is equitably available to all students through study and hard work. On the other hand, mathematics can be thought of as a subject that separates children into those who can and those who cannot, and that is valuable as a sorting mechanism, allowing people to label some children as smart and others as not smart. Some people revel in the inaccessibility of mathematics as it is currently taught, especially if their own children are succeeding, because they want to keep a clear societal advantage. Others, thankfully, are willing to embrace the change needed, even if their children are succeeding now, especially when they learn that their children's perceived advantage is often based on a math that is really not going to help them in the future.

The Myth of the Mathematically Gifted Child

Some people, including some teachers, have built their identity on the idea they could do well in math because they were special, genetically superior to others. People try really hard to hang on to the idea of children who are genetically gifted in math, and the whole "gifted" movement in the United States is built upon such notions. But we have a great deal of evidence that although people are born with brain differences, such differences are eclipsed by the experiences people have during their lives, as every second presents opportunities for incredible brain growth (Thompson, 2014; Woollett & Maguire, 2011). Even the people whom society thinks of as geniuses actually worked really hard and in exceptional ways to achieve their accomplishments. Einstein did not learn to read until he was nine, and he failed his college entrance examination, but he worked exceptionally hard and had a very positive mindset, celebrating mistakes and persistence. Rather than recognizing and celebrating the nature of exceptional work and persistence, the U.S. education system focuses on "gifted" students who are given different opportunities, not because they show great tenacity and persistence but often because they are fast with math facts. The labeling of students as gifted hurts not only the students who are deemed as having no gifts but also the students who are given the gifted label, as it sets them on a fixed mindset pathway, making them vulnerable and less likely to take risks. When we have gifted programs in schools we tell students that some of the students are genetically different; this message is not only very damaging but also incorrect. Not surprisingly, perhaps, studies that have followed people who had been labeled as gifted in their early years show that they go on to average lives and jobs (http://ireport.cnn.com/docs/DOC-332952).

Malcolm Gladwell unpacks the nature of expertise in his best-selling book *Outliers*. Drawing from extensive research conducted by Anders Ericsson and colleagues, he points out that all experts, including math experts, have worked for at least 10,000 hours in their field (Gladwell, 2011). Some people who have excelled in math choose not to be proud of the hard work and struggle they went through; they prefer to think they were born with a gift. There are many problems with this idea, one being that students who are successful through hard work often think that they are imposters because their achievement was not effortless. Many of these high-achieving students drop out of math because they do not believe that they really belong (Solomon, 2007). This problem comes from a pervasive idea that "math people" are those who effortlessly achieve in math because they were born with something different, and only they truly belong. Add to this idea the stereotyped notions about who is "naturally" good at math, and we start to understand the nature of the problem we face in the United States. Many people recognize that mathematics inequality comes from stereotyped ideas about who can achieve in mathematics and they work to combat them on a daily basis. Unfortunately there are others who work hard, whether consciously or not, to promote the inequities that pervade the mathematics education landscape.

There are some math teachers—fortunately I have met only a few—who think they are superior to teachers of other subjects in their schools, and who think their job is to find the few math students who are special like they are. One high school teacher I met gave 70% of his students an F in every math class he taught, every year. He did not see the students' failure as a reflection on his teaching; he saw it as a reflection on the students who he did not believe had the "gift." In discussions with this teacher, I realized that he feels justified in failing so many students, even though he is ending students' academic futures and stopping them from graduating high school, because he believes he is the guardian of math success and his job is to make sure only the "stars" move on to higher levels. Some university math departments give students a lower grade if they attend office hours and seek help. They do this because the admirable approach of working harder, which should be encouraged, is a sign to them that students don't have the gift. When mathematics is taught with an attitude of elitism, and it is held up as being harder than other subjects and suitable only for the gifted few, a tiny subset of those who could achieve in mathematics—and the scientific subjects which require mathematics—do so. When this elitist idea is combined with stereotypical ideas of who has the gift, harsh inequities are produced. We have only to look at the national U.S. data on the students who take advanced mathematics to see the impact of the elitist, "gifted" culture of mathematics in the United States. In 2013, 73% of math doctorates were male and 94% were white or Asian. The proportion of women taking mathematics PhDs between 2004 and 2013 actually fell, from 34% of students to 27% of students (Vélez, Maxwell, & Rose, 2013). These data should be cause for high-level discussions of mathematics inequities, prompting policy makers and others to seriously consider what we are doing in K–12 schooling that contributes to these growing inequities.

Women are underrepresented in most STEM subjects, but there are also some humanities subjects in which women's underrepresentation is more severe than in STEM. For example, 54% of U.S. PhD students studying the STEM subject of molecular biology are women, but only 31% of students studying the humanities subject of philosophy are women. This was interesting to researchers who looked into the reasons for the different patterns of representation. They found that the subjects in which professors believed that raw, innate talent is the main requirement for success are exactly those subjects in which women—and African American students—are underrepresented (Leslie, Cimpian, Meyer, & Freeland, 2015). As I discussed in Chapter One, math was the STEM subject whose professors were found to hold the most fixed ideas about who could learn. Additionally, researchers found that the more a field values giftedness, the fewer female PhDs there were in the field, and this correlation was found to hold across all 30 fields they investigated. These ideas about giftedness cause fewer women to participate, because strong stereotypes persist about who really belongs in math (Steele, 2011). If women are underrepresented when university mathematics professors believe in giftedness, it is probably safe to assume that the same ideas about giftedness harm girls in early years of schooling, across K-12.

Carol Dweck, Catherine Good, and Aneeta Rattan conducted research to find out how much students felt a sense of belonging in math (Good, Rattan, & Dweck, 2012)—in other words, how much they felt they were members of the mathematics community and how much they felt accepted by those in authority. The researchers found that students' feelings of membership and acceptance in math predicted whether they planned to pursue mathematics in the future. The researchers went on to study the factors in the students' environment that led to different feelings of belonging, and they found that two factors worked against feelings of belonging. One was the message that math ability is a fixed trait; the other was the idea that women have less ability than men. These ideas shaped women's, but not men's, sense of belonging in math. The women's lowered sense of belonging meant that they pursued fewer math courses and received lower grades. Women who received the message that math ability is learned were protected from negative stereotypes—they maintained a high sense of belonging in math and remained intent on pursuing mathematics in the future.

In addition to the ideas of innate talent that pervade mathematics, another problem is the intellectual pedestal upon which most people put mathematics. People who calculate quickly are thought of as smart and special. But why is this? Mathematics is not more difficult than other subjects—I would challenge people who think so to produce a powerful poem or work of art. All subjects extend to difficult levels; the reason so many people think math is the most difficult is the inaccessible way it is often taught. We need to change the thinking around this if we are to open mathematics to many more people.

When Math Inequalities in Course Placement Become Illegal

One source of mathematics inequities is the high school course placement decision-making process. In the United States, the classes that a student takes from ninth grade onward determine, in part, the opportunities they will receive for the rest of their lives. Most universities require at least three years of high school mathematics for college eligibility, making these classes critical for students' futures. This means that high schools should do all that they can to make sure all of their students have the opportunities to take the mathematics courses they need. In my view, because of the role played by mathematics, high school math teachers and their administrators have an extra responsibility to work tirelessly to keep mathematics opportunities open to all students. A recent study of high school placement shed a very interesting—and disturbing—light on this issue.

In 2012 the Noyce Foundation studied student placement in nine school districts in the San Francisco Bay Area and found that over 60% of students who had passed algebra in eighth grade and/or who had met or exceeded state standards on California Standards Tests (CSTs) were placed into an algebra course again when they entered high school, repeating the class they had passed (Lawyers' Committee for Civil Rights of the San Francisco Bay Area, 2013). This started students on a path of low achievement from which many never recovered. In most high schools, only students who start with a class in geometry can ever reach AP statistics or calculus. But why would students be repeating a class, when it was so important for them to start on a higher path and they had already passed an algebra course? When the Noyce Foundation studied the data, they found that the vast majority of the repeating students were Latino/a and African American. The particular data they uncovered showed that 52% of Asian students took Algebra 1 in eighth grade and 52% took geometry in ninth grade. Among white students the algebra participation rate was lower: 59% took algebra in eighth grade but only 33% were in geometry in ninth grade. More disturbingly, 53% of African American students took algebra in eighth grade and only 18% were placed into geometry. Similarly, 50% of Latino/a students took algebra in eighth grade but only 16% were placed into geometry. The filtering of *most* of the African American and Latino/a students who had passed algebra into a low pathway is a clear case of racial discrimination, and the Silicon Valley Community Foundation took the unusual step of hiring lawyers to improve the situation. The legal firm employed found that the schools were acting illegally. They concluded: "Purposeful placement decisions that disproportionately impact minority students violate state and federal laws. But those responsible for math placement decisions also face legal liability if the misplacement decisions are the unintentional results of applying seemingly objective placement criteria that disproportionately impact minority high school students." In other words, math teachers may not be intentionally discriminating by race or ethnicity, but if they use other criteria, such as homework completion, that impact students of color more than other students, they are breaking the law. One of the great achievements of civil rights campaigners in the United States was to make eventual impact the criterion that matters. The San Francisco lawyers highlighted the fact that math placement that results in inequalities is a legal offense.

I expect that the teachers in the study did not think they were blocking the pathways of students of color because of their skin color; rather, a more subtle process of racism was occurring, with teachers deciding that some students do not belong in higher-level mathematics. One middle school principal in a different part of California asked me to sit with him one day and look at his data. He had been disturbed to find that students who had passed algebra in eighth grade in his school were being placed into repeat algebra classes in high school. When we looked together at the data we could not see any relationship between achievement and placement—as we should have—in the data. Rather, we saw a different relationship: a relationship between ethnicity and course placement; the students who were advancing were mainly white, and the students being held back were mainly Latino/a. I immediately recognized this as the same kind of racial discrimination in placement decisions that the Noyce Foundation had revealed. I asked the principal how this could possibly be happening. He explained that the high school teachers had told the middle school teachers they had "better not" advance any student who might fail, and that if students were late with homework or didn't shine in class, they should be held back. One of the high school teachers later managed to instigate a policy across the district that no child with a discipline referral could take algebra in eighth grade in any of the middle schools across the district. Such events may seem incredible, but they are happening because some teachers and administrators believe that they are the guardians of math and it is their job to find the students who truly belong.

After the Noyce Foundation had identified the issue and the Silicon Valley Foundation took on the responsibility of encouraging school districts to improve, a number of school districts made changes in the ways they placed students—with immediate effects. Some of the decisions school