MESSAGE

18 Faster Isn't Smarter

THE TROUBLE WITH TIMED TESTS

> The damage starts early in this country, with school districts requiring young children to take timed math tests from the age of 5. This is despite research that has shown that timed tests are the direct cause of the early onset of math anxiety.
>
> —Jo Boaler, mathematics education researcher

It's a widespread belief that to be good at math means to be fast at computation. But this belief may in fact do more harm as good. Some of the world's greatest thinkers, scientists, and mathematicians have not been fast at arithmetic, even though they were tremendously successful in working with higher-level mathematics. Dr. Emma King has noted her poor performance on rote arithmetic computation, in spite of her highly recognized work in the scientific field of cosmology. Numerous scientists and scholars from around the world could tell similar stories.

Certainly as part of a complete and balanced mathematics program it is useful to be able to add, subtract, multiply, and divide quickly, and it is important to know basic addition and multiplication facts without having to figure them out or count on your fingers. But asking students to demonstrate this knowledge within an arbitrary time limit may actually interfere with their learning. While computational recall is important, it is only part of a comprehensive mathematical background that includes more complex computation, an understanding of mathematical concepts, and the ability to think and reason to solve problems. Measuring this one aspect of mathematics—fact recall—using timed tests is both flawed as an assessment approach and damaging to many students' confidence and willingness to tackle new problems.

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A Classroom Story

The pressure and potential damage of timed tests became especially evident to me several years ago when a seventh-grade teacher invited me to visit her class. It was September, and the teacher was spending two weeks reviewing multiplication facts before going on to seventh-grade material. The teacher explained to me that each day she was testing a different set of facts. The day I visited, the class was taking a timed test on the "four timeses." The students became increasingly anxious as the teacher passed out short fact tests face down on their desks. All eyes were watching the second hand on the clock; students knew that until it reached 12, they were safe. When the second hand hit 12, the teacher said, "Begin!" The boy I was sitting next to had seemed particularly anxious, and when it was finally time to start, he began to slowly grind out a few answers. He was gripping his pencil so hard that it broke in the process. After what seemed an eternity, the three minutes were finally up. I looked at the boy's paper. He had not come close to finishing, and the few answers he had so painstakingly attempted to write were wrong. If his performance was similar to others in the class, I had to conclude (as the teacher had) that these seventh graders did not know their facts.

The teacher collected the papers and handed out a puzzle-type worksheet for the students to complete while she graded the tests. The puzzle worksheet was on the same facts the students had just seen on the test—the "four timeses". I sat quietly as the same boy now used his broken pencil to calmly and correctly complete all the facts on the worksheet. He got the correct answer to the puzzle, put down his pencil, and pulled out a book to read. A few minutes later, the teacher read the names of the students who had passed the timed test. Of course, the boy seated next to me was not on the list.

The lessons from this story are clear. Some students respond well to competitive and timed situations, thriving on the pressure to bring out their best; others have quite a different reaction. This particular boy was clearly in the latter category. He was prevented from finishing the test, something that causes some students tremendous frustration. Even more damaging, he received a clear message that some students are good at math and some are not; and he knew exactly which group he was in. Furthermore, the teacher was led to believe, incorrectly, that this student did not know his multiplication facts. Consequently, and perhaps worst of all, the boy was placed in a special group to receive remediation he didn't need on low-level arithmetic, robbing him of the opportunity to move into more interesting problems and engaging work involving seventh-grade mathematics.

An Alternative Scenario

When I tell this story, sometimes teachers share other approaches to helping students develop speed in computation. For example, if a teacher or school chooses to include speed as a mathematics priority, the teacher might offer students the option to work toward their best time during a six- or nine-week grading period, designating a specified block of time one day a week for this type of work. When a student is ready to try to improve his previous time, he can request to take the test. Students record their starting and ending times, doing their best to complete the test quickly and beat their best time, but always finishing and competing against only themselves. This type of self-administered assessment carries much less stress and allows each student to complete the test without competing against other students. Some teachers may devise other less damaging ways than using timed tests to help students become more proficient in their fact recall.

What Can We Do?

Even if we use other practices to evaluate speed, we need to weigh the importance of this aspect of mathematics within the entire program. Overemphasizing fast fact recall at the expense of problem solving and conceptual experiences gives students a distorted idea of the nature of mathematics and of their ability to do mathematics. Some students never survive this experience and they turn away from mathematics for years, sometimes forever. Having experienced timed tests when they were students, many adults believe that accurate, fast computation is the most significant part of mathematics. When pressed, many of these adults who dislike or fear mathematics attribute these negative feelings to experiences from their school years, especially the use of timed tests. In determining how much to value speed in arithmetic, we must consider the costs and benefits: If teachers highly value speed in mathematics, what are the potential gains for student learning? The potential damage?

For some students, their success at being fast at computation opens doors to allow them access to higher-level mathematics. But as Jo Boaler notes in the quote at the beginning of this message, for many other students, trying to be fast at computation and being expected to show their speed on timed tests may well lead them to reject mathematics and to see themselves as "nonmath people." Marilyn Burns' words from some time ago still hold true: "Speed with arithmetic skills has little, if anything, to do with mathematical power" (1989). We are now discovering that being good mathematical thinkers or problem solvers is at least as important as being good at computation and can also pave the way to higher-level mathematics. At a time when we want to help every student learn challenging, rigorous, and relevant mathematics, we must look for ways to tap into each student's strengths, not fall into the trap of believing that timed tests are the way we identify our good mathematics students.

Reflection 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?
- What value do you put on speed in your classroom, and, if speed is one of your goals for students, how can you evaluate it in positive ways that support student learning?
- If your school or district mandates timed tests, and if you disagree with this mandate, how can you work aggressively to change this practice?
- How can you use a variety of assessments that go beyond timed computation or fact recall in order to find out how well students are learning mathematics?

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 help your daughter or son understand that it is useful to be able to perform mathematical procedures efficiently, but that this is not the only measure of success in mathematics?
- Realizing that support at home can be tremendously useful in fact recall, how can you help your son or daughter learn, practice, and reinforce basic facts and mental procedures so that these become automatic, without using timed tests or sending negative messages about mathematics?

FOR LEADERS AND POLICY MAKERS

- How does this message reinforce or challenge policies and decisions you have made or are considering?
- In particular, if your school or district endorses, encourages, or mandates the use of timed computation or fact recall tests, how might you redirect this policy?
- How can you find out whether teachers support the use of timed tests? How can you make teachers aware of the potential negative consequences of using timed tests?
- How can you help teachers develop a robust set of assessment tools and strategies to inform their teaching and to find out what mathematics students know?

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RELATED MESSAGES

Faster Isn't Smarter

- Message 16, "Hard Arithmetic Isn't Deep Mathematics," discusses what rigorous mathematics looks like.
- Message 24, "Do It in Your Head," makes a case for including the teaching of mental math as part of a balanced mathematics program.
- Message 14, "Balance Is Basic," reminds us of the importance of teaching not only computation, but also mathematical concepts and problem solving.
- Message 35, "Putting Testing in Perspective," looks at the types of assessments teachers can use in support of student learning.

Smarter Than We Think

- Message 3, "He Doesn't Know His Facts," tells the story of a very successful man who received advanced degrees in mathematics-intensive fields without knowing his multiplication facts.
- Message 19, "How to Know What They Know," offers thoughts about how to assess student learning on a day-to-day basis without relying on timed tests.
- Message 1, "Smarter Than We Think," illuminates the nature of intelligence and reminds us that being smart may not look like what we think, and that intelligence has much to do with effort, struggle and persistence.

MORE TO CONSIDER

- "Timed Tests and the Development of Math Anxiety" (Boaler 2012) presents a compelling case for avoiding the use of timed tests in school mathematics.
- "The Need for Speed in Mathematics" (Gilliland 2001) looks at why timed skills tests may not be helpful for students.
- "Are We Obsessed with Assessment?" (Gojak 2013a) considers the downside of overly assessing students.
- *About Teaching Mathematics: A K–8 Resource, Fourth Edition* (Burns 2015) covers many aspects of school mathematics, including a discussion on misconceptions about the value of timed tests.
- *Overcoming Math Anxiety* (Tobias 1995) looks at the role of negative school experiences, including timed tests, in the development of math anxiety in adults.
- The Family Resources page of the National Council of Teachers of Mathematics (www.nctm.org/resources/families) includes, among other resources, links to documents that answer questions about the changing nature of mathematics today and the use of timed skills tests.

The following examples are selected formative assessment resources, offering a variety of strategies for monitoring student learning on a day-to-day basis without the use of timed tests

- *INFORMative Assessment: Formative Assessment to Improve Math Achievement, Grades K–6* (Joyner and Muri 2011) provides resources for monitoring, learning, and adjusting teaching based on how well students are learning the intended mathematics. *INFORMative Assessment: Formative Assessment to Improve Mathematics Achievement, Middle and High School* (Joyner and Bright, forthcoming) provides resources for monitoring learning and adjusting teaching based on how well students are learning the intended mathematics.
- *Good Questions for Math Teaching: Why Ask Them and What to Ask, K–6* (Sullivan and Lilburn 2002) and *Good Questions for Math Teaching: Why Ask Them and What to Ask, Grades 5–8* (Schuster and Anderson 2005) offer practical suggestions on asking the kinds of questions that inform teaching and help students learn to think.
- *How to Assess While You Teach Math: Formative Assessment Practices and Lessons, Grades K–2: A Multimedia Professional Learning Resource* (Islas 2011) offers a variety of resources for formative assessment in the early grades. *How to Assess While You Teach Math: Formative Assessment Practices and Lessons, Grades 3–5: A Multimedia Professional Learning Resource* (Islas and Terry, forthcoming) offers a variety of resources for formative assessment in the upper elementary grades.
- "What Does Research Say the Benefits of Formative Assessment Are?" (Wiliam 2007b) presents research findings on the benefits of formative assessment in mathematics from one of the world's experts. NCTM Research Brief.
- "Five 'Key Strategies' for Effective Formative Assessment" (Wiliam 2007a) suggests research-based classroom strategies for incorporating formative assessment into effective mathematics teaching. NCTM Research Brief.

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