

FOREWORD

Seldom has a book been as timely or as necessary as *Productive Math Struggle* is today. The cumulative evidence is clear that when students engage in productive math struggle it can lead to a deeper understanding of mathematics, the development of a positive mathematical identity, and the continued study of mathematics. Productive math struggle has become a major theme at education conferences, institutes, and workshops all across the country. The concept of productive math struggle is so omnipresent that it is one of those rare educational concepts to make its way into mainstream media and popular culture.

While productive math struggle might be widely discussed, it is also the case in the United States that far too many parents, students, and even teachers simply don't believe there should be any struggle, productive or otherwise, in the mathematics classroom. The prevailing societal expectation is the myth that an effective teacher of mathematics makes the mathematics easy for students. In turn this leads to the unproductive belief that if a student experiences struggle in mathematics, then either the teacher is not doing his or her job well, or the student simply "isn't a math person." Ironically, many of the individuals who hold these negative beliefs about productive math struggle are simultaneously strong believers in productive struggle if the construct is applied to music or athletics. In performance activities like music or athletics, most parents, learners, teachers, and coaches expect participants to experience challenge and struggle, make mistakes, and continue to learn, grow, and improve. Productive math struggle implies that the process of learning mathematics is not fundamentally different than the process of mastering a piece on the piano or improving one's time in the one-mile run.

While seemingly everyone is talking about productive struggle, no one is providing the comprehensive guidance necessary for teachers and leaders to effectively nurture and support student engagement with productive math struggle. A clear gap exists between what we know about the importance of productive math struggle and direction on how to successfully engage students in productive math struggle. Specific guidance on how to overcome this gap is what practitioners desperately need and what makes *Productive Math Struggle* an indispensable resource for every teacher of mathematics. Grounded in the research as well as their personal experiences as teachers, SanGiovanni, Katt, and Dykema provide six action steps teachers can leverage to intentionally plan to provoke and support productive math struggle before, during, and after a lesson. Math struggle is typically viewed as an unfortunate and unexpected

event that emerges during a lesson, but the authors successfully reframe it as something teachers of mathematics need to intentionally plan for students to experience.

The authors illustrate with vivid examples how many of our “taken for granted” instructional practices and structures can undermine productive math struggle and damage students’ mathematical identity. In addition to the action steps, the authors provide numerous supporting routines, activities, teaching tips, vignettes for reflection, and “struggle moves” teachers can implement to nurture an environment where students successfully engage in productive math struggle and “push through” that struggle to gain a deeper understanding of mathematics.

Coherence in education is at best elusive. One of the remarkable accomplishments of SanGiovanni, Katt, and Dykema’s work lies in how they seamlessly connect the research on high-quality tasks, high expectations, identity, and *equity* to productive math struggle. This is perhaps their greatest contribution. The authors see productive math struggle as a critical feature of mathematics classrooms that supports access, equity, and empowerment, specifically arguing that every student is “worthy of struggle.” Productive math struggle isn’t just for students in gifted, talented, or AP courses. Productive math struggle is for each and every student. SanGiovanni, Katt, and Dykema make a compelling moral argument that productive math struggle is something to be valued, rather than something to be avoided—equity demands that each and every student experience productive math struggle.

Mathematics education in the United States finds itself, as it so often does, at a crossroads between what the research indicates makes a positive difference for teaching and learning on the one hand, and dominant societal beliefs concerning mathematics and mathematics instruction on the other—beliefs that in the case of productive math struggle stand as obstacles to the implementation of the very practices needed to reach every student and achieve more equitable outcomes. SanGiovanni, Katt, and Dykema provide a clear pathway through these obstacles. In an era where “helicopter” and “bulldozer” parents rush to rescue and eliminate all struggle from their children’s lives, productive math struggle becomes something much more than an instructional experience; it becomes a necessary transferrable life skill.

I encourage you to collaboratively engage with your colleagues to study, implement, and reflect on the pathway the authors offer. Demonstrate to yourself and your colleagues that you practice productive struggle by continuing to learn, reflect, and grow in your practice of teaching mathematics. By doing so you will not only deepen your students' understanding of mathematics, but you may ultimately prepare your students to better navigate life itself.

Matt Larson, PhD

Past President (2016–2018), National Council of Teachers of Mathematics (NCTM)

Associate Superintendent for Instruction, Lincoln Public Schools, NE

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