

From The Editor's Desk

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It's that time of year again to learn that last little tidbit of math, wrap up the 2015–2016 school year, reflect on the journey we've been on with our students, and begin to (1) think about our own summer professional development, (2) start our planning for summer school teaching, and/or (3) dream about that upcoming vacation!

This edition of the CMT presents one more idea from *Principles to Actions: Ensuring Mathematical Success for All*—**Support productive struggle in learning mathematics:** “Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships” (NCTM, 2014).

Encouraging productive struggle has been ingrained in my practice since reading NCTM's *Professional Standards for Teaching Mathematics* in 1991. In the book, Standard 6: Promoting Mathematical Dispositions states that the teacher “promotes students’ confidence, flexibility, perseverance, curiosity, and inventiveness in doing mathematics through the use of appropriate tasks and by encouraging students in mathematical discourse.” Over the years, what I continued to realize about this standard is that:



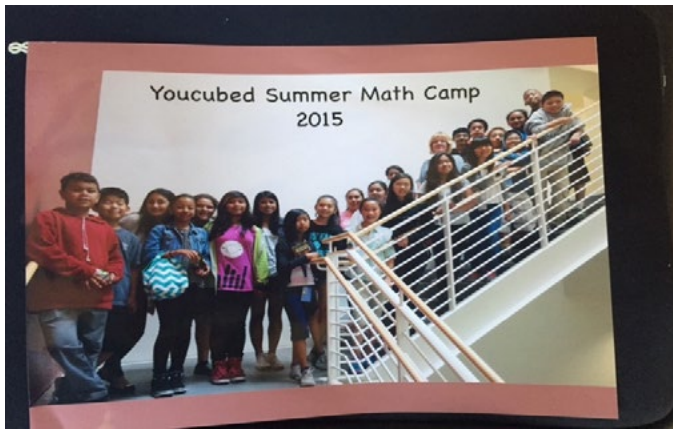
- Non-judgmental verbal cues by the teacher are an important part of students being able to clarify their process to solution and correct any mistakes, rather than the teacher saying, “Here, let me show you.”
- The classroom culture should support students raising questions and challenging ideas generated by other students as well as by the teacher, rather than students feeling afraid or embarrassed to speak up, just in case they are wrong.
- Students should embrace mistakes as a visible and natural part of the learning process.

- Ample time given for students to be active participants in engaging tasks both encourages and supports productive struggle.

Two years ago, *productive struggle* became my concern for students in a Math for Elementary Teachers class I taught at Colorado College. Students came face-to-face with the conceptual understanding of the base-10 system versus their previously learned systematic routine of how one adds, subtracts, multiplies, and divides. Their own frustration looking outside their once comfortable box of knowing math procedures led them to previous memories of “failing math so many times.” Somehow, *struggle* suggests the words: hard, impossible, failure—negative words—and since they already knew how to do arithmetic, they were unclear as to why they must be subjected to struggling.

On the flip side, when teachers initially think of helping students to have a *growth mindset*, they may mistakenly think this has everything to do with *praise* for one’s efforts. This was clearly the interpretation my college students had: “I was praised by my teachers and parents for both my effort and my academic achievement”; “My teachers were rewarding outcomes”; and “I had not seen any positive outcomes, and was thus putting in no effort.” As a teacher of these pre-service elementary teachers of math, I was trying to model and support productive struggle, and due to memories, they wanted little of it.

Last summer, Jo Boaler asked me to teach one of four math classes of middle schoolers at the four-week YouCubed Summer Math Camp at Stanford University. My awesome experiences there provided me with both new ideas and realizations on growth mindset. Recently, I went back to interview some of my students for Jo’s continuing research. What a difference from my college students. These middle-schoolers told me: “I know there are many ways to solve math problems”; “I know that mistakes grow your brain”; and “This year, I’m not afraid to speak up in class, even if I’m wrong.” Whereas, struggle might suggest negative words, *growth mindset* for these adolescents was purely positive! Each still has a can-



do attitude and a positive mathematical disposition.

As you read the *President's Message* and *Why Zombies Love ME: Shifting Mathematical Mindsets*, examine your own thoughts on productive struggle and growth mindset. Then peruse the book review for Jo Boaler's *Mathematical Mindsets*, and perhaps read the book to learn more.

The second foci of the **Spring CMT is: Summer: Professional Development or Summer School**. Last summer, I participated in all three of the suggested summer activities. In addition to teaching the YouCubed Summer Math Camp, the experiences there provided me with the collegial planning and discussion time that is rarely afforded to teachers in the regular school year, as well as new ideas on growth mindset. I plan to turn my learnings into conference presentations and an action research paper. Professional development (PD) and summer school teaching all in one! The work at Stanford was followed by horseback riding, hiking, fishing, and good food at a Wyoming dude ranch; and a visit to Grand Teton National Park.

What are your summer plans? Opportunities abound. Read about past activities from *Harrison District 2, Transition Summer Camp*, and *NCTM's 2015 Summer Institute*. They might whet your appetite. *Fast Connections* and *NCTM Professional Learning Opportunities* give you already calendared PD opportunities.

Perhaps you're the teacher who: 1) wants an unstructured summer of reflecting on your journey with students, and 2) likes to read about ideas and activities you could put into practice next year? If you want to learn more about *productive struggle*, go to: [Principles to Actions Professional Learning](#)

[Toolkit](#). A K–12 grade-band range of tasks in the toolkit helps teachers understand, and be able to use in their classrooms, the Mathematics Teaching Practices (from *Principles to Actions*) that continue to be foci of CMT issues. [The Case of Jeffrey Ziegler and the S-Pattern Task](#) is a high school example that supports productive struggle. While some tasks in each grade-band or teaching practice are available to everyone, the entire collection is available to NCTM members.

The foci of the Fall 2016 CMT are:

- Facilitate meaningful math discourse
- Build procedural fluency from conceptual understanding

The CMT Editorial Panel is looking for articles on each focus that clarify/explain research, and/or demonstrate and connect to classroom practice. Questions and article submissions can be sent to sandie.gilliam@coloradocollege.edu. Articles are due by July 15.

Whatever summer plans you choose, go and recharge your batteries for a productive new school year!

