

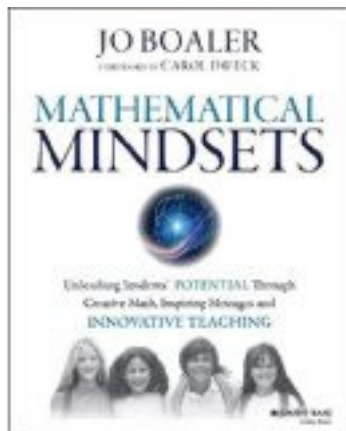
## PRODUCTIVE STRUGGLE

# Mathematical Mindsets

Reviewed by Leigh Ann Kudloff, CCTM Regional Representative

WITH A FORWARD BY CAROL DWECK, the author of *Mindset: The New Psychology of Success*, to set the stage, *Mathematical Mindsets* by Jo Boaler applies the concept of mindset to the mathematics classroom and challenges current practices. Starting with Dweck's work and what she has learned from their collaboration, Boaler details how the idea of mindset not only applies in a math classroom, but also about how teachers can build their students' mindsets to improve math achievement. Referencing her online class (taken by more than 40,000 people), Boaler compels the reader to join those teachers and commit to changing mathematics classroom practices. An overview of recent brain research and connections to learning math is presented. Boaler provides examples and explanations of the power of mistakes and struggle, while defining both growth and fixed mindsets. Our own CMT editor, Sandie Gilliam, is highlighted early in the book for the way she encourages her students to share mistakes openly and how practice not only builds growth mindsets but also creates a collaborative learning environment. Boaler is clear throughout about her goal for writing *Mathematical Mindsets*: "Wherever you are on your own mindset journey, whether these ideas are new to you or you are a mindset expert, I hope that the data and ideas I share in this book will help you and your students see mathematics—any level of mathematics—as both reachable and enjoyable."

Next, Boaler challenges the status quo of mathematics education today and encourages us to see the



creativity and beauty in mathematics. She highlights the widespread misconceptions held by students, teachers, parents, and the community. She suggests that by changing our focus from calculating to making connections, thinking logically, and using space, data, and numbers creatively, we can make real mathematics a creative, visual, connected, and living subject. Using the definition of a growth mindset—the belief that intelligence grows the more you learn—Boaler outlines several changes to school mathematics to create mathematical mindsets. First and foremost, mathematics should be viewed as a flexible conceptual subject that is focused on thinking and sense making rather than procedures. She stresses the importance of flexibility with numbers and asking questions about math facts, math practice, homework, math apps, and games.

Two of the most valuable aspects of this book are the selection of rich mathematical tasks provided and Boaler's explanation of how to find, design, and adapt other tasks to create mathematical excitement. She suggests that the following reflective questions should be used in this process:

- Can you open the task to encourage multiple methods, pathways, and representations?
- Can you make it an inquiry task?
- Can you ask the problem before teaching the method?
- Can you add a visual component?
- Can you make it low floor and high ceiling?
- Can you add the requirement to convince and reason?

Boaler also includes a list of websites to support the use of rich tasks. She suggests that when such mathematical tasks provide different ways of seeing, different methods and pathways, and different representations, the mathematics changes for children,

parents, and teachers. The math becomes transformational.

Boaler raises more issues with the status quo in mathematics education by pointing out “the elitist construction of math” and “the myth of the mathematically gifted child.” She explains how our current practices limit achievement and participation of students of different ethnicities, genders, and socioeconomic income levels—more than any other subject taught! Additionally she illustrates when math inequalities in course placement can become illegal. After painting this bleak picture, Boaler goes on to provide strategies to move along the path of equity with these strategies:



- Offer all students high-level content
- Work to change ideas about who can achieve in mathematics
- Encourage students to think deeply about mathematics
- Teach students to work together
- Give girls and students of color additional encouragement to learn math and science
- Eliminate (or at least change the nature of) homework

She summarizes by empowering teachers to provide positive messages about success and the value of persistence and hard work for disengaged students. Teachers are responsible for and have the opportunity to make mathematics accessible to all students. Further Boaler recommends “de-tracking” in favor of “growth mindset grouping,” and offers ways to teach heterogeneous groups effectively. Boaler acknowledges that equitable, growth mindset teaching is more difficult than traditional teaching, but also states that it is more important and fulfilling for teachers as students achieve more.

*Mathematical Mindsets* not only addresses instruction but also provides strategies for assessment with a growth mindset. The book encourages developing student self-awareness and responsibility in the following ways: self-assessment, peer assessment, reflection time, traffic lighting, jigsaw groups,

exit tickets, online forms, doodling, student-written questions and tests. These strategies help students know what they are learning and where they should be in their learning. Boaler goes on to explain the importance of teacher feedback to help students understand the gap between where they are and where they should be. Additionally, she explains how teacher feedback is more valuable than grading, while providing advice about grading to teachers that have to give grades. The change from grading to feedback has a positive, powerful impact on student self beliefs, motivation, and future learning pathways.

The book also includes two appendices with very helpful information. Appendix A includes supporting materials and mathematical tasks that can be used in classrooms. Appendix B outlines classroom norms that nurture mathematical mindsets.

*Mathematical Mindsets* provides a plethora of material for use by new teachers, experienced teachers, administrators, coaches, parents, and higher education faculty, and strongly supports rich discussion for book study groups.

Personally, I have already recommended it to many of my colleagues and plan to use it in my math methods class in January. Used in conjunction with the online course, [How to Learn Math](#), this book can be a catalyst for great changes in mathematics classrooms. Teachers have the opportunity to examine all aspects of their practice while building growth mindsets. I can hardly wait to get started!

(Editors note: If you are interested in participating in an online summer book study on *Mathematical Mindsets*, send an email to [sandie.gilliam@comcast.net](mailto:sandie.gilliam@comcast.net).)