MESSAGE

1 Smarter Than We Think

HELPING STUDENTS GROW THEIR MINDS

Smart is not something you are. It's what you become.

—Salome Thomas-EL ("Principal EL"), Thomas Edison Charter School, Wilmington, DE (2010)

When I first heard a few years ago about the *Washington Post*'s social experiment involving Joshua Bell, world-renowned classical violinist, I immediately thought of the lessons the experiment offers to educators. At the *Post*'s request, Bell wore street clothes—jeans, a long-sleeved t-shirt, and a baseball cap—to play his three-million-dollar Stradivarius violin in the L'Enfant Plaza metro station for forty-five minutes during Washington, DC's morning rush hour. The wonderful article in the Sunday edition of the paper described in beautiful detail what nearly all of one-thousand-plus people missed as they walked or ran by on that January day (Weingarten 2007). Reflecting on what those people didn't notice caused me to wonder what talents and abilities we—teachers, families, and other adults—may not be seeing in the young people in our lives.

Why Some Students Don't Succeed

There are many reasons why some students don't reach the high standards we set in mathematics. When I ask teachers to consider possible reasons for a lack of success, many identify factors related to the student (gaps in previous knowledge, attitude, intelligence, motivation, socioeconomic level); factors related to school (superficial coverage of content, shallow or inadequate instructional resources, a repetitive curriculum, lack of relevance of what is taught); factors related to the community or family (low expectations from family, a belief that only some people can do mathematics, societal expectations); and other

factors related to equity, opportunity to learn, and so on. While all of these issues and factors may relate to some students' lack of success in mathematics, I would argue that none of them are reasons that make it impossible for those students to succeed. For any reason or cause we might see as an obstacle that keeps a student from learning, I believe that somewhere a student is overcoming that same obstacle and learning mathematics well, possibly to a very high level. And I'm guessing that when we find that student, we can also find at least one teacher who has played a role in that student's learning.

How Students Hide Their Intelligence

Like Joshua Bell in the subway station, our students can disguise their talents and potential in ways that make it difficult for us to see them as smart, hard-working, creative, analytical, thoughtful, or "mathematical." Some students may not dress like our stereotypes of serious mathematics students—perhaps adopting the look of the latest fad, wearing dirty or shabby clothes, or just not being well-groomed overall. Other students may disguise their potential through their behavior or attitude—acting out, behaving rudely, being sullen, or simply remaining silent or behaving in ways so as not to be noticed. Others may not speak English well or may have learning disabilities, diagnosed or not. Others may miss class or arrive late, or show up lacking sleep or food. Some may just be unpleasant or argumentative or just the opposite, placid or accepting everything said without thinking.

The opportunity for teachers is to see through the disguises, to confront our preconceptions and biases about what a good mathematics student looks like or acts like. This is not an easy task, as many of those preconceptions and biases lie below the surface and we may not be aware of them. But if we can move past our unhelpful habits and beliefs, I believe we can open doors for both ourselves and our students.

Understanding Fixed and Growth Mindsets

One of the biggest factors in how well students do in mathematics may lie in their, and our, view of intelligence: Who's smart and how smart are they? Over time, two mindsets have represented the majority of thinking about intelligence. One mindset—a *fixed* or *entity* mindset—is based on the belief that each person is born with certain genes that determine absolutely their intelligence. Based on a fixed mindset of intelligence, nothing in a person's life is likely to change his or her intelligence; the

person is as smart now as they are ever going to be, even if they acquire knowledge along the way. The other mindset—a *growth* mindset—is based on seeing intelligence as a malleable quantity. In this view, the genes a person inherits have an influence on his or her intelligence, but genes are not the only influence. A person's intelligence and abilities are also influenced by experience and the kinds of thinking a person does over time.

Consider the implications of these two mindsets. Someone with a fixed mindset, believing that she or he has limited capacity for intelligence, that they were born with whatever mathematics ability they're ever going to have, is far more likely to give up when faced with a hard math problem. *Why bother? This problem is clearly beyond my ability.* On the other hand, someone with a growth mindset realizes that every person can develop his or her own intelligence and abilities. Individuals operating from a growth mindset know that intelligence and ability are related to effort and experience, so they are much more likely to be willing to tackle a hard problem. *This problem looks really hard. I guess I'm going to have to work a while on it.* A growth mindset is also likely to support someone's willingness to take a risk and share his or her thinking in a class discussion, thus contributing to the development of mathematical habits of mind for all involved.

A person's mindset about intelligence is significant and powerful, and it influences even more aspects of life than these examples. In her best-selling book *Mindset,* Carol Dweck (2006) offers an in-depth, accessible discussion of intelligence. The most essential idea related to a growth mindset is that there is increasing evidence and support that a person's experience, especially experience wrestling with challenging academic material, can have a positive effect on that person's intelligence.

This isn't a new idea; support for the contributions of experience to intelligence has been around for more than a hundred years, even before the technology was available for real-time analysis of the brain. In fact, in 1909, Alfred Binet, the creator of IQ tests, stated:

> A few modern philosophers … assert that an individual's intelligence is a fixed quantity … which cannot be increased. We must protest and react against this brutal pessimism.… With practice, training, and above all, method, we manage to increase our attention, our memory, our judgment and literally to become more intelligent than we were before. (as quoted in Elliot and Dweck 2007, 105–106)

Today, through brain scans and other recent advances in cognitive psychology, we have support for Binet's point of view. It's fair to say that wrestling with complex tasks in mathematics may make a person

smarter, even forming new neural connections in the brain. The flip side seems equally apparent—that not having such opportunities can stagnate, or even diminish, a person's intelligence over time. Since the teacher is the front-line decision maker about the tasks a student sees, the influence of a teacher's day-to-day choices on students' intelligence, not just on what they learn, is significant.

Teaching to Grow Students' Minds

Since the benefits of a growth mindset are so substantial, how do we promote a growth mindset among the students we serve? Teachers—and to a large extent families and other adults—can support students in growing their minds and increasing their intelligence in at least four areas.

BELIEVE IN EVERY STUDENT'S POTENTIAL

Is every student a potential Joshua Bell? Or a Crystal or Richard or Marisa or Jamal or …? The latter are all students I've written about who showed, and thankfully developed, their potential after sometimes many years of appearing to be less capable than they turned out to be. But do all students have equal potential? When I ask this question of teachers after they have been discussing the issues described in this message, they often respond that, while all students may not have the same potential in the same areas, they all likely have far more potential than they have shown, including their potential to do mathematics. I would assert that all students have untapped potential. And the adults around students—teachers, families, community friends, mentors—can have a tremendous influence on helping students unlock that potential and grow their minds.

CHOOSE RICH, DEEP, ENGAGING INSTRUCTIONAL TASKS

If experience influences a person's intelligence, then the mathematical tasks and problems we present to students, and how we present them, take on critical importance. Curriculum developers and authors of instructional materials have a responsibility to ensure that materials include rich, deep, engaging, and relevant tasks that cause students to think and to grapple with challenging mathematics. And, regardless of the curriculum, or for that matter the standards, table of contents, or pacing guide, teachers have a responsibility to make day-to-day instructional choices that ensure that students work with problems that engage their interest and their intellect.

Some teachers, thinking they are helping students by not frustrating them to the point of disengagement, try to protect students from struggling by offering shallow problems or procedural exercises that call for little more than one-step application of recently learned skills. And some parents, reflecting their students' frustration when presented with more challenging problems, advocate only giving students problems they have already learned how to solve. But when we limit students' experience in school to such low-level expectations, we cheat them of the opportunity to wrestle with hard mathematics and to grow their minds, even becoming smarter. In the end, a decision to avoid student frustration may diminish students' confidence and willingness to tackle anything difficult, leaving students ill-equipped to deal with real problems they will face outside of school.

PROVIDE FEEDBACK FOCUSED ON EFFORT

In addition to choosing good instructional tasks, we can monitor the kind of feedback we give students. When we praise students for how smart they are—*You are so smart!*—or unintentionally let them know we don't think they're smart enough to take on a particular problem, we reinforce a fixed mindset and make students feel like the amount of effort they put into something doesn't matter. But when we provide feedback based on effort—how hard students have worked or may need to work to arrive at a solution to a problem—*Your hard work really paid off!*—we encourage a growth mindset. Feedback based on a sincere interest in knowing how a student is thinking can be a powerful stimulus to encourage continued work and learning. In this way, we help them learn to persevere and build their confidence as they expand their learning and increase their intelligence.

MODEL HOW WE HANDLE MISTAKES

By modeling how we handle our own mistakes, we can help students develop a positive disposition toward mathematics and encourage their willingness to tackle hard problems. Many students have come to think that they're supposed to know the answer to a math problem right away. Mathematics can sometimes seem unforgiving, as students view answers to mathematics problems as either right or wrong; they certainly don't want to be wrong! As adults, when we acknowledge that we have made a mistake (whether in mathematics or in life) and as we make adjustments to our thinking or our actions based on what we learn as a result of the mistake, we can help students shift their view and adopt a healthy attitude about what success in mathematics looks like and how mathematical thinking really works.

What Can We Do?

> No one's born being good at things; you become good at things through hard work.
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> —President Barack Obama (2009, Remarks at Back to School Event)

Our job as influential adults in students' lives is to never underestimate the talents and intelligence any young person might be able to develop under the most conducive circumstances, and to express our high expectations and supportive confidence that each one will develop that talent and intelligence. Our job as educators is to make sure every student has the opportunity to wrestle with challenging mathematical tasks and rich, complex problems so that they can grow new neural connections, increase their confidence, build their willingness to persevere, and develop a positive and productive attitude about his or her competence and potential. We can offer feedback based on effort and perseverance and model the importance of mistakes to our learning.

Wouldn't it be wonderful if every student finished their elementary and secondary educational experience knowing they are capable, succeeding in learning high-level mathematics, and having discovered their unique talents and abilities, wherever they may lie? Every one of us can support that goal for at least one student. As we help students develop a growth mindset that lets them know they can become smarter and smarter with hard work, maybe even students will realize they are smarter than they think.

Reflections and Discussion

FOR TEACHERS

- What issues or challenges does this message raise for you? In what ways do you agree with or disagree with the main points of the message?
- In what ways do you teach, or can you teach, that support every student in becoming smarter?

FOR FAMILIES

- What questions or issues does this message raise for you to discuss with your son or daughter, the teacher, or school leaders?

- How can you let teachers know that you support presenting students with challenging, deep problems that cause students to think and wrestle with mathematical ideas, rather than only presenting problems that students have learned specifically how to solve?
- How can you communicate to your daughter or son your confidence that they can become smarter and succeed in mathematics?
- A parent's attitude toward mathematics can have a strong effect on a student's confidence, in either a positive or negative way. How can you let your son or daughter know that you have high expectations for their success in ways that support their confidence and development of a positive attitude about learning, about mathematics, and about himself or herself?

FOR LEADERS AND POLICY MAKERS

- How does this message reinforce or challenge policies and decisions you have made or are considering?
- How do your placement and tracking practices support the growth of every student's intelligence?

RELATED MESSAGES

Smarter Than We Think

- Message 8, "Oops!," looks at the value of mistakes for both students and adults, discusses how we can learn from mistakes, and recognizes the contributions of how we handle mistakes to a growth mindset.
- Message 4, "They Just Aren't Motivated!," examines what motivates students to engage in mathematics.
- Message 3, "He Doesn't Know His Facts," tells the story of a man who overcame an apparent barrier with hard work.
- Message 29, "Finding Great Teachers," offers lessons about supporting teachers in developing their talents.
- Message 13, "Clueless," considers how a student's intelligence may be disguised by what we teach them and how we teach them.

Faster Isn't Smarter

- Message 18, "Faster Isn't Smarter," examines the negative implications of timed tests, potentially disguising how capable some students may be.

- Message 2, "Untapped Potential," advocates allowing all students access to good mathematics and discusses the importance of supporting all students in becoming smarter.
- Message 17, "Constructive Struggling," considers the advantages of offering students challenging problems.
- Message 31, "Do They Really Need It?," tells a story about doing what we say we believe in terms of high expectations.
- Message 30, "Crystal's Calculator," describes a student whose talents emerged after getting past a barrier.

MORE TO CONSIDER

- *Mindset: The New Psychology of Success* (Dweck 2006) is a breakthrough book for both educators and the public about the implications that mindset has on intelligence.
- *Self-Theories: Their Role in Motivation, Personality, and Development* (Dweck 2000) looks at how people work and when they're most functional and successful.
- "Pearls Before Breakfast" (Weingarten 2007) tells the story of the Joshua Bell experiment.
- "Ability and Mathematics: The Mindset Revolution That Is Reshaping Education" (Boaler 2013) presents an overview of the impact of a growth mindset on mathematics teaching.
- *The Immortality of Influence: We Can Build the Best Minds of the Next Generation* (Thomas-EL 2006) offers an uplifting true story of the power of mentoring, high expectations, and support for students apparently unlikely to succeed.
- "Educ115N: How to Learn Math" is a Massive Open Online Course (MOOC) and related website offered by Stanford University and taught by Dr. Jo Boaler for educators, students, or noneducator adults addressing key issues related to learning mathematics, including discussions on intelligence, mistakes, perseverance, problem solving, teaching for student engagement, and other topics.
- *The Mismeasure of Man, revised and expanded edition* (Gould 2012) is an update of the author's concerns about the measurement of intelligence via IQ scores and standardized tests in general, and presents a renewed argument questioning the merits of any view of intelligence as a fixed quantity.
- The Dana Center's website, www.learningandtheadolescentmind.org, includes a nice summary of issues affecting students' success in school, especially in mathematics. It includes background information, teaching suggestions, and resources for further study.

- "Growth Mindset and the Common Core Math Standards" from *Edutopia* (Bryant 2013) looks at a growth mindset as it relates to students developing mathematical habits of mind described in the Common Core Standards for Mathematical Practice (NGA Center and CCSSO 2010).
- "Improving Student Achievement in Mathematics by Promoting Positive Self-Beliefs" (National Council of Supervisors of Mathematics 2010) describes research and includes references related to student beliefs and student learning.
- *David and Goliath: Underdogs, Misfits, and the Art of Battling Giants* (Gladwell 2013) looks at likely and unlikely candidates for success and considers the role of compensation and effort in helping people who might not be expected to succeed overcome their limitations and achieve success.
- *Outliers: The Story of Success* (Gladwell 2008) considers what makes some of the most extraordinary individuals achieve great things.
- *The Smartest Kids in the World: And How They Got That Way* (Ripley 2013) is a reporter's fascinating story of education in the United States and other countries from the perspective of a few students crossing cultures and experiencing education in a different light.
- *Why Don't Students Like School?* (Willingham 2009) is a cognitive scientist's view of fundamental principles about students, the growth of their intelligence, and implications for the classroom.
- *The Path to Purpose: How Young People Find Their Calling in Life* (Damon 2008) discusses how to help adolescents uncover their interests and determine possible future steps.
- *Sparks: How Parents Can Ignite the Hidden Strengths of Teenagers* (Benson 2008) presents ways that parents and other adults can help students uncover their potential.
- *Shattering Expectations Series: Breaking the Glass Ceiling of Achievement for Low-Income Students and Students of Color* (The Education Trust 2013) offers data and recommendations for how we can uncover and develop the potential in all students.

This message is also available in printable format at mathsolutions.com/smarterthanwethink.