TEACHING STATEMENT

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Early on in my education, I was often dissatisfied when my teachers would state a fact or opinion without giving a full explanation. "Because it is", "you'll see why in a few years", or "it's too complicated to teach it to you now" were not satisfactory answers, and many times I would stay after class just so I could hear some sort of explanation, even if it went over my head. In fact, I believe it was precisely this curiosity and yearning for the truth that sparked my joy for mathematics and teaching. I hope to spread a similar appreciation for and understanding of mathematics to all my students.

1 Philosophy

In my classroom I strive to promote an environment where students can:

- Identify their preferred mathematical learning style
- Develop critical-thinking and pattern recognition skills
- Get a glimpse of what higher-level mathematics looks like

Mathematics is a difficult subject that requires a strong foundation and logical, rigorous arguments. In this aspect it seems rigid and static. But it is at the same time an incredibly diverse and alive subject with more than one way to arrive at any given answer. Because of this, presenting the material in more than one way is paramount to reaching as many students as possible and providing many places for students to latch on. A visual diagram is just as useful as a numerical equation (indeed many theorems have both a geometric and an algebraic proof). An informal explanation based on intuition and a rigorous proof are both equally important.

2 Practices

During my first assignment as a teaching assistant for an undergraduate discrete mathematics course, I confidently showed that I am capable of carrying out the three goals above. Twice a week I would meet approximately ten students to help review the material from their lecture the previous day. The small class size enabled me to survey each student individually to try and find what worked best for them. I remember one student in particular learned best through pictures, so when reviewing partitions of n I made sure to draw each as a breaking of a strip of n boxes in the corresponding way. As the semester progressed I observed that my students trusted me and were comfortable learning from me. On days where we had extra time, I would informally show them more advanced topics such as braid groups and young tableau.

As I advanced in my teaching career and became the one fully in charge of teaching a course, promoting the same learning environment as before became a more difficult task. The classes are too large to personally cater to each student. Time and material constraints are more prevalent and limit what I can and cannot cover. Nevertheless, I still find ways to successfully carry out my teaching philosophy. Time permitting, I try to provide several explanations of key concepts at various levels of detail. When introducing a new topic for the first time, I provide many examples and mention how the new topic can show up in more advanced mathematics. I may even throw in a paradoxical or pathological example or a connection to my research in combinatorics if applicable. The goal is to give those students who are interested in pursuing mathematics topics to look up on their own time or to discuss with me outside of class, and I have had a few instances of this.

In all of my classes I reiterate to my students that learning mathematics, and other subjects for that matter, is about finding, generalizing, and predicting patterns. Understanding how a new topic applies to simple, well-known examples and then conjecturing how it will generalize to more complicated cases is an important skill that I try to teach my students. As an example, in my calculus classes when teaching the product rule for differentiation of two and three functions, I ask my classes to conjecture what the rule for four, five, or any number of functions would be. Here there is a clear pattern what most students seem to see.

Directly involving undergraduate students in my own research is another practice that I hope to promote moving forward. Combinatorics has the benefit of being easily accessible due to the concrete nature of the relevant objects outside of the theory. For example pipe dreams, Young tableau, and the quantum alcove model can all be fairly easily understood after a basic combinatorics course. Interested students can play around with these objects and even carry out some computations or simple proofs.

3 Conclusion

In summary, my curiosity in knowing why things are true has helped me teach in a way that encourages students to think critically and mathematically. I introduce topics in both a formal, rigorous way and an informal, more intuitive way to ensure that every student gets something out of my courses.