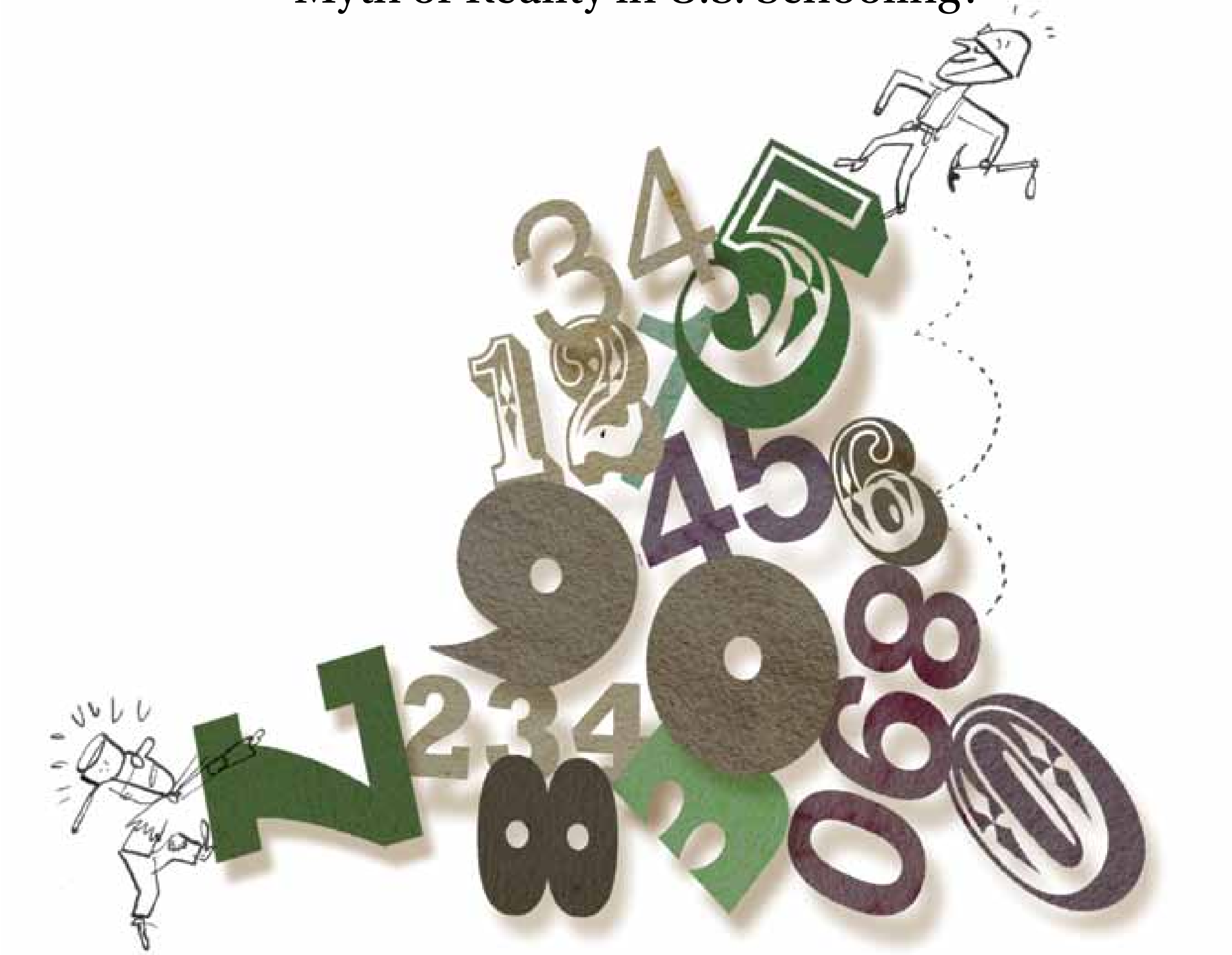
Equality of Educational Opportunity

Myth or Reality in U.S. Schooling?



ILLUSTRATIONS BY SERGE BLOCH

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Public schooling is often regarded as "the great equalizer" in American society. For more than 100 years, so the story goes, children all across the country have had an equal opportunity to master the three Rs: reading, writing, and arithmetic. As a result, any student willing to work hard has the chance to go as far as his or her talent allows, regardless of family origin or socioeconomic status.

This assumption regarding opportunity and emphasis on individual talent and effort seems to be a natural offshoot of the rugged individualism and self-reliance that are so much a part of the fabled American character. We have long celebrated our cowboys, entrepreneurs, and standout athletes—but we have also long ignored those who have not succeeded. When success is individual, so is failure. It must result from a lack of effort, talent, motivation, application, or perseverance, not a lack of opportunity. Right?

Not according to our research. Defining educational equality in the most basic, foundational way imaginable—equal coverage of core academic content—we've found that America's schools are far from being the equalizers we, as a nation, want them to be.

So what? Does it really matter that "the great equalizer" is a myth? To our way of thinking, it does. First, as researchers, we believe it is always important to question our assumptions—and that goes for our national assumptions about equality and individualism as well as our personal assumptions. Second, the more

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we study schools, the more inequity we see. While other researchers have tackled important issues like disparities in teachers' qualifications and in classroom resources, we have focused on the basic question of what mathematics topics are taught. We have been disturbed to see that whether a student is even exposed to a topic depends on where he or she lives. Third, we find that those who don't question basic assumptions draw tragic, unsupportable conclusions. Take, for example, the controversial book *The Bell Curve*,[1] in which Richard J. Herrnstein and Charles Murray wrongly argued that unequal educational outcomes can *only* be explained by the unfortunate but unavoidable distribution of inherited abilities that relegate some students to the low end of the intelligence distribution. As we will show, unequal educational outcomes are clearly related to unequal educational opportunities.

In this article, we explore the extent to which students in different schools and districts have an equal opportunity to learn mathematics. Specifically, we discuss research on (1) the amount of variability in content coverage in eighth grade across 13 districts (or consortia of districts) and 9 states, and (2) the variation in mathematics courses offered by high schools in 18 districts spread across 2 states. We knew we would find some variability in terms of content coverage and course offerings, so our real question had to do with the nature and extent of the differences and whether they seemed to matter in terms of student achievement. Simply put, sometimes differences yield equivalent results, but sometimes differences make a difference.

In the United States, research like this is necessary because our educational system is not one system, but a disparate set of roughly 15,000 school districts distributed among 50 states and the District of Columbia. While states, with varying degrees of focus, rigor, and coherence,[2] have developed academic standards, local districts still maintain *de facto* control of their curriculum—some have written their own standards, some have written their own curriculum, some mandate the use of selected textbooks, and some leave all such decisions up to the schools. Even in states that control the range of textbooks that may be adopted by districts, the districts themselves always control (or choose to allow schools to control) which content within those textbooks will be covered or emphasized.

Leaving the choice of content coverage to individual districts and schools (with very few state controls) makes it possible and even *probable* that schools cannot be the equalizers we would like them to be. With roughly 15,000 school systems, American children simply are not likely to have equal educational opportunities as defined at the most basic level of equivalent content coverage. It is therefore highly questionable and even unfair to assume that differences in student achievement and learning are the sole result of differences in individual students' efforts and abilities. To assert that those who do not achieve at prescribed levels fail to do so because they cannot, or do not, take advantage of the opportunities afforded them is, at best, to mistake part of the story for the whole. The whole story also must consider the radically different opportunities provided by different schools, districts, and states, and acknowledge that which opportunities are provided is determined by socioeconomic factors, housing patterns, community structures, parental decisions, and many other factors that have one thing in common—they are all beyond the control of individual students.

In the research literature, the concept we are exploring is called the "opportunity to learn" (OTL). While it has been defined in many ways, to our way of thinking the specific mathematics content is the defining element of an educational opportunity in mathematics. Of course, many things can and do affect how that content is delivered. But our research focuses on equivalent content coverage because this allows a more precise definition of "equal educational opportunity" as it relates to learning. Without equality in content coverage, there can be no equality in opportunity related to that content, no matter the equality of other resources provided. Ultimately, learning specific content is the goal. The mathematics itself is at the heart of the opportunity to learn and thus is a very salient component in examining equality of educational opportunity. In addition, it is a factor that policymakers can address.

In all, our research aims to answer one question: do all the different mathematics content roads fairly and equally lead to the same high-quality educational outcomes? As we will explain below, they do not.

I. Inequality in Eighth Grade

For our research on eighth-grade mathematics, we examined the extent to which students in different districts and states had the same opportunity to learn specific mathematics topics and how that was related to their academic achievement.* To do this, we analyzed a unique† set of data from a study that replicated the 1995 Third International Mathematics and Science Study (TIMSS)—the most extensive multinational comparative study ever attempted. In addition to assessing student achievement in over 40 countries, the 1995 TIMSS collected a great deal of other data, including detailed information on the mathematics curricula and classroom content coverage.

The replica study had many components or substudies. The part we are concerned with here is the TIMSS 1999 Benchmarking Study, which was designed to compare—or benchmark—U.S. states and districts against the countries that participated in the 1999 TIMSS.‡ As shown in Table 1 (on page 14), for the benchmarking study we worked with 13 school districts (or consortia of districts) and 9 states, all of which chose (and paid) to participate as we gathered extensive data on their eighth-grade mathematics content coverage and student achievement. A total of 36,654 students in these states and districts took the 1999 TIMSS test and provided a wide array of demographic and socioeconomic data, including age, gender, racial/ethnic group, whether English was spoken in the home, what education-related posses-

†The data gathered in the TIMSS 1999 Benchmarking Study are unique in two important ways. First, it is exceedingly rare to have common measures across all research sites (i.e., states and districts) for the variables of interest. Often researchers must make assumptions about the comparability of measurements in order to build a usable data set. Here, we have consistently measured the mathematics content as it was implemented in the classroom, the mathematics performance of the students in those classrooms, as well as individual indicators of students' socioeconomic status. Second, we have these common measures from a group of districts, district consortia, and states that, while not a random sample, are likely to be nationally representative. This affords a completely unique opportunity to examine the relationship between mathematics content coverage and achievement at the district level while controlling for students' socioeconomic status.

‡Although the United States did participate in the 1995 TIMSS, the resulting information was for the United States as a whole and could not provide much insight into what was happening in states and districts.

*For a technical and thorough discussion of this study, please see **www.epc.msu.edu/publications/report/Equality%20of%20educational%20opportunity.pdf**.

Table 1
Districts and States That Participated in the 1999 TIMSS Benchmarking Study

Education Jurisdiction	# of Classes	# of Students
Academy, CO	49	1,233
Chicago, IL	49	1,059
DE Science Coalition	58	1,268
First in the World Consortium, IL	38	748
Guilford County, NC	50	1,018
Jersey City, NJ	48	1,004
MI Invitational Group	46	901
Miami-Dade, FL	54	1,226
Montgomery County, MD	50	1,155
Naperville, IL	53	1,212
Rochester City, NY	51	966
SMART Consortium, OH	53	1,096
SW Pennsylvania Math/Science Coalition	84	1,538
Idaho	115	1,847
Illinois	228	4,679
Indiana	100	2,044
Michigan	117	2,623
Missouri	114	1,924
Oregon	122	1,886
Pennsylvania	171	3,236
South Carolina	99	2,008
Texas	112	1,983
Total	*1,861*	*36,654*

sions were in the home (e.g., computer, dictionary, and number of books), parental education level, number of adults in the home, etc.* In addition, the students' 1,861 mathematics teachers filled out a questionnaire on the topics they had covered during the school year.

The mathematics topics listed in the teacher questionnaire were based on the mathematics content framework[3] developed for the 1995 TIMSS; it consists of 44 specific mathematics topics (e.g., common fractions, percentages, 3-D geometry, etc.) that cover the full range of K–12 mathematics. On the questionnaire, teachers indicated whether they had taught each topic for 1 to 5 periods, more than 5 periods, or not at all.

Gathering all these data was simply the first step. We didn't just want to know what was being taught in our states and districts; we wanted some sense of how each topic fit into the scope and sequence of mathematics schooling across the grades from an international perspective (hence the benchmarking idea). Using the 1995 TIMSS multinational mathematics curriculum data, we developed an International Grade Placement (IGP) topic index to indicate the grade in which the most countries typically emphasized each topic.† We say "emphasized" each topic because we realize that topics are often taught in multiple grades. Nonetheless, we were able to identify the grade in which each topic typically received its greatest instructional focus. Each topic was assigned a value between 1 and 12 indicating an international consensus regarding the grade in which the topic should be emphasized. Table 2 (below) lists a few selected topics and shows their IGP values. For example, the first topic, whole numbers, has an IGP value of 1.7. This means that most countries give whole numbers their greatest instructional focus toward the end of first grade.

Given the hierarchical nature of school mathematics (in which addition must come before multiplication, fractions before exponents, etc.), we think it is reasonable to assume that topics receiving their main instructional focus in later grades in most countries are more difficult than those receiving their main focus in earlier grades. Thus, our IGP topic values provide an indication of some international consensus regarding the rigor and appropriate grade level of each topic.

With this IGP topic index and the teacher questionnaire, we developed a measure of students' opportunity to learn mathematics in each of the 1,861 eighth-grade classrooms we were studying. Our opportunity-to-learn measure took into account which topics were taught, how much time was devoted to each topic, and what the IGP value was for each topic. Using this measure, we assigned each classroom a value between 1 and 12 to indicate the average international grade level of all the topics taught (weighted by instructional time). In effect, our opportunity-to-learn measure assigns an International Grade Placement value to each classroom. Averaging all the IGP values for the classrooms in a district, we can then determine each district's IGP

Table 2
International Grade Placement (IGP) for Selected Topics from the Mathematics Teacher Questionnaire

Selected Mathematics Topics	IGP
Fractions and Number Sense	
Whole numbers—including place value, factoring, and operations	1.7
Understanding and representing common fractions	4.4
Computations with common fractions	4.4
Simple computations with negative numbers	6.6
Square roots (of perfect squares less than 144), small integer exponents	7.5
Geometry	
Congruence and similarity	8.4
Symmetry and transformations (reflection and rotation)	7.1
Algebra	
Simple algebraic expressions	7
Representing situations algebraically; formulas	7

*In our discussion, we make use of the internationally scaled total test score in eighth-grade mathematics for the replica of TIMSS (TIMSS-R).

†This empirically derived indication of topic rigor has been found to have strong face validity as well as construct validity.[4]

value. And, we can do the same for each state.

As can be seen from Table 2, a classroom that spent a lot of time on fractions (a fourth-grade topic, according to our IGP topic index), and very little time on algebraic expressions or formulas (seventh-grade topics), might have an IGP classroom value of a little more than 5, indicating a content mix that in most TIMSS countries is taught during the fifth grade. In contrast, a classroom that spent the vast majority of its time on the geometry and algebra topics listed in Table 2 would have a value of about 7 to 8, because almost all time was spent on seventh- and eighth-grade topics.

Students' Opportunity to Learn Mathematics

As we briefly explained in the introduction, school districts have far more influence than states over what content gets taught. So, our discussion focuses on our district-level findings. As for the state-level findings, suffice it to say that we did all the same analyses with our state-level data as with our district-level data, and the findings were very similar. Although variation among states on all opportunity-to-learn indicators was less than that among the districts, this did not alter the pattern or significance of the observed relationships and did not change our conclusions. (The lesser variation at the state level is to be expected as states represent a broader combination of many districts.)

Internationally, the focus of eighth grade for all students in virtually all of the TIMSS countries—except the United States—is algebra and geometry. In our study, not a single district had all of its students focusing mainly on algebra and geometry. This is reflected in the districts' IGP values, which ranged from 6.0 to 6.9. This means that in some districts, eighth-grade teachers (on average) were teaching content typically found at the end of fifth or the beginning of sixth grade internationally, while in other districts, the content came closer to that found at the end of sixth or the beginning of seventh grade.‡ Not only is this a lot of variation in students' opportunity to learn mathematics, it indicates that *all students* were being shortchanged since none of the districts were focusing on eighth-grade (or even seventh-grade) content.

Figure 1
Scatterplot of Percent of Students' Parents with a College or University Degree and Mean Achievement for 13 Districts

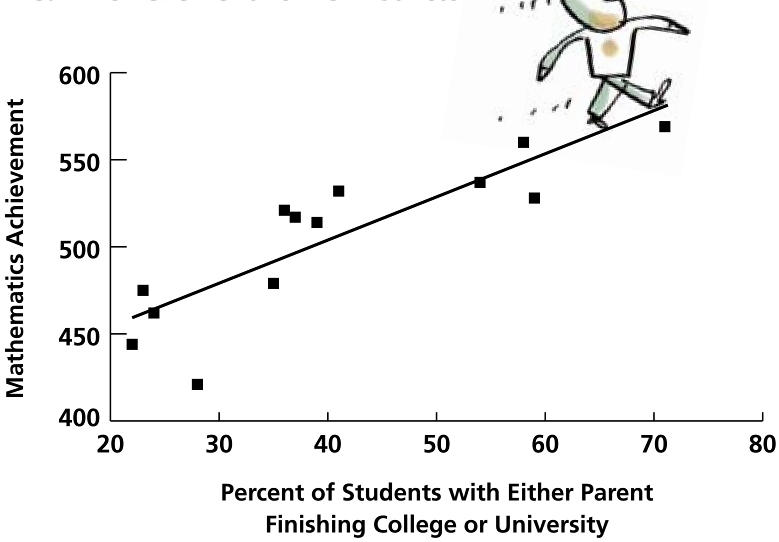
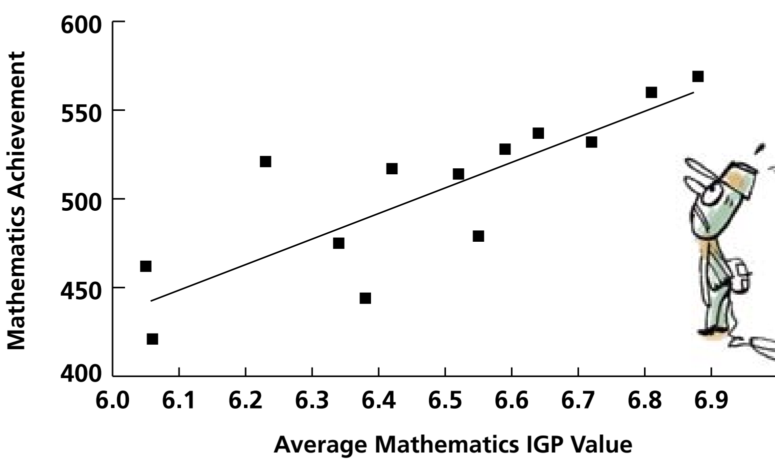


Figure 2
Scatterplot of Districts' Average Mathematics IGP Value and Mean Achievement for 13 Districts



Of course the real question is, does any of this variation in mathematics learning opportunities make any difference in students' achievement? We addressed this issue through a set of analyses that we briefly describe here.

On the basis of decades of findings that students with higher socioeconomic status typically have higher scores on achievement tests,[5] some researchers and policymakers have hypothesized that socioeconomic status has a *greater* impact on achievement than does schooling itself. Some have even gone so far as to conclude that schooling doesn't really matter. Indeed, among our districts, we found a strong relationship between students' mathematics achievement as measured by their TIMSS scores, and the percentage of students' parents who had a college or university degree (a common indicator of socioeconomic status). This relationship is depicted in Figure 1 (top left).

Does this mean that all the differences we found in students' opportunity to learn mathematics are not important? Not at all. Figure 2 (bottom left) shows the relationship between our 13 districts' TIMSS mathematics scores and their IGP values. Clearly, as IGP value—and, therefore, a more demanding opportunity to learn mathematics—increased, so did achievement. The relationship between students' opportunity to learn and achievement was every bit as strong as the relationship between their socioeconomic status and achievement.

Nonetheless, we still do not have the whole story. Sadly, in our "land of opportunity," students' socioeco-

‡Lest one think that such variation has decreased in recent years, we also have more recent evidence from a study we are doing with over 60 districts from Michigan and Ohio. Based on a more precise measure, the opportunity to learn in eighth grade varied even more, ranging from 5.5 to 7.5. Still, no district was teaching predominantly what most other high-achieving countries would consider eighth-grade content.

nomic status is related not only to their achievement, but also to their opportunity to learn. As shown in Figure 3 (bottom left), across the districts we found a strong relationship between the percentage of students' parents with a college or university degree and the district IGP value. This means that the more parents with a college or university degree in a district, the higher the IGP value and the higher the average mathematics achievement. The estimated increase in opportunity to learn was not trivial: the mathematics content coverage in districts in which around 60 percent of students' parents had a college or university degree was about one-half of a grade level ahead of districts in which less than 30 percent of students' parents had a college or university degree.

These results have profound policy implications. The realization of the fundamental vision of public schools as the great equalizers rests on the assumption that content coverage is essentially the same for all children. If some are not taught essential mathematics topics in their schooling, why would we believe they will learn mathematics as well as those who are exposed to all essential content?

How can we think about these interrelationships between student achievement, content coverage, and socioeconomic status? Figure 4 (right) provides a simple model that hypothesizes how both socioeconomic status and curricular content play a role in mathematics achievement at the district level.

Finding that socioeconomic status and opportunity to learn are both independently related to achievement is not surprising; these relationships have been studied previously in various ways with various types of data—both national and international, but not at the district level. In fact, we found such relationships when we analyzed the international TIMSS data.[6] However, what is unique to the United States is the strong estimated relationship between socioeconomic status and opportunity to learn. When high-quality national or regional standards (and/or curricula) are in place, as they typically are in other countries, that linkage is essentially minimized if not eliminated.[7]

As a result of its strong correlation between socioeconomic status and opportunity to learn, *the United States has a particularly strong relationship between socioeconomic status and achievement*. Using the 1995 TIMSS data, we found that the correlation between socioeconomic status and achievement was stronger in the United States than in 32 (out of 40) other countries. This raises the issue of equality, given that the lower the income-level composition of a district, the more likely it is that content coverage will be less demanding and that the average mathematics achievement of eighth-graders will be lower. Most other countries have clear, detailed national or regional academic standards and/or curricula that define content coverage and therefore minimize the influence of socioeconomic status on opportunity to learn.[8]

The implication of our conceptual model is that by adopting focused, rigorous, coherent, and common content-coverage frameworks, the United States could minimize the impact of socioeconomic status on content coverage—a goal toward which virtually all our international economic peers are making progress.

Hopefully, the recently developed Common Core State Standards (see **www.corestandards.org**) will help the United States offer students greater equity in their opportunity to learn. But for now, a burning question remains: which is more important to student learning, socioeconomic status or opportunity to learn? An easy question to pose, but not a simple one to answer due to the complex nature of our U.S. education system. To disentangle these relationships, we analyzed the relationship between socioeconomic status, IGP value, and achievement at the classroom and district levels.

At the classroom level, controlling for socioeconomic status and students' prior achievement, the IGP value was statistically significantly related to achievement (actually, residual gain in achievement), as were our measures of socioeconomic status. For a one grade-level increase in IGP value, the increase in

Figure 4
Conceptual Model Relating Socioeconomic Status, Opportunity to Learn, and Achievement in the United States

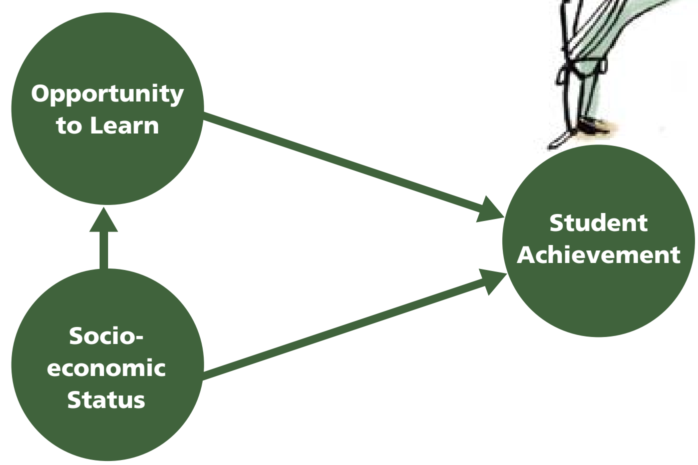
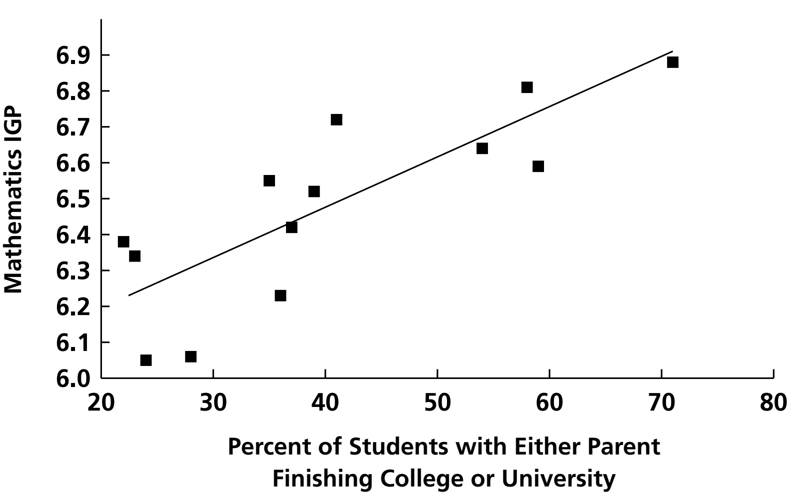


Figure 3
Scatterplot of Percent of Students' Parents with a College or University Degree and Average Mathematics IGP Value for 13 Districts



mean achievement at the classroom level was .15 of a standard deviation. That's like a student in the 50th percentile moving to the 56th percentile.

The impact of district-level opportunity to learn on student achievement (controlling for student- and classroom-level variables) was approximately one-third of a standard deviation. So, our best estimate indicates that an increase of one grade-level in IGP value at the district level would move a student from the 50th percentile to roughly the 65th percentile on mathematics achievement. Thus, the answer to our question is that student achievement is significantly related to socioeconomic status, but, *having controlled for this at all three levels (student, classroom, and district), both classroom- and district-level opportunity to learn is also significantly related to student achievement.* Variation in students' opportunity to learn comes from both the classroom and the district. This is both good and bad news. It is good news because opportunity to learn is something districts and teachers can change. The bad news is that districts seem to persist in providing less rigorous content to students with lower socioeconomic status.

The bottom line is that equality of educational opportunity, where opportunity is defined in terms of content coverage, does not exist within or across districts. Just as problematic is our initial finding: for these districts, the typical content covered in these eighth-grade classrooms is considered sixth-grade content internationally. *Other TIMSS countries are typically two grade levels ahead of the United States in terms of the rigor of their curricula*. Fortunately, our research suggests that the achievement of U.S. students would likely increase substantially if we would make our mathematics content more demanding.

Up to this point, we've dealt with the consequences of content variation at the middle school (eighth-grade) level. Do these differences in opportunity to learn persist once students move to high school? We address this in the next section.

II. Inequality in High School

As part of a research and development project called Promoting Rigorous Outcomes in Mathematics and Science Education (PROM/SE),* we have worked with nearly 60 school districts in two states, Michigan and Ohio (because the work is ongoing, we will not identify the districts). To explore the extent to which high school students have an equal opportunity to learn mathematics, we examined the transcripts of 14,000 seniors in 30 high schools in 18 of our PROM/SE districts. As we explain below, we found a shocking number of mathematics courses and dramatic differences in students' course taking.

Much of the variation we found is the result of the pervasive use of high school tracking (i.e., offering different levels of the same course, such as Basic Algebra, Algebra, and Honors Algebra). While tracking today is typically not as rigid as it used to be (with students in the college, general, or vocational track for all their courses), it still has an impact on students' opportunity to learn.

Most schools and districts in the United States track students because they believe it optimizes students' achievement. Advocates of tracking argue that this type of curricular differentiation facilitates teaching and learning, as it matches students' current knowledge and ability levels to the most suitable curriculum. Tracking theory contends that some students would struggle immensely in a high-level curriculum, while a low-level curriculum would confine others.

Most research on secondary school mathematics tracking, however, has found that it tends to adversely impact students in low-level courses compared with their peers in high-level courses. Students in low-tracked mathematics courses are less likely to expect to go to college, less likely to actually attend college (even after controlling for students' postsecondary expectations), and have lower self-images.[9] Perhaps most salient, though, is that many studies have found that mathematics tracking tends to exacerbate achievement inequalities between high- and low-tracked students.[10]

In order for multiple mathematics tracks to exist, the school must offer multiple mathematics courses. A school that offers four mathematics courses—one corresponding to each grade level—and requires all of its students to take these courses, only offers one possible sequence of courses and thus one track. However, this is highly uncommon. Schools typically offer more than four mathematics courses—often many more—and allow students to choose from numerous possible sequences of courses. These sequences can, and often do, vary by the number of courses taken, the order in which courses are taken, and the types of courses taken.

Not only do we have great variability across districts, but by international standards, our eighth-grade students are exposed to sixth-grade content.

To find out just how much variability there was in our 30 high schools and 18 districts, we began by counting the number of distinct mathematics courses offered. We treated each new course title as a different course, even in cases like "Formal Geometry" and "Geometry," or "Applied Algebra" and "Algebra I." Previous research has shown that the covered content in two courses with a similar title can vary wildly.[11] We therefore find it more prudent to assume that if schools choose to give courses different titles, then it is most likely that the content is different, at least to some extent.

In all, we found 270 different mathematics course titles, including 39 focused on mathematics below algebra, 11 on beginning algebra, 9 on geometry, and 9 on advanced algebra. Here are a few examples:

- **Below Beginning Algebra**: Fundamental Math, Technical Math, Transitional Math I, Contemporary Math I, Practical Math, Math Junior, Intervention Math I, Final Math Topics, Corrective Math, Alternative Math, Life Skills Math, Vocational Math

*To learn about this project, see **www.promse.msu.edu**.

- **Beginning Algebra**: Applied Algebra, Algebra I, Algebra I Honors, Introductory Algebra, First Year Fundamental Algebra
- **Geometry**: Elementary Geometry, Plane Geometry B, Geometry, Informal Geometry, Fundamental Geometry
- **Advanced Algebra**: Algebra II General, Enriched Algebra II, Integrated Algebra II, Advanced Algebra II, Essentials of Algebra II, Algebra II

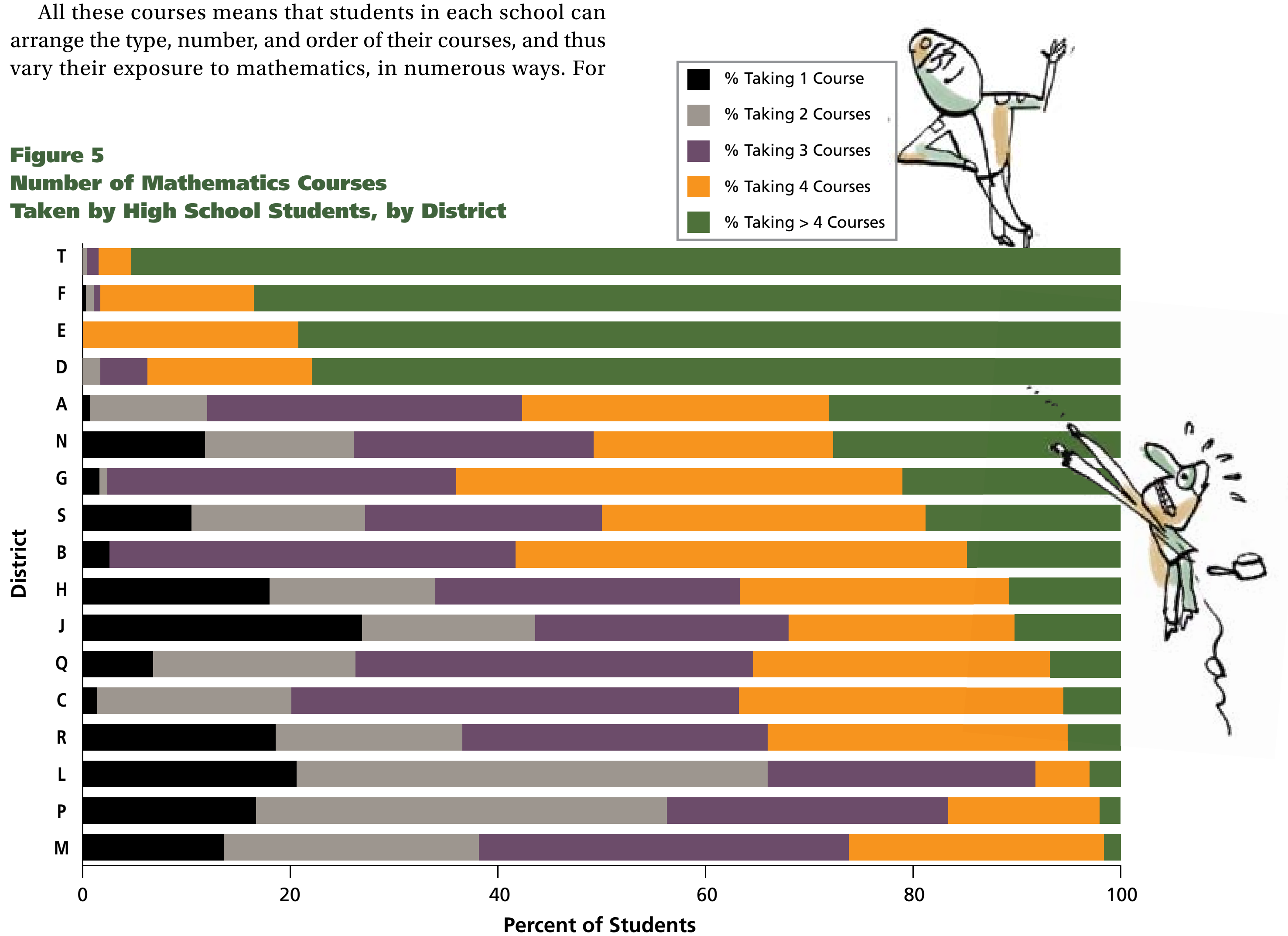
Of course, what really matters is not all 270 courses, but which courses are offered in each of the 18 districts. We focus on the district rather than the school because the district sets curriculum policies. Of course, high schools in the same district may not offer the exact same number or types of mathematics courses, but we found the variation among schools in the same district to be quite small. In contrast, we found that the number of mathematics courses offered by each district varied considerably. If a district were to offer only one course for each mathematics content category (e.g., beginning algebra, geometry, precalculus, etc.), then there would be fewer than 10 courses offered. Looking across our 18 districts, the number of courses ranges from a low of 10 to a high of 58, with most districts offering close to 30 mathematics courses.

All these courses means that students in each school can arrange the type, number, and order of their courses, and thus vary their exposure to mathematics, in numerous ways. For example, two students in the same school may take substantively different sequences of courses—such as Basic Math, then Algebra, then Geometry; versus Geometry, then Advanced Algebra, then Precalculus—*and* take different versions of these courses—such as Elementary Geometry versus Honors Geometry.

We have, until this point, focused on the total number of courses offered, seeing large variation in both the number and the types of courses. The variation in actual courses taken, however, is not as large as it could be. Many students take similar courses. About 40 percent of the students in our study took Algebra I, Geometry, and Algebra II. Nevertheless, variation in course taking remains significant.

One particular way that students' mathematics course taking varies is in the number of courses they take. As shown in Figure 5 (below), we examined the number of mathematics courses taken by each of the 14,000 seniors in our 18 districts. We were dismayed to find that in half the districts, anywhere from 10 to 27 percent of students took just one mathematics course in high school. (In the other districts, anywhere from 0 to 7 percent took just one course.) At the other extreme, in four districts the vast majority of students took four or more mathematics courses. Across districts, variation was common. Most districts had students who took anywhere from one to four or more courses.*

Figure 5
Number of Mathematics Courses Taken by High School Students, by District



Although we began this study well aware that high school students have options in selecting their mathematics courses, we were startled by the differences across districts. Students may attend high school in the same district, but as they graduate there is little commonality in the type or amount of mathematics to which they have been exposed. We do not believe all high school students should take the same courses, but we do believe there should be a high degree of overlap across programs for most students. We certainly do not see any reason for 270 mathematics courses, or for 25 percent of students in one district to take just one mathematics course while more than 90 percent of students in another district take more than four courses.

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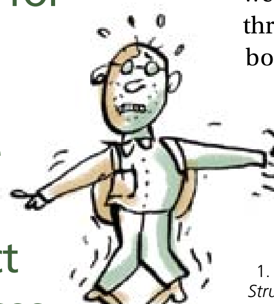

Most nations endorse the idea that, as public policy, *all* their children should have equal educational opportunities. For the vast majority of 1995 TIMSS countries, intended mathematics content coverage was indeed the same for all their students through what we would call middle school. Even in countries that appear to be creating different tracks, the reality is that basic content is covered by all, with advanced students studying the same topics more deeply.[12] The associated differences among student performance on the TIMSS achievement test were thus far more a matter of individual student ability and effort, combined with differences in teacher quality, than a matter of public policy that supported or even encouraged regional or local differences in students' opportunity to learn.

Sadly, this is not the case in the United States. Not only do we have great variability across districts in eighth grade and high school, but by international standards, our eighth-grade students are exposed to sixth-grade mathematics content. Differences in mathematics achievement are *not* simply the result of differences in student ability and effort, but also matters of chance or social factors such as poverty and housing patterns that influence where a student happens to attend school. There's just no escaping that less opportunity to learn challenging mathematics corresponds to lower achievement.

Though we wish it weren't so, the United States *cannot* be considered a country of educational equality, providing equal educational opportunities to *all* students. This lack of equality in content coverage is not merely an issue for the poor or minorities. Rather, any student in the United States can be disadvantaged simply because of where he or she attends school. In school mathematics at least, the playing field for students is not level. For all students—the lucky few and the unlucky many—educational opportunity depends on factors that cannot be wholly overcome by student ability and effort.

As a nation, we must act to correct these inequities. The solution is not as easy as simply making sweeping changes in course content, but improvement is possible. Although the research we presented here is limited to eighth grade and high school, we suspect changes would need to be made from preschool through high school in mathematics content coverage, textbooks, teacher training, and professional development. Without such changes, the inequality in opportunity to learn mathematics will continue to epitomize the worst sort of playing field: how it tilts depends on where one stands. ☐

*No doubt, some of the course titles indicated a one-semester course such as Algebra A and Algebra B. However, such instances would not substantially alter our conclusions.

Endnotes

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