Teaching Statement

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During my time at the University of Utah, I have been the primary instructor for seven different classes, including college algebra, statistics at the introductory and intermediate level, and discrete mathematics. Through my experience, I've developed two on two key principles: active learning and transparency. As more research is done on learning, and as I grow as an educator and a person, I will be continuously reevaluating these principles and the concrete techniques I use to realize them in order to ensure I am always teaching my students as effectively as possible.

Active Learning

In a previous discrete math class session, my students and I had derived the finite sum of a geometric series. I asked the students to conjecture about the *infinite* sum of a geometric series for any real r with $|r| < 1$. I gave them 30 seconds to silently consider the problem, and then I asked them to discuss with their groups.

As I walked around the class, I realized they had no idea what to do next. It can be easy, as mathematicians, to forget that the impulse to try things out, to make guesses and test them, is a skill that needs to be learned, just as much as the formulas. So I brought their attention to the front of the class and reminded them about a standard mathematicians' trick. What do we do when we're stuck? We try examples. At the board, I started computing finite sums of powers of $\frac{1}{2}$, and together the class noticed the finite sums seemed to be getting close to 2. We decided we needed more data to make a guess about what happens generally, so we computed the finite sums of powers of $\frac{1}{3}$. Before I began, I quickly checked in with them: "do we expect this to be smaller or larger than the previous sum?" Primed with the knowledge this sum should be less than 2, we noticed the finite sums approached $\frac{3}{2}$. Then I let them loose to explore more. Someone came up with the hypothesis that the infinite sum of $\frac{1}{n}$ would be $\frac{n}{n-1}$. "What happens if r isn't of the form $\frac{1}{n}$?" one student wondered. But now they knew what to do without my intervention, and with their group, they started calculating finite sums of powers of $\frac{2}{3}$. When I finally showed them the limit derivation of the geometric sum formula, the satisfaction in the classroom was palpable.

The above anecdote shows that using active learning gets students thinking critically as well as building students' enthusiasm. I use active learning for a variety of cognitive demands. Sometimes I have students explore a question and form conjectures, and sometimes I ask them to rephrase a definition in their own words. There is an art to giving students the freedom to explore math while still steering them toward the topics on the syllabus. It's difficult, but when it's successful, it's magical.

Discovery takes more time than being presented with an idea, so I employ several practical time-saving measures. In order for students to spend less time writing and more time practicing mathematical ideas, I give out guided notes at the beginning of class each day. The first page of the notes has learning objectives and definitions for that day to help both the students and myself put the lesson into a big-picture context. They are involved in the

math, they develop good mathematical habits, such as trying examples, and they practice communicating with others.

In order for students to take chances in exploration, it's necessary to cultivate a comfortable environment. I tell my students explicitly that I want an environment that welcomes mistakes and I ask them to support each other's learning. I ask for questions, and count to ten in my head before I move on. I check in after I've answered a question, to make sure I've succeeded. I don't hold back my naturally exuberant reactions when expressing joy and excitement in the classroom. I want to demonstrate to students that math can be an exciting experience.

> " Jenny was one of the first people in 3 years to basically make the classroom feel comfortable again. "
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> - Student Evaluation from Math 2200, Summer 2018
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> " She also created a great environment in which to mess up, then improve upon your mistakes."
> - Student Evaluation from Math 2200, Summer 2018

Transparency

By telling students exactly why the class is structured as it is, I engage them in their own learning. I give the entire class an anonymous feedback form approximately halfway through the semester. One example of my attempts to be transparent is that I explain to students that group work has been shown by research to be an effective way to learn, even though I admit that I personally find group work uncomfortable. When I was younger, I thought that group work existed in class as a treat for the extroverts, and I would try not to engage. I didn't realize I would learn more by trying to teach others and learn more by hearing my fellow students explain concepts in a different way than the instructor. I make sure my students know that many people don't necessarily enjoy group work at first, but it is helpful nonetheless.

Acknowledging my fallibility has the counter-intuitive effect of strengthening my authority in the classroom. When students ask me about class structure, I tell them all of my thoughts and reasons, and I ask for suggestions. Sometimes they have great suggestions, and sometimes they don't. Either way, however, they realize that I've deeply considered each aspect of my class. I gain authority, not through displays of dominance, but through displays of thoughtfulness.

Conclusion

By using active learning and transparency, I try to relate to my students both as humans and as mathematicians. When I figure out a difficult math problem, see an intriguing question, or read an elegant proof, I feel exhilarated. I want to share this joy and energy with my students. I believe that if I can encourage them to believe they are capable of doing math, and encourage their mathematical curiosity, I will have given them a source of fulfillment that will last their whole lives.