

### **Nature of Mathematics**

Since I currently teach math and science to advanced fifth grade learners, I chose to focus on the nature of math, even though my heart wanted to focus on science or technology. Simply put, I'm burnt out when it comes to math and I thought this might be a good opportunity to begin to rejuvenate my love of teaching math.

### **Common Core Math Practices - Current Practice**

Reflecting critically on my use of the Math Practices in the classroom has led me down an interesting path exploring the "why" I've come to have my current relationship with math.

I work in a District in which academic achievement is paramount, especially when it comes to math. A question I often hear at parent/teacher conferences is "Where does my child rank in your class?" It's not unusual to have students in tears on standardized testing days because they are filled with anxiety. In fact, last year, during NWEA testing, I wrote on the board, "This test will have NO impact on where you go to college." Mind you, I teach fifth grade. It's common for parents to purchase the middle school math textbooks to have their child(ren) work through the book at home in the evenings so they can test into a higher level math class when they move on to middle school. This background is important for me to consider because it plays a key role in my daily classroom experience with math.

I have beautiful laminated posters of the Math Practices in my classroom and, every so often, I will refer to one of them when I'm teaching a mini-lesson or during a math classroom conversation. However, reflecting on my practices as a math teacher these past few years, I don't explicitly teach the Math Practices or integrate them as much as I should. Every year, I have this inner struggle when it comes to math. Do I fight the battle with our community about math in the classroom or do I just give in? Unfortunately, the last few years, I've just given in. I've found myself pushing to get through the content, often ignoring what I know to be best for students. It's disappointing.

Every year, I start with renewed vigor. I use materials and tasks from Dr. Jo Boaler's [website](#) (Boaler, 2013) that focuses on Mathematical Mindset. We start with open-ended explorations and watch videos about growth mindset. We even establish Math Norms (Figure 1) and expectations for our Math Community (Figure 2) and I link these norms and expectations to the Common Core Math Practices. For example, one of our first math investigations is Four 4's. Students try to use four 4's to find every number from 1 to 20. Students can only use four 4's. They must use four 4's each in each equation but can use any operations. For example, students might use  $4 + 4 + 4 - 4 = 8$  to find "8" or  $(4 \times 4) \div (4 \times 4) = 1$  to find "1". After we share our results, we have a class discussion and link this experience to our Math Norms and Math Practices 1 and 8, especially as students tend to use repeated ideas as parts of solutions.

Inevitably, however, about a month into the school year, that feeling comes upon me - look at how much content my colleagues have already covered so far. Why am I so far behind? What if my students don't perform as well on testing? What if parents get wind of how much further ahead Mrs. T's students are? Even though I know what I'm doing is best for students, I fall into this trap.

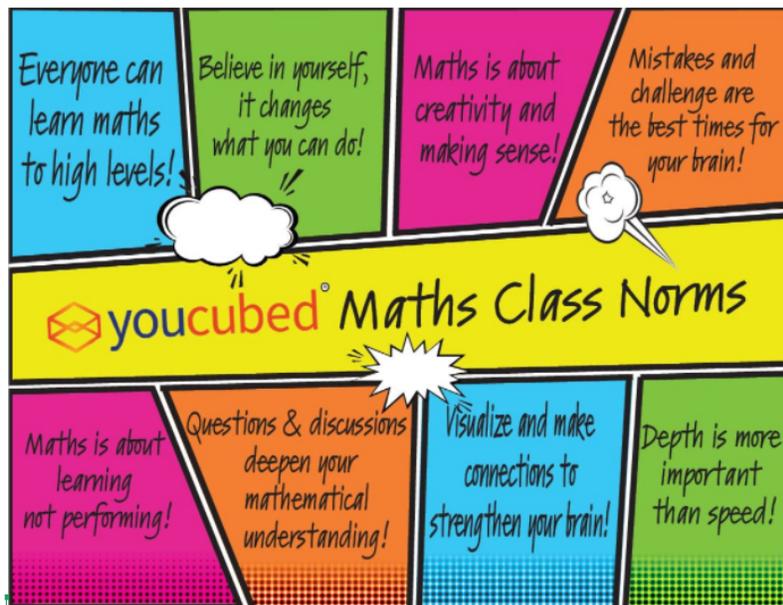


Figure 1

OUR MATH COMMUNITY...	
LOOKS LIKE	SOUNDS LIKE
<ul style="list-style-type: none"> <li>• We are focused, trying our best and being productive with our time</li> <li>• We are helping each other</li> <li>• We are paying attention to the speaker</li> <li>• When we are collaborating in a group, everyone participates</li> </ul>	<ul style="list-style-type: none"> <li>• When working with others, we are listening to one another and taking turns sharing ideas</li> <li>• We are engaged in math conversations using math vocabulary</li> <li>• We are on task; no side conversations</li> <li>• We have appropriate voice levels at different times</li> </ul>

Figure 2

**Common Core Math Practices - Enhancing my Current Practice**

I think I start each year off with good intentions and best practices to help my students think and investigate like mathematicians. My struggle comes with balancing the skills my students need to master with the math tasks that incorporate higher levels of thinking.

I think one of the first steps I need to take is to unpack the Math Practices. Although some of the practices I understand well, there are a few that I find a bit vague and struggle to grasp. For example, Math Practice 2 - Reason abstractly and quantitatively. I'm not sure what this should look like/sound like in a fifth grade classroom. Two resources I've used in the past to help with the Common Core Math Standards are the National Council of Teachers of Mathematics (<https://www.nctm.org/>) and Achieve the Core (<https://achievethecore.org/>). These might be good starting points to help me better understand the Math Practices I'm not really comfortable with.

Looking at the Math Practices that I am comfortable with, one that stands out to me is Math Practice 4 - Model with mathematics. This is a practice I could naturally emphasize when I'm teaching throughout the year. Since I work with advanced learners, many of my students are excellent calculators. They have memorized old-school tips and tricks for calculating and solving algorithms. However, when asked to explain why they take the steps they do when solving algorithms, they don't know; they can't explain their thinking. This past year, when I had fourth graders and we were focused on subtracting large numbers with regrouping, I first had students draw base-ten pieces to "show" the steps they were taking with regrouping. I told the students they couldn't use numerals! Then, when they were able to see the correlation between their algorithm steps and the models, their understanding clicked. This was a natural part of my lesson plan but I didn't take time or even think about connecting Math Practice 4. What a missed opportunity!

Perhaps I already utilize the Math Practices without even realizing it and instead of thinking I need to add something else to my plate, maybe I need to shift my mindset. We already utilize these Math Practices on a daily basis, I just need to recognize that and then determine how to make those connections with my students, as well.

I've always struggled making Learning Targets authentic in my classroom. It has always seemed so forced and non-organic. During my last evaluation meeting with my principal, she gave me a suggestion because she knows this is something I struggle with. Why don't I ask my students, at the end of our lesson, what they thought the Learning Target was for that lesson? That serves two purposes - to reflect on my lesson and its intended purpose and to help students make sense in their learning. I could also add this question - What Math Practices did we use today? How do you know? What a great opportunity this might be to put the learning in the hands of my students.

### **Nature of Math and Nature of Science**

One overlap between the Common Core Math Practices and the NGSS Nature of Science understandings is the focus on evidence. NGSS states that "scientific knowledge is based on empirical evidence" (NGSS, April 2013). This links directly to Math Practice 3 - Construct viable arguments and critique the reasoning of others. Common Core describes this practice as being able to justify conclusions "using concrete referents" (CCSS, 2010). When engaging in scientific and/or mathematical discourse, students need to be able to justify their thinking with evidence.

Another overlap between the nature of math and nature of science is the focus on a variety of strategies. In science, the NGSS encourages a variety of methods. In math, the CCSS encourages a variety of tools and methods. When we dive deep into the Common Core Math Standards, we see suggestions of various methods and math strategies and no one right way to teach the content. When we look closely at the NGSS standards, we see wording that offers multiple examples and assessment suggestions. Both of these content resources are showing we need to meet students where they are and encourage their natural learning tendencies by offering various methods for learning.

Finally, the focus on modeling is present in both the nature of math and the nature of science. In NGSS, students use models to explain phenomena and communicate ideas. In the CCSS, we see that Math Practice 4 is to Model with mathematics. In addition, both contents offer the idea that models should be improved when new understanding takes place demonstrating to students that, when we learn something new, our previous thinking needs to be adjusted.

## Reference List

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