

ASCD Resources on the Coronavirus Crisis

As schools shift to distance learning to combat the spread of coronavirus, ASCD has compiled firsthand guidance from education, health, and safety experts to help schools coordinate initiatives and attend to well-being issues. Visit www.ascd.org/coronavirusresources for more info.

The Invisible Math Obstacle

Imagine you're sitting in math class. The teacher scribbles long division on the board. You understand the concept, but you know the three-digit numbers will dissipate like smoke in your head as soon as you begin. You don't want your classmates to see you counting on your fingers. You match the rows of problems in the book with the rows of students, to predict which equation the teacher might ask you to solve.

In the world of learning differences, dyslexia is a household name, understood through extensive research, testing, and diagnostics that enable assistance for struggling readers. But developmental dyscalculia, a mathematical learning challenge affecting an estimated 5 to 7 percent of students, remains mostly in the shadows. While most educators are aware that students may struggle with math or have emotional anxiety around the subject, there's less understanding about the specific cognitive struggles students with dyscalculia might experience and the need for tailored attention, accommodation, and instruction in a mainstream math class.

Defining Dyscalculia

A student with dyscalculia has trouble grasping and processing numbers, including mathematical reasoning, calculation, and number-sense skills. This might manifest through issues such as differentiating between quantities (big vs. small), solving word problems, measurement or estimation, working with money, telling time, remembering sequences, memorization, spatial reasoning, or gauging distance. It's also common for dyscalculia to accompany other learning challenges like ADHD and dyslexia—though they are distinct issues requiring different supports. Because there is no way to eliminate dyscalculia, identification ensures students have lifelong tools to work with the challenge.

Daniel Ansari, head of the Numerical Cognition Laboratory at Western University in Canada, attributes the knowledge gap around dyscalculia to a lack of research and advocacy, though he says both fields are growing. An increasing number of organizations—Understood, Dyscalculia.org, Western University, ADDitude, and others—raise awareness and funding for dyscalculia support. The 2018 Netflix movie *Amateur* features a young basketball star's struggle with this learning condition. Though experts say the film doesn't get everything right, it's one of the first times dyscalculia received mainstream media attention.

A Different Language

Kara Ball, an elementary science/STEM education specialist in Baltimore City Public Schools, remembers well what it was like to struggle with dyscalculia as a student. She assumed she was just anxious about math and needed more practice, but remedial math classes and weekend tutors didn't help. She understood how math worked, but mental math was impossible. Anything larger than a three-digit number wouldn't stick.

The tangible supports Ball used to compensate—counting on fingers, scrap paper for visual notes or pictures, a calculator—felt embarrassing or weren't encouraged by educators. “You need to be able to just tell us,” Ball recalled her teachers saying. “You won't always have a calculator in your pocket.”

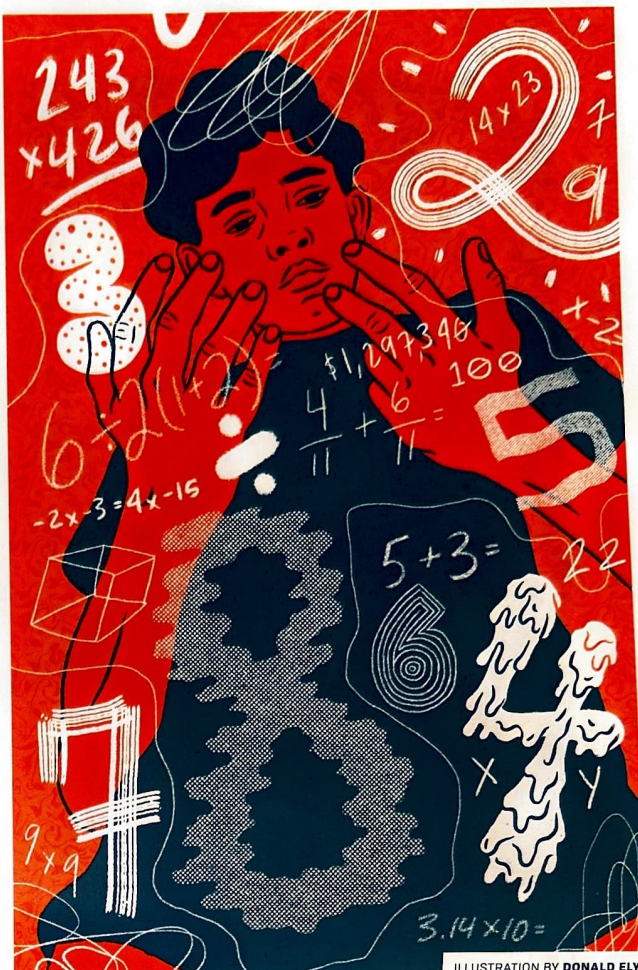


ILLUSTRATION BY DONALD ELV

It wasn't until 6th grade that she was officially diagnosed with dyscalculia (after a separate dyslexia diagnosis in 3rd grade). She still remembers the assumptions people made about her abilities long after grade school and well into college.

“I didn't want to count on my fingers in 10th grade math,” she said. “I declined all my accommodations, so that no one would need to know that I was Kara with two disabilities, something that I should have been upfront and honest about with people. That's what I work with my students on. It's a part of who you are.”

Ansari's lab researches key identifying predictors for math disabilities, including studying behavior and brain activity. “The parietal lobe is critical for doing basic math, but children who have math learning disabilities don't activate those regions to the same extent,” said Ansari. “Students show greater activation in other parts of the brain as they develop strategies to overcome their weakness.”

From Awareness to Identification

According to the National Center for Learning Disabilities, 1 in 5 children have brain-related learning or attention challenges. Yet, in the 2019 study “Forward Together: Helping Educators Unlock the Power of Students Who Learn Differently” by the center and the organization Understood, fewer than 1 in 5 general educators said they're “very well prepared” to teach them. This stems in part from a lack of focus in teacher-prep programs. Ball, who was a finalist for the 2018 National Teacher of the Year and is dual-certified in elementary and special education, has partnered with these and other groups to lead dyscalculia awareness sessions around the nation. Many audiences she speaks with haven't heard of dyscalculia or assume it's related to dyslexia.

So, Ball tells them about coping strategies she still uses as an adult. She always carries scrap paper to write down numbers. She takes pictures of hotel rooms and needs a calculator to make change. In the girls' running club at her school, she uses a small string of beads to record laps and track mileage.

Ansari hopes research will allow dyscalculia experts to design better identification screening for early detection. In the meantime, tools such as his laboratory's two-minute activity (numeracyscreener.org) or Nancy C. Jordan's “Number Sense Screener” can help with diagnosis. Students with dyscalculia need explicit, repetitive instruction, more time to understand how symbols represent quantity, playful activities to avoid math anxiety, and suggestions for finger counting in more sophisticated ways. Teachers might model math concepts with concrete supports (cubes or fraction bars) or representational ones (doodles, dots, tallies). The sooner students have these accommodations, the easier it will be for them to work with dyscalculia.

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OUR MISSION

ASCD empowers educators to achieve excellence in learning, teaching, and leading so that each child is healthy, safe, engaged, supported, and challenged.

MATH OBSTACLE

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Build Math Stamina

Ball might have up to three students with potential learning differences each year. To begin early identification, she uses whole-class formative assessments and exit checks to see which students make gains with traditional instruction. She also watches for familiar signs like persistent difficulties doing simple math, struggles with counting and memory long after peers can retrieve answers, or challenges matching numbers to amounts.

She loops in parents and a math coach and normalizes modifications and tailored group work. At the elementary level, she gives students the choice to solve math problems using the book, a multiplication table, or a rounding table, and any other tools they choose to find the answers.

Her students with learning challenges are especially excited for STEM activities because the work often pushes students to fail and try again. One of Ball's favorite lessons asks students to build a working arcade game. Many who are used to succeeding on the first try get frustrated. But her students with learning differences thrive on the fact that there's no one solution or right answer, similar to the kind of persistence dyscalculia demands of students daily.

"My students with disabilities don't fear failure because they're used to failing all day long," Ball said. "They tend to have more out-of-the-box ideas and solutions and are willing to try things out. We realize we just have to persist and keep going until it's successful." ●

Kate Stoltzfus is the associate writer at ASCD.

An Instructional Action Plan for Dyscalculia

Characteristic of Dyscalculia	Instructional Strategy
The student can do worksheets but fails tests.	Replace traditional tests and quizzes with authentic assessments. The student explains and demonstrates concepts using manipulatives, illustrations, and examples, or by making something that communicates key ideas effectively. More at dyscalculia.org/testing-differently .
The student is unable to keep up in class.	Provide instructional concepts in multiple forms: teacher notes, videos of lectures and demonstrations, study guides, manipulatives, step-by-step examples, and access to resources that provide background knowledge, illustrations, and practice exercises. Provide a syllabus that details upcoming content with links to multimedia resources for demonstrations and practice.
The student is easily overwhelmed, experiences anxiety, and shuts down.	Interrupt this cycle by maximizing engagement and supports. Provide active, ample, and multimodal opportunities for the student to experience and creatively demonstrate concepts.
The student is unable to work independently.	Build independence by guiding the student in hands-on activities with deliberate instruction on the language involved. Have the student successfully teach the concepts to others using key vocabulary, verbal explanations, and visual demonstrations with examples.
The student lacks basic skills, such as number sense, place value, and math facts.	Build fluency in mathematics language by teaching the student using money and a language-enhanced place value chart. Practice 20 minutes per day. For guidance, see dyscalculia.org/math-1d-remediation .

Chart by Renee M. Newman, founder of dyscalculia.org.



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