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Nature of STEM

Methods of STEM

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The Nature of Math is one that is based in inquiry and though provoking problem solving. Math allows seamless integration into the other subjects of STEM because it is the basis of all of the sciences. Without the ability to do Mathematics, one is incapable of successfully participating in the Sciences.

In Mathematics education, we use the Standard for Mathematical Practices in which there are eight tenets. They are: 1. Making sense of problems and preserver in solving them, 2. Reason abstractly and quantitatively, 3. Construct viable arguments and critique the reasoning of others, 4. Model with Mathematics, 5. Use appropriate tools strategically, 6. Attend to precision, 7. Look for and make use of structure, and 8. Look for and express regularity in repeated reasoning. These 8 tenets are what guide how we teach mathematical skills in class. As a second year teacher, I am still learning how to perfectly address all 8 tenets but how I am currently addressing them is matching certain practices with the appropriate standards. Not all standards align with all 8 tenets but most do, in which case students get a lot of practice working with the Standards for Mathematical Practices frequently.

I recently taught a statistics lesson using google sheets where students were given a “lab” like activity with several different tasks and had to figure out the different tools and capabilities google sheets has to offer by playing around with it. Part of the “lab” also required students to collect data and analyze it using google sheets functionality. I believe this activity encompassed tenets 1, 2, 4, 5, and 7. Tenet 1 exists in almost any challenging or new problem a student will face, and this was their first time using google sheets. For tenet 2, students had to make educational guesses and reason as to why certain cells contained the material they contained because of tool being used. Tenet 4 was present because students modeled real data and used mathematics to analyze it. For tenet 5, students had to figure out the correct tools to use and when on google sheets and for tenet 7, students had to identify and complete patterns as a part of the activity. This activity took our classes 3 days to complete but it was well worth it.

To better enhance my ability to address the Standards for Mathematical Practice, I would want to have my students engage more in longer assignments that require them to question and discover more. I currently focus on getting my students as many “at-bats” as I can, but for a deeper understanding of mathematics, I would like them to dive into more inquiry-based learning. “The nature of mathematics (NOM) can be considered the cycle of inquiry that begins with the representation of quantities as abstract symbols, accounting for all possibilities through manipulation of the rules (although there is some flexibility), and validating the quality of solutions and models by understanding the differences between mistakes and reasonable choices that did not turn out to be successful” (Peters-Burton, 2014). In order for my students to fully grasp a deep understanding of mathematics, my practices need to be inquiry based as Peters-Burton says. My students need to be able to understand and practice the rules of mathematics while thinking abstractly. I can vision this happening through inquiry-based learning that is also project-based learning. Where students are not just practicing solving problems but really looking at the rules of mathematics and how it shapes our world.

My goal used to be to include one project per unit, but now my mindset has shifted, I want to be able to give my students room to explore and to wonder. I would like to include more inquiry-based projects in each unit as well as activities for lessons where they get to explore a new concept. Of course, I know I cannot get rid of the traditional “at-bats” that mathematics requires but I can supplement it with additional learning opportunities for students to grow and to love mathematics.

An area of STEM I looked into is Science. I picked Science because that is another subject that I teach. I am a math teacher but this year I taught physics as well. I am less familiar with the tenets of science but I was curious to see how they overlapped. They both overlap in the following ways: Both Science and Math require students investigate or make sense of situations. In science that is a lab or any type of investigation and in math it is looking at a challenging problem and figuring out ways to solve it. Both tenets require students to think critically about the situation at hand. Another way both are similar are that both require that students to understand the fundamental laws and rules that make science and math work. For math that might be the order of operations and for science that could be the Newton’s Law of Universal Gravitation. These laws are things we accept in order for our field to function properly and serve as a pathway to understanding the fields. The last thing they share in common is both Science and Math are routes to answering questions. In any STEM field, we ask questions and poke around for answers. We try out different methods and ideas in hopes of getting a solution. Both are ways to answer questions.

Peters-Burton, E. E. (2014). Is There a "Nature of STEM"? *SSM Journal*.