TEACHING PHILOSOPHY

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Each semester as a math instructor, I have two goals for my students. First, I want my students to develop a conceptual understanding of how the math they learned has meaning in a broader context. Second, I want my students to walk away with a greater confidence in their own mathematical abilities, better equipped to successfully approach math in the future. My teaching style aims to achieve these goals for all types of students. While my teaching philosophy will continue to develop with time, there are defining characteristics of who I am as a teacher: I employ multiple teaching approaches to optimize student learning, I strive to create an inviting classroom environment to engage students, and I challenge students' preconceived notions of mathematical ability and mathematics itself.

My teaching style is grounded in my belief that learning math requires time and persistence. Spending three years as a recitation instructor has provided me with valuable insight on the student perspective. A common trend is the belief that math is a memorized set of algorithms and unfounded rules. Consequently this ideology leads students to become discouraged when they do not immediately see how to solve a problem. Confusion with a new concept demonstrates the student is actively thinking about the problem and how it fits into their broader understanding. I call it "productive struggle," and I encourage it during group work and discussion in my classroom. In the year I was chosen as a Math Excel recitation leader, productive struggle was a daily occurrence; the result was deep conceptual learning in the classroom. Math Excel is an intensive version of Calculus recitation where students experience smaller class sizes, more frequent class times, and two undergraduate assistants under my supervision. Students often expressed frustration about being stumped on a problem. I consistently responded with, "This is great news!" which elicited bewildered and even angry expressions because they did not see the benefit in their struggle. After my guidance in brainstorming possible techniques, the group collaboratively settles on a correct solution. I want my students to realize that confusion is natural in the learning process.

At the University of Kentucky, I have been the primary instructor for math classes designed for preservice teachers, future engineers, business majors, and students satisfying their one math requirement. I have worked with middle school and high school aged students through outreach events, Math Circles, and private tutoring. Through these experiences, it is clear that an overarching obstacle to students engaging with math is a defeated attitude about one's math aptitude. Too often I have students visit me during office hours with resigned statements such as "I've never been good at math" or "I'm just not a math person." They have internalized mathematics ability as a fixed entity which they do not possess. As an instructor, I challenge my students' preconceived notions about what it means to be good at math. I emphasize a growth mindset when speaking about mathematics. For example, I have students in my classroom replace a statement like "I can't do this" with "I'm still learning how to do this." When I make a mistake at the board, instead of discrediting the mistake as "stupid," I openly point out my error to demonstrate that mistakes happen regardless of mathematical aptitude. Learning mathematics is achieved not through flawless work but through steadfast commitment.

I believe effective teaching starts with creating an environment which encourages student learning. With each course, I intentionally develop a classroom where students participate actively through collaborating with peers, choosing to ask questions, and volunteering solutions. One defining feature of my teaching style is guided class participation. In my Calculus II course, I noticed my students were hesitant to volunteer their solutions in front of the class. I responded by adopting a version of a *Think-Pair-Share* strategy into my lesson, which I now incorporate in my classes on a regular basis. I present a problem and give students an appropriate amount of time to think about the problem. When time is up, they share their thoughts with the other students nearby. Only after allowing time for small group conversation do I bring the class back together for discussion. This leads to an increase in both the frequency and fervor

of participation among the students. Another way I engage my students is making an effort to maintain an upbeat and enthusiastic demeanor both in the classroom and during office hours. Although I certainly do not expect my students to share my level of enthusiasm, I do think it makes a positive impact on the amount of time they spend learning the material. Previous students have indicated appreciation of my positive energy because it motivated them to put forth more effort in the course.

To accommodate the diversity in student learning styles, I provide multiple approaches to the course material. I believe my role as instructor is to guide my students to motivate and derive course topics. In my College Algebra course, I repeatedly emphasize how a problem can be approached through an algebraic lens and a geometric lens. While both are important, one usually resonates better with a student and consequently serves as an entry point into understanding the topic. Last academic year I taught a two semester sequence of Mathematics for Elementary School Teachers. That year I designed and implemented hands-on activities on a daily basis to optimize learning among students with very diverse math backgrounds. My goal was for them to first understand and then communicate *why* the elementary math worked. I had them discover volume formulas for pyramids and cones in terms of prisms and cylinders using handmade polyhedra and sand. I had them deconstruct polygons into rectangles and triangles to derive area formulas. I had them model operations in various base systems with multi-link blocks to better understand our base-ten system. These simple activities had lasting effects. Many students cited activities throughout the semester on their final exam. My students had internalized the content because they were given the opportunity to make the connection in the classroom.

I encourage active learning in my classroom, and as a result, I spend class time addressing student errors. My preservice teachers were eager to present their solutions on the board during class; however, their solutions often left much to be desired mathematically speaking. I repeatedly turned to the class, and together we considered the solution on the board as its own entity, no longer associated with the student who wrote it up. Instead of correctly working the problem from scratch, we pinpointed the initial error in reasoning. The discussion naturally transitioned to correcting the flawed solution. Allowing the students to identify errors in the classroom encourages deeper understanding and increases confidence working problems outside the classroom. During a lesson, I often work through examples dictated by my students. At each step I ask for ideas of how to proceed; expectedly, I receive thoughtful yet incorrect responses. I explore the proposed approach if it highlights a common misunderstanding or mistake. As a class we discover why it fails to answer the intended question. I view this as a prime opportunity to re-emphasize a concept that was previously misunderstood.

I enjoy developing new teaching techniques to experiment with in my classroom, and I recognize it takes practice to implement them effectively. This challenge excites me and is one of the reasons I love my role as a math instructor. When teaching equations of lines to my preservice teachers, I designed an activity similar to the game *Telestrations* to help students develop fluency with both drawing and identifying equations of lines. In groups, students alternated between drawing a line and writing the equation of the line on dry erase boards which are passed around the group and erased between each person. At the end of the activity the boards which display the starting equations are deemed successful, while the other boards had accumulated mistakes along the way. Unfortunately, the mathematical errors could not be traced, so I made adjustments and implemented the improved activity in my College Algebra course this semester. This time I used packets of paper with pre-drawn coordinate systems for students to pass around. The groups could identify and discuss the mistakes which took place. There was much less chaos, and overall students gained practice with multiple skills in a memorable way.

I use each course I teach as an opportunity to grow as a teacher. I learn from personal experience, I read articles addressing how students learn math, and I exchange teaching ideas with fellow colleagues as a pastime. I spend time thinking about how to incorporate the above ideas above into my teaching style while keeping my course goals for students in mind. Going forward as a math instructor, I plan to continue my quest to effectively teach to diverse learning students, to practice active learning in the classroom, and to challenge my students' fixed mindset towards mathematical ability and math itself.