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*Teaching Philosophy*

### **Fostering Risk-Taking and Positivity in Mathematics**

“I just can’t do math” is a phrase uttered countless times by students at all levels. As educators, we know that this is in fact not the case. While some people may find it easier than others, anyone should be able to “do math” if they put forth the effort. However, these students have often been discouraged by previous experiences. Oftentimes, mathematics success is viewed solely as getting the correct answer, and not as developing mathematics skills regardless of correctness. I held this view in high school, where suddenly I went from excelling to struggling in mathematics. Luckily in college I had brilliant mathematics professors who helped me enjoy mathematics again and have confidence in my mathematical abilities. Now that I have had some teaching experience myself, I can see that these professors employed methods and techniques grounded in solid pedagogy. I have firsthand knowledge of the effects good pedagogical teaching can have on students, and so I strive to be a teacher who uses such pedagogical methods. In this way, I create a classroom environment in which negative experiences lead to positive learning goals.

#### **Mathematics Is About Reasoning, Communication, And Making Mistakes.**

No matter what class I teach, my overarching goals for my students are the same. My main focus in any class is to use the content to develop students’ mathematical thinking and communication skills. As a result, my classroom is very student centered. I call upon the students to not only answer questions but to explain their thinking and why they chose what they did. For example, in pre-calculus my students evaluate sample work in pairs, analyzing it both in terms of content and rationale. After reaching a consensus, I have each group contribute to class discussion. In this way, even unsure or lower-achieving students can actively contribute to learning and class discussions. I stress that there are multiple solutions and multiple explanations for most problems. Examining these allows students to study the ideas behind any exercise in more depth and from different perspectives, leading to a robust understanding of the material. Furthermore, this shifts the focus in class from correct answers to correct thinking. In this situation, where students are rewarded for thinking and reasoning rather than just for success, students are more comfortable being wrong and taking risks. The knowledge that there is not just “one right way” reduces math phobia in students as they experiment with their own ideas in a safe environment. This type of environment also makes struggling a productive process, which from my personal experience is one of the best ways to learn. When students are comfortable with being uncertain, it makes it easier for them to see the big picture surrounding the exercise. This helps them connect related ideas. When students are comfortable being incorrect, they can examine and readjust their thinking while it develops. In the end, the student has a robust knowledge of an idea, complete with both examples and counterexamples.

#### **Mathematics Should Be A Positive Experience.**

Every student should have the opportunity to experience mathematics in a positive, non-judgmental manner. It is especially important for such learning to occur in grades K-12, so that students’ logic and perceptions are not restricted by the time they reach college. In order for K-12 teachers to foster a risk-taking, positive environment, they have to be comfortable with and think positively of mathematics as a discipline. Furthermore, some of these teachers have answer-centric summative perceptions of mathematics. I recall a conversation with my pre-service teacher class about fraction multiplication. From previous knowledge, the class was comfortable giving the “answer,” but further discussion focused on the need, as teachers, to be able to explain the reasoning and cause behind said answer. Through these

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discussions, pre-service teachers develop the perspective and knowledge to bring a summative idea of mathematics into a formative idea.

It is our duty as mathematicians to aid in the training of pre-service and in-service teachers, in both content and pedagogy, so that these teachers feel comfortable giving their students the freedom necessary for true, comprehensive learning to occur. The more comfortable teachers are with the material and sound pedagogical techniques, the more likely it is that they will integrate student mistakes into positive learning experiences and help combat the negativity often associated with mathematics. Furthermore, a dynamic knowledge of content allows these teachers to integrate student ideas into their teaching, rather than ignoring methods different from their own. Teachers with solid backgrounds can be comfortable adapting others' strategies because they are comfortable making mistakes. By modeling the positive use of mistakes, teachers can foster this idea in their students.

### **I Also Make (And Learn From) Mistakes.**

I take risks as I develop and improve my teaching by implementing new and different pedagogical techniques. Many practices already have plenty of literature supporting them, and thus one can feel confident enacting them. Other times, however, implementing new techniques requires empirical evidence to evaluate their effectiveness. If the new technique is in fact effective, I have improved my classroom. For example, I took a risk by implementing Twitter as a pedagogical technique in my classroom. Twitter has mixed reviews across disciplines as to its pedagogical effectiveness. However, I thought it had potential to contribute to effective mathematical communication in my classroom. Preliminary data on the effects of Twitter suggest that Twitter could have a positive impact on pre-service teachers. When implementing new techniques, my teaching and knowledge thereof grows in a positive manner no matter the outcome.

Mistakes are an integral part of learning how to reason and communicate mathematically. Counterexamples are highly prevalent in mathematics, and yet are generally viewed negatively by students. By fostering an environment which welcomes mistakes as learning opportunities, one can enhance learning and reduce negativity at the same time. By training teachers and modeling the usefulness of mistakes as I develop my own teaching, I aim to help spread this idea throughout the K-16 curriculum.