener, 2006).



Source: Wilkins et al., 2006. ©The Education Trust. Used with permission.

Figure 1. NAEP performance for different groups.



Source: Perie, Moran, & Lutkus, 2005, p. 42

Figure 2. Mathematics score gap between 12th grade White students and African American students, 1978–2004.

These data make clear that students from some groups are not learning as much in our schools as students from other groups. This can often lead people to jump to the conclusion that group characteristics are to blame. Researchers have studied several aspects outside the school system to try to explain the differences in school achievement among various populations, such as differences in intelligence (Jensen, 1969; Bodmer & Cavalli-Sforza, 1973), poverty and deprivation (Guo, 1998), cultural disadvantage and deprivation (Carter, 1970), cultural and language discontinuities (Ogbu & Matute-Bianchi, 1986), and the quality of the family's life style (Clark, 1983). I argue, however, that it is important to analyze the practice and the structure of classrooms, schools, and districts to seek responses to two important questions: *Why do such disparities in school achievement exist?* and *What are the causes of these gaps?*

The Opportunity Gaps

Shifting the frame from looking at measures of educational outcomes to examining what students actually experience in schools results in a very different way of describing disparities among students in schools. This new frame calls attention to the fact that African American and Latino students are less likely than White students to have teachers who emphasize high quality mathematics instruction, and appropriate use of resources. For example, African American and Latino students are less likely than White students to have access to:

- teachers who emphasize reasoning and nonroutine problem solving;
- computers; and,
- teachers who use computers for simulations and applications (Strutchens & Silver, 2000)

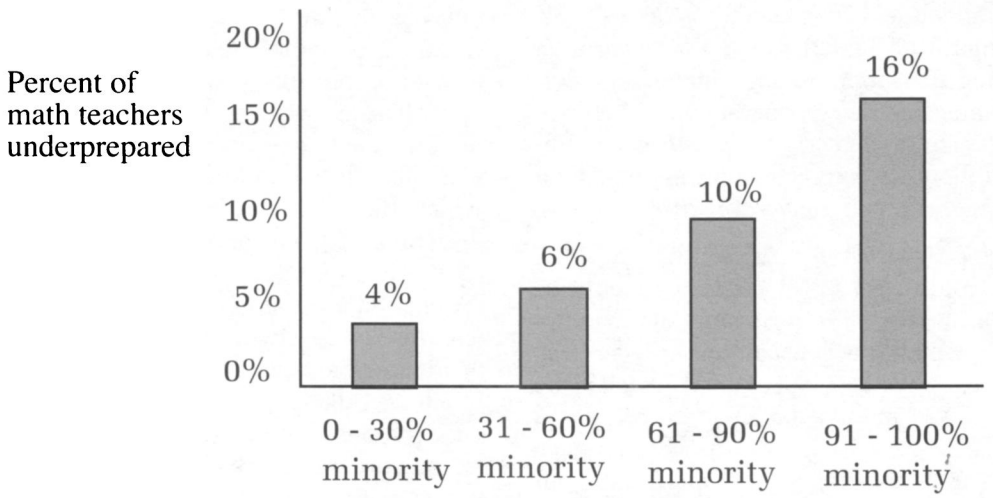
The data that follow describe how African American and Latino students are less likely to have access to qualified and experienced teachers, are more likely to face low expectations, and are less likely to receive equitable per student funding.

Access to Experienced and Qualified Teachers

Teacher quality, as measured by experience and qualifications, is inequitably distributed by ethnic groups and economic class. Classes in schools serving mostly African American and Latino students are twice as likely to be taught by inexperienced teachers (with three years of experience or less) as classes at schools where there is a majority of White students (Wilkins et al., 2006). Classes in high poverty schools are also more likely to have inexperienced teachers. The percentage of inexperienced teachers in low poverty schools is 11% whereas in high poverty schools it is 20% (Mayer, Mullens, & Moore, 2000).

Looking at teacher qualifications, the least prepared teacher recruits are disproportionately found in under-resourced, hard-to-staff schools serving predominantly low-income and minority students in central cities and poor rural areas. Thus, students who most need highly skilled teachers are least likely to have them, further magnifying inequalities (Darling-Hammond, 2001). For example, in California, the percentage of under-prepared teachers in mathematics (who do not hold full credentials) rises as the percentage of minority students increases (see Figure 3) (Esch et al., 2005).

Out-of-field teaching—teachers who do not have at least a minor in the subject area they teach—has been a problem in mathematics for quite some time, and improvement has been slow. More classes in high poverty schools are taught by out-of-field teachers (34%) than in low poverty schools (19%). Classes in high schools and middle schools with high percentages of Latino and African-American students are also more likely (29%) to be taught by teachers who lack even a minor in the subject area compared to schools with low percentages of minority students (21%) (Jerald, 2002). For core academic classes taught by of out-of-field teachers between 1994 and 2000, the percentages in low-poverty and low-minority schools remained essentially unchanged. However, there was a significant increase in the percentages of core academic classes taught by out-of-field teachers, from 29.0% to 33.6% in high-poverty schools, and from 24.5% to 29.2% in high-minority schools (Jerald, 2002).



Source: Esch et al., 2005, p. 75

Figure 3. Percentage of mathematics teachers who are under-prepared versus schools' percentage of minority students.

Opportunity to Benefit from High Expectations for Achievement

While about 88% of teachers are White, more than one-third of the students in the U.S. are ethnically and culturally diverse (Ladson-Billings, 2005). In states like California and Texas, and in many of the largest school districts across the country, "minority" students are now over 50% of the student population. Often, students whose ethnic or cultural background differs from that of their teachers are put in situations where the teacher assumes deficits in the students, rather than locating and teaching to their strengths, such as resilience, eagerness, energy, and creativity. Teachers may attribute the failure of a student to thrive intellectually to a deficit in the student rather than a deficit in their own teaching. As a consequence, teachers may be teaching less when they should be teaching more (Delpit, 1992). Linda Bol and Robert Berry (2005) found that middle and high school teachers were most likely to "attribute the achievement gap to student characteristics such as differences in motivational levels, work ethic, and family support" (p. 32).

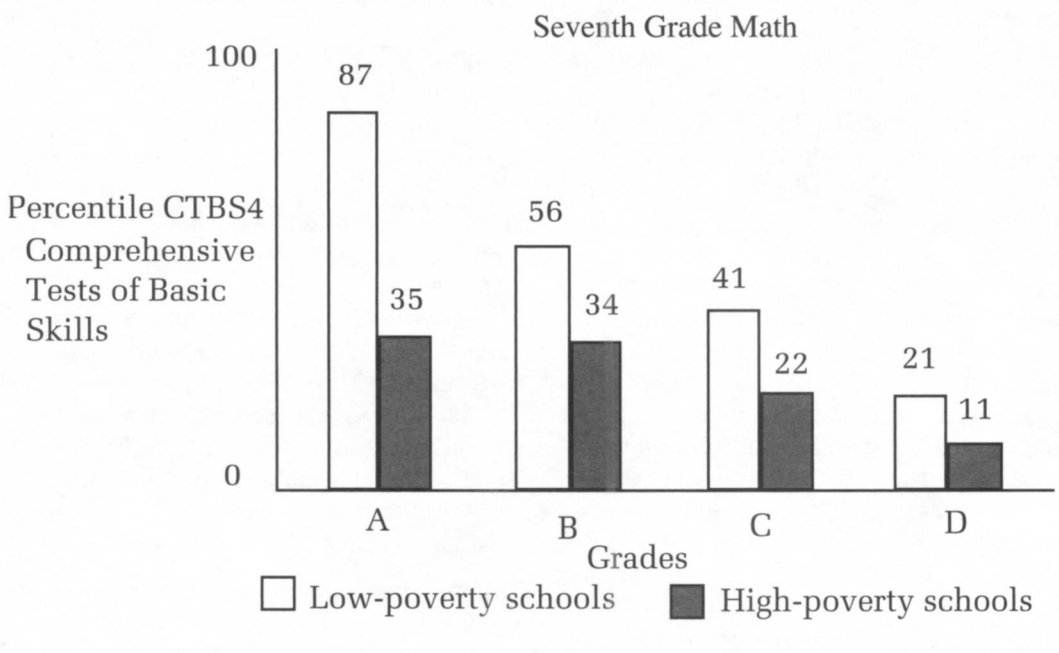
Many mathematics teachers fail to use the culture of African American students in instruction. This can result in a school culture that is alienating to many African American students and inconsistent with their own cultural experiences, dreams, hopes and struggles (Malloy, 1997). The same could be said for many Latino students. As Lynne Getz (1997) points out, people from different ethnic backgrounds may experience an entirely different relationship with the public schools. While White students may feel nurtured, enriched, and included, Latinos may experience "ostracism, alienation, and neglect" (Getz, p. ix). Teachers' beliefs about student capabilities and home environments can lead to a sense of helplessness on the part of the teacher. This helplessness can then result in lower expectations, ineffective teaching, and reinforced stereotypes (Irvine & York, 1993). Low expectations lead in turn to fewer opportunities for students to learn more challenging and advanced mathematics.

Different expectations for different students are often reflected in the ways teachers teach and test. In the research of Madaus et al. (1992), it was found that teachers with at least 60% African American or Latino students in their classes were far more likely to spend classroom time using multiple-choice testing and other means of assessing low-level cognitive objectives than teachers who had a majority of White

students in their classrooms. Teachers also may not give all students the same type of feedback. Raymond Buriel (1983) found that even after controlling for socioeconomic status, achievement, and English proficiency, "Mexican-American children received less teacher affirmation following correct responses than their Anglo-American classmates" (p. 894).

Giving high grades for work that in other schools would earn lower grades or would be more appropriate for younger students is another form in which low expectations are manifest. A study by Abt Associates (1993) (as cited by Haycock, 2006) found such a pattern correlated to income levels (see Figure 4). This practice can have a devastating effect when a student who has earned all As in mathematics in her school has to compete with students from schools with higher expectations and becomes fully aware of the inadequacy of her academic preparation.

Middle schools and junior high schools more often place African American and Latino students in remedial mathematics programs, so they are more likely to learn fewer topics and skills (Oakes, 1990, p. 161). Unfortunately it is not unusual to see African American and Latino students placed in low tracks even in cases where their standardized test scores or other measures of talent are equal to or better than their White or Asian American peers (Education Trust as cited by Love, 2002, p. 258). Jeannie Oakes (1995) found that in San Jose "African-American and Latino students were much less likely than white or Asian students with the same test scores to be placed in accelerated courses" (p. 686). For example, only 56 percent of Latinos scoring between 90 and 99 NCEs (Normal Curve Equivalent) were placed in accelerated classes, while 93 percent of Whites and 97 percent of Asian Americans with the same NCEs scores were admitted to these



Source: Prospects (Abt Associates, 1993), as cited by Haycock, 2006, slide 56.

Figure 4. Students in poor schools receive As for work that would earn Cs in affluent schools.

classes (Oakes, 1995). Susan Dauber, Karl Alexander, and Doris Entwisle (1996) found that African American sixth graders were "more likely to be in remedial than in regular mathematics, even when academic history and educational expectations were controlled" (p. 299). Likewise, African American and Latino students are less likely to be identified as capable learners and placed in enriched or accelerated programs. For example, Maximino Plata, William Masten and Jerry Trusty (1999) found that teachers in a school with a mixed population of students (Hispanic and Anglos) would nominate Anglo students for gifted programs in significantly higher proportions than Hispanic students in all four areas (intelligence, leadership, academic achievement and creativity), and even Hispanic students who were nominated to gifted and talented programs were perceived by teachers to have less potential than their nominated Anglo peers. This is not an isolated case. In 2000, 32% of White 8th-graders were in what teachers considered high ability classes, but only 16% of Latino and 16% of African American 8th-graders were in such classes (Strutchens, Lubienski, McGraw, & Westbrook, 2004). Consequently, African American and Latino students have fewer opportunities to learn high levels of mathematics than their White peers.

Enrollment of African American and Latino students in 8th-grade courses that determine to a great extent whether they will have the opportunity to take advanced mathematics (pre-calculus and calculus) before they graduate from high school is significantly lower than that of European American students. Only 49% of Latinos and 47% of African American students have taken prealgebra or algebra in 8th grade compared to 68% of European American students (Strutchens et al., 2004). Often African American and Latino students are tracked out of advanced mathematics courses based on false assumptions. Love (2002) quotes an urban high school mathematics teacher:

> We thought we were tracking students in or out of higher-level mathematics courses by their ability. Then we looked at the data on student achievement on standardized tests. We learned that African American and Latino students who scored as high as white students were getting tracked out of college-level courses. (p. 3)

Only 22% of Latino and 25% of African-American high school graduates were enrolled in the college track courses at their high schools (Wilkins et al., 2006). In addition, track assignment is not the only factor leading to differences in course-taking. At many schools with large numbers of students from low socioeconomic status backgrounds, even students in college preparatory programs typically take fewer academic classes (Oakes, 1990). This is a result of the fact that not all schools offer the same number of options for advanced courses in mathematics. For instance, in California, regardless of high school size, the number of Advanced Placement courses decreases as the percentage of African Americans and Latinos in the school population increases (Oakes, Joseph, & Muir, 2004).

Opportunities to Receive Equitable per Student Funding

In many places in the U.S., school funding is based mainly on local property taxes. Thus schools in districts with a large number of well-to-do people have more funds per student than schools in districts with a large number of people in poverty. For example, the difference of per-student expenditure in the City of New York and other parts of the state was so big that the state was sued to allocate funds for students in more equitable ways. Recently the state's highest court ruled that New York City should be allocated at least $1.93 billion more per year. Although this is far less than the $4.7 billion set by a lower court (Herzenhorn, 2006), it is a clear indication that the funds allocated for students in the city were not sufficient.

Additionally, in many places a large proportion of African American and Latino students live in districts with less funding available. According to NAEP data from 2000, only 3% of White 8th-graders are in schools where more than 75% of students qualify for free or reduced-price lunch, whereas 34% of African American and 34% of Latino 8th-graders are in such schools. Conversely, a higher percentage of White 8th-graders attend schools with less poverty. The majority of White 8th-graders (64%) attend schools with less than one quarter of the students being eligible for free or reduced price lunch, but only 15% of African American and 25% of Latino 8th-graders do so (Strutchens et al., 2004 p. 281). School districts that educate the greatest number of African-American and Latino students receive less local and state money to educate them than the districts serving the fewest number of minority students (Wilkins et al., 2006). Students in schools with fewer resources are not always aware of how other schools provide better learning tools such as up-to-date books, science laboratories, materials for experiments, and access to technology within the classroom (Fine, Bloom, & Chajet, 2003).

Table 1 shows per student spending for two districts in each of several metropolitan areas. For each district the percentage of students who are African American or Hispanic, and the percentage of low-income students is also provided (Kozol, 2005). The pattern is unmistakable. In each metropolitan area, the higher the percentage of Latino and African American students, the lower the per student spending. In some cases, the per student spending in a low-minority district is twice as much as in the district with large numbers of African American or Latino students.

Metropolitan area	School District	Spending per student	% Hispanic + African American	% Low income
Chicago area	Highland Park and Deerfield (HS)	$17,291	10	8
	Chicago	$8,482	87	85
Philadelphia	Lower Merion	$17,261	9	4
area	Philadelphia	$9,299	79	71
Detroit area	Bloomfield Hills	$12,825	8	2
	Detroit	$9,576	95	59
Milwaukee area	Maple Dale - Indian Hill (K-8)	$13,955	20	7
	Milwaukee	$10,874	77	76
Boston area	Lincoln (K-8)	$12,775	19	11
	Lawrence	$7,904	86	69
New York City	Manhasset	$22,311	9	5
area	New York City	$11,627	72	83

Table 1. Per student spending in several metropolitan areas 2002-2003. Adapted from Kozol, 2005, pp. 321-24.

Often, schools with more low-income students and/or a large proportion of Latino or African American students have problems retaining highly qualified teachers. Teacher pay plays a role since districts with fewer financial resources are not able to compete with teachers' salaries in wealthier districts. Who would blame a teacher who needs to care for her or his family for moving to another school district where the pay is better? At the time the state of New York was sued over inequitable funding for education, the plaintiffs pointed out that the starting salary for New York City teachers was about 25% less than starting salaries in wealthy suburban counties (Goodnough, 1999).

Furthermore, the problem of unequal funding also exists *within* districts. Schools with a larger proportion of minority or low-income students within the same district often also receive less funding per student from the district in terms of teacher pay. For instance, in Baltimore City Schools there are significant differences in the real costs of teachers' salaries between schools. While the district average was $47,178, in one school the average salary of the teachers was only $37,618, and at another school the average was more than $57,000 (Roza & Hill, 2004). Thus, the teacher expenditure per student is very different from school to school. Consistently, high-poverty and low-performing schools are staffed with teachers whose salaries are lower than average. This happens because as more experienced teachers migrate from one school to another they take their higher salaries with them. More experienced teachers tend to migrate to schools with a larger proportion of European American students, less poverty, and better performance on state mandated tests (Roza & Hill, 2004; Wiener, 2006). Schools with high needs are thus left with the least experienced and least paid teachers.

This example is not an isolated incident. In many urban districts there are huge differences in average salaries for teachers from one school to another. This inequity is not transparent due to the fact that urban districts calculate school budgets using average teacher costs. Thus a school with a staff consisting of mainly senior teachers with higher salaries does not appear in the official budget as receiving more money than another school that is staffed mainly by beginning teachers with lower salaries. As a result, the fact that teacher expenditure per student is very different from school to school is effectively masked. Unfortunately the schools that are shortchanged in this way typically have a large proportion of children in poverty and those that benefit from this budgeting system have a larger proportion of wealthier students. By using average costs for the school budgets, districts hide the fact that they are taking away from the poor to benefit the rich. For many years, federal programs that allocate funds that are meant to supplement and not supplant have ignored this practice. Roza and Hill (2004) point out, "Current Title I legislation allows districts to use average salary figures when comparing expenditures among schools.... Districts were henceforth allowed to maintain major inequities in school funding, as long as these were driven by teacher allocation" (p. 212 and 216).

By casting light on the inequities of opportunity faced by low income and African American and Latino students—less access to experienced and well qualified teachers, less access to high teacher expectations, and less per student funding for their schools—the achievement gap is better understood as a manifestation of an underlying cause—the opportunity gap. Any viable solution to the problem of differential achievement in mathematics must address these inequities of opportunity. The question then becomes, what can be done to close these gaps in opportunities?

Providing Equitable Opportunities

Actions within the Classroom

The position of the National Council of Teachers of Mathematics (NCTM) with respect to closing the achievement gap is that all students "should have equitable and optimal opportunities to learn mathematics free from bias," and that "all students need the opportunity to learn challenging mathematics from a well-qualified teacher who will make connections to the background, needs, and cultures of all learners" (NCTM, 2005). The solution is thus framed as opportunity to learn. As a professional organization of teachers, it is natural that NCTM stresses the impact that effective teach-

ers can have. Qualified teachers who are committed to the learning of their students are the single most important factor for students' success. As can be documented by multiple examples, teachers can make a big difference.

Richard Kitchen (2007a) describes several examples of schools that are consistently high achieving, especially in mathematics, and that serve low-income students from many different ethnic backgrounds. In these schools teachers have high expectations and offer sustained support for academic excellence. Teachers make teaching and learning their priorities to support high academic expectations; they provide supplemental support for student learning; and they regularly review basic skills learned in the past. These schools have a great variety of teaching resources to support their teaching; and provide regular access to professional development opportunities for their teachers (Kitchen, 2007b). These examples demonstrate that there is nothing intrinsic to the students' backgrounds or cultures that would prevent them from achievement. All they need are opportunities to learn mathematics with qualified and committed teachers supported by their schools.

Marilyn Strutchens (2000, pp. 10-11) describes a series of effective strategies for teaching African American students. These strategies would benefit students from all backgrounds, but they are especially important for students from groups that are underserved by traditional school practices. These strategies are:

- Help students develop a relational understanding of concepts.
- Help students develop number sense.
- Express a deep belief in the capabilities of students.
- Enable students to use mathematics as a tool for examining issues related to race, ethnicity, gender, and social class.
- Create classroom environments where students are able to find and justify their solutions, as well as question other students about their responses to the same or different questions.

However, all too often many of these techniques are not present in classes with large numbers of African American or Latino students, or in schools with high numbers of low-income students.

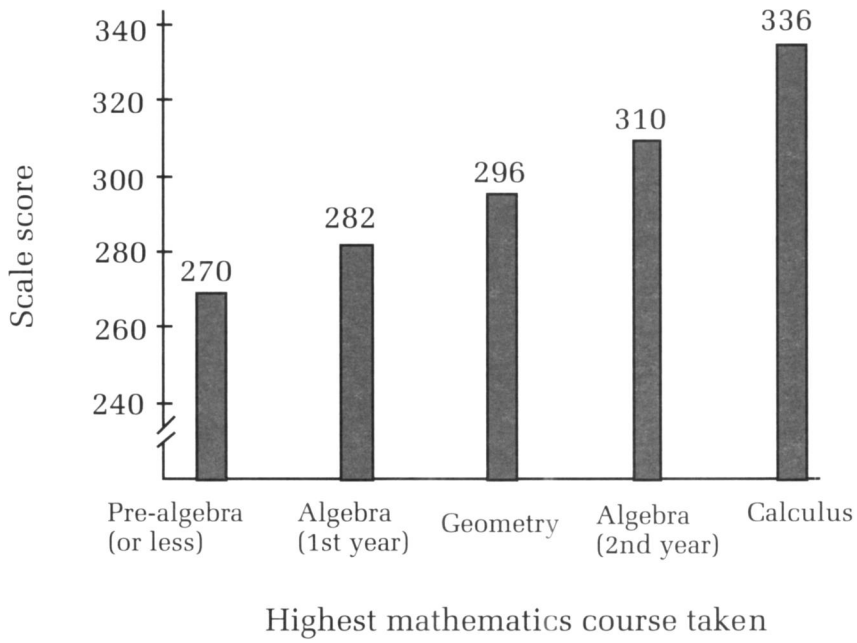
Many African American students "learn from direct contact with teachers and peers and take a holistic, relational, and intuitive stance" (Malloy, 1997, p. 28). Teachers need to expand and use instructional materials and teaching approaches that will benefit such students. Teaching strategies that provide opportunities for students to learn cooperatively rather than competitively will allow students to use their cultural background to their advantage. Through writing and oral presentations, students can have opportunities to use their unique ways of expression (Malloy, 1997).

Assigning homework, and expecting students to do it can also have a positive effect. There is a clear positive correlation between doing homework and performance on the NAEP test. The average scale score for students who never do homework is 289, for students who sometimes do homework it is 296, and for students who often do homework it is 312 (Perie, Moran, and Lutkus, 2005). Teachers need to be aware that doing homework is important, but also be aware of special circumstances that some of the students face. Some teachers meet both needs by providing flexibility as to when the homework is due, but still expecting the work to be done.

Actions beyond the Classroom

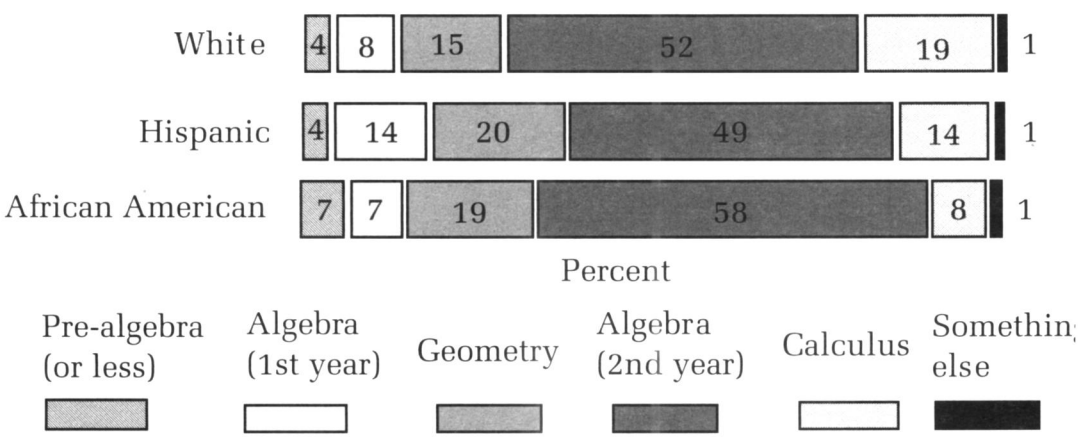
Solving the problem of out-of-field teaching needs action at the school and district levels. Part of the problem is due in some places to a shortage of qualified teachers in mathematics. However, a considerable part of the problem, about half, could be solved with the present cadre of teachers by assigning teachers to teach in their field of expertise (Jerald, 2002).

Students need the opportunity to take more advanced level courses in mathematics. Not surprisingly, students who take more advanced mathematics courses do better on tests (Figure 5). However, participation in more advanced mathematics courses in high school is uneven among groups of different ethnic backgrounds (Figure 6).



Source: Perie, Moran, and Lutkus, 2005, p. 57

Figure 5. Mathematics scores for students, age 17, by highest mathematics course taken, 2004



Source: Perie, Moran, and Lutkus, 2005, p. 58.

Figure 6. Percentage of students, age 17, by race/ethnicity and highest mathematics course taken, 2004

We need to encourage and expose students from all backgrounds to opportunities to take more advanced courses. Jeannie Oakes (1990) reports that girls and students from minority groups usually receive less encouragement and have fewer science- and math-related opportunities both in school and out than do White males. However, when girls and students from minority groups receive encouragement and are exposed to opportunities, they show interest and participate. Thus, we may be able to increase their participation in more advanced courses with school conditions and focused interventions that encourage students and provide them with opportunities to learn mathematics and science (Oakes, 1990).

In their study of schools that were highly successful educating students of poverty, especially in mathematics, Kitchen, DePree, Celedón-Pattichis, & Binkerhoff (2007) identified three salient characteristics they shared:

> (a) high expectations and sustained support for academic excellence, (b) challenging mathematical content and high-level mathematics instruction that focused on problem solving and sense making (as opposed to rote instruction), and (c) the importance of building relationships. (p. xiv)

Other studies have also found that relationships with family, friends, and teachers are especially important for students' academic success. Sharon Whitehead (2006) conducted a case study of highly successful mathematics students who came from a background of poverty. From the perspective of these students, the most important factors in their success were relational in nature: high expectations, support, and empowerment.

Actions beyond the School

In order to guarantee that the students with the most needs have experienced and well-qualified teachers requires action at the district, state, and federal levels to rectify inequities in per student funding, teacher assignment, student placement in mathematics, and access to advanced mathematics coursework. There can be no real equity of opportunity to learn as long as the "savage inequalities" in our schools continue to exist (Kozol, 1991).

Final Comments

Often, inequalities in achievement are perceived as the result of a hierarchy of competence. When the very students who have been given more opportunities to learn show higher achievement than students provided fewer opportunities to learn, they are perceived as more capable or having more aptitude. This manner of talking about achievement gaps without mentioning the opportunity gaps that cause them invites a focus on the students who lag behind and draws on deficit models to "explain" low performance in terms of factors such as cultural differences, poverty, low levels of parental education, and so on. Reframing the problem in terms of opportunity gaps focuses attention on examining the lack of access to the very resources that contribute to the success of more privileged students. This focus clarifies what actions need to be taken to guarantee that all students do indeed have opportunities to receive a high quality education. As many examples across the nation show, when given the opportunity, students from any cultural or ethnic background and any socioeconomic level can excel (Kitchen et al., 2007).

Elizabeth Cohen (2000) stresses that to address equality of educational opportunity we need to take into account both the big picture of the social location of a classroom "in relationship to inequalities in the larger society and in the organization of the school" (p. 265), as well as "the experiences of students within schools and classrooms" (p. 265). Of course, schools alone cannot redress all the inequities in opportunities students face in society. As Robert Evans (2005) points out, schools can only be a part of a solution, but schools must be part of the solution. Inequities in society cannot be ameliorated without the full participation of the schools and a clear understanding of the problem.

References

Bodmer, W. F., & Cavalli-Sforza, L. L. (1973). Intelligence and race. In W. T. Greenough (Ed.), *The nature and nurture of behavior: Developmental psychobiology* (pp. 125-135, 139). San Francisco: W. H. Freeman.

Bol, L., & Berry, R. Q. (2005). Secondary school teachers' perceptions of the achievement gap. *The High School Journal, 88*(4), 32-45.

Buriel, R. (1983). Teacher-student interaction and their relationship to student achievement: A comparison of Mexican-American and Anglo-American children. *Journal of Educational Psychology, 75*(6), 889-897.

Carter, T. P. (1970). *Mexican Americans in school: A history of educational neglect.* New York: College Entrance Examination Board.

Clark, R. M. (1983). *Family life and school achievement: Why poor Black children succeed or fail.* Chicago, IL: University of Chicago Press.

Cohen, E. G. (2000). Equitable classrooms in a changing society. In M. T. Hallinan (Ed.), *Handbook of the sociology of education* (pp. 265-283). New York: Kluwer Academic / Plenum Publishers.

Darling-Hammond, L. (2001). The challenge of staffing our schools. *Educational Leadership, 58*(8), 12-17.

Dauber, S. L., Alexander, K. L., & Entwisle, D. R. (1996). Tracking and transitions through the middle grades: Channeling educational trajectories. *Sociology of Education, 69*(4), 290-307.

Delpit, L. D. (1992). Education in a multicultural society: Our future's greatest challenge. *Journal of Negro Education, 61*(3), 237-249.

Evans, R. (2005). Reframing the achievement gap. *Phi Delta Kappan, 86*(8), 582-589.

Esch, C. E., Chang-Ross, C. M., Guha, R., Humphrey, D. C., Shields, P. M., Tiffany-Morales, J. D., Wechsler, M. E., & Woodworth, K. R. (2005). *The status of the teaching profession 2005.* Santa Cruz, CA: The Center for the Future of Teaching and Learning. Retrieved January 14, 2007 from http://www.cftl.org/documents/2005/stp05fullreport.pdf

Fine, M., Bloom, J., & Chajet, L. (2003). *Rethinking accountability.* Retrieved March 11, 2007, from http://www.annenberginstitute.org/VUE/spring03/Fine.html

Getz, L. M. (1997). *Schools of their own: the education of Hispanos in New Mexico.* Albuquerque: University of New Mexico Press.

Goodnough, A. (1999, November 16). City's teachers perform poorly on state exams. *New York Times,* p. 1.

Greene, J. P. & Foster, G. (2004). The teachability index: Can disadvantaged students learn? Education Working Paper No. 6 (September). Retrieved December 3, 2006 http://www.manhattan-institute.org/html/ewp_06.htm

Guo, G. (1998). The timing and influences of cumulative poverty on children's cognitive ability and achievement. *Social Forces, 77*(1), 257-287.

Haycock, K. (2006). Improving achievement and closing gaps, Pre-K through college. Retrieved December 10, 2006 from http://www2.edtrust.org/EdTrust/Product+Catalog/recent+presentations.htm

Heffter, E. (2006, November 30). WASL achievement gap costly to fix, officials say. *The Seattle Times.* Retrieved December 10, 2006, from http://seattletimes.nwsource.com/html/education/2003454369_gap30m.html

Herzenhorn, D. M. (2006, November 21). New York cuts aid sought for city schools. *New York Times,* p. 1.

Irvine, J. J., & York, D. E. (1993). Teacher perspectives: Why do African-American, Hispanic and Vietnamese students fail? In S. W. Rothstein (Ed.), *Handbook of schooling in urban America* (pp. 161-173). Westport, CT: Greenwood Press.

Jensen, A. R. (1969). How much can we boost IQ and scholastic achievement? *Harvard Educational Review, 39*(1), 1-123.

Jerald, C. D. (2002). All talk, no action: Putting an end to out-of-field teaching. Retrieved December 5, 2006 from http://www2.edtrust.org/NR/rdonlyres/8DE64524-592E-4C83-A13A-6B1DF1CF8D3E/0/AllTalk.pdf

Kitchen, R. S. (2007a). Introduction to the participating highly effective schools. In R. S. Kitchen, J. DePree, S. Celedón-Pattichis & J. Brinkerhoff, *Mathematics education at highly effective schools that serve the poor* (pp. 21-31). Mahwah, NJ: Lawrence Erlbaum Associates.

Kitchen, R. S. (2007b). High expectations and sustained support for academic excellence. In R. S. Kitchen, J. DePree, S. Celedón-Pattichis & J. Brinkerhoff, *Mathematics education at highly effective schools that serve the poor* (pp. 33-53). Mahwah, NJ: Lawrence Erlbaum Associates.

Kitchen, R. S., DePree, J., Celedón-Pattichis, S., & Brinkerhoff, J. (2007). *Mathematics education at highly effective schools that serve the poor: Strategies for change.* Mahwah, NJ: Lawrence Erlbaum Associates.

Kozol, J. (1991). *Savage inequalities: Children in America's schools.* New York: Crown.

Kozol, J. (2005). *The shame of the nation: The restoration of apartheid schooling in America.* New York: Three Rivers Press.

Ladson-Billings, G. J. (2005). Is the team all right? Diversity and teacher education. *Journal of Teacher Education, 56*(3), 229-234.

Love, N. (2002). *Using data / getting results: A practical guide for school improvement in mathematics and science.* Norwood, MA: Christopher-Gordon Publishers.

Madaus, G. F., West, M. M., Harmon, M. C., Lomax, R. G.. and Viator, K. A. (1992). *The influence of testing on teaching math and science in grades 4-12.* Chestnut Hill, MA: Boston College, Center for the Study of Testing, Evaluation, and Educational Policy. (ERIC No. ED370772.)

Malloy, C. E. (1997). Including African American students in the mathematics community. In J. Tentracosta (Ed.), *Multicultural and gender equity in the mathematics classroom: The gift of diversity* (pp. 23-33). Reston, VA: National Council of Teachers of Mathematics.

Mayer, D. P., Mullens, J. E., & Moore, M. T. (2000). *Monitoring school quality: An indicators report, NCES 2001-030.* Washington, DC: National Center for Education Statistics. Retrieved December 17, 2006 from http://nces.ed.gov/pubs2001/2001030.pdf

National Council of Teachers of Mathematics. (2005). *Closing the achievement gap.* Reston, VA: National Council of Teachers of Mathematics. Retrieved November 19, 2006 from http://nctm.org/about/position_statements/position_achievementgap.htm

National Governors' Association. (2005). *Closing the achievement gap.* Retrieved January 4, 2007 from http://www.subnet.nga.org/educlear/achievement/

Oakes, J. (1990). Opportunities, achievement and choice: Women and minority students in science and mathematics. *Review of Research in Education, 16,* 153-222.

Oakes, J. (1995). Two cities' tracking and within-school segregation. *Teachers College Record, 96*(4), 681-690.

Oakes, J., Joseph, R., & Muir, K. (2004). Access and achievement in mathematics and science: Inequalities that endure and change. In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of Research on Multicultural Education* (second ed., pp. 69-90). San Francisco: Jossey-Bass.

Perie, M., Moran, R., & Lutkus, A. D. (2005). NAEP 2004 *Trends in Academic Progress: Three Decades of Student Performance in Reading and Mathematics.* U. S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. Washington, DC: Government Printing Office. Retrieved December 3, 2006 from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2005464

Plata, M., Masten, W. G., & Trusty, J. (1999). Teachers' perception and nomination of fifth-grade Hispanic and Anglo students. *Journal of Research and Development in Education, 32*(2), 113-123.

Roza, M., & Hill, P. T. (2004). How within-district spending inequalities help some schools to fail. In D. Ravitch (Ed.), *Brookings papers on education policy 2004*. Washington, DC: Brookings Institution Press. Retrieved December 17, 2006, from http://muse.jhu.edu.ezproxy1.lib.asu.edu/journals/brookings_papers_on_education_policy/toc/pep2004.1.html

Strutchens, M. E. (2000). Confronting beliefs and stereotypes that impede the mathematical empowerment of African American students. In M. E. Strutchens, M. Johnson, & W. Tate (Eds.). *Changing the faces of mathematics: Perspectives on African Americans* (pp. 7- 14). Reston, VA: National Council of Teachers of Mathematics.

Strutchens, M. E., & Silver, E. A. (2000). NAEP findings regarding race/ethnicity: Students performance, school experiences, and attitudes and beliefs. In E. A. Silver & P. A. Kenney (Eds.), *Results from the seventh mathematics assessment of the National Assessment of Educational Progress* (pp. 45-72). Reston, VA: National Council of Teachers of Mathematics.

Strutchens, M. E., Lubienski, S., McGraw, R., & Westbrook, S. K. (2004). NAEP findings regarding race/ethnicity: Students' performance, school experiences, attitudes and beliefs, and family influences. In P. Kloosterman, & F. K. Lester (Eds.) *Results and interpretations of the 1990 through 2000 mathematics assessments of the National Assessment of Educational Progress* (pp. 269-304). Reston, VA: National Council of Teachers of Mathematics.

Whitehead, S. S. (2006). *Poverty and factors leading to success in mathematics as told by AP Calculus students.* Unpublished doctoral dissertation, Arizona State University, Tempe.

Wiener, R. (2006). Understanding opportunity gaps that are behind achievement gaps. UNC Symposium: High poverty schooling in America. Retrieved December 4, 2006 from http://www.law.unc.edu/pdfs/Wiener.pdf

Wilkins, A., & Education Trust staff. (2006). *Yes we can: Telling truths and dispelling myths about race and education in America.* Washington, DC: The ducation Trust. Retrieved November 20, 2006 fromhttp://www2.edtrust.org/NR/rdonlyres/DD58DD01-23A4-4B89-9FD8-C11BB072331E/0/YesWeCan.pdf