

Teaching Statement

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1 Introduction

Teaching has always been a passion of mine. When working with other students as an undergraduate, I would always feel a sense of pride and joy if I could help explain a problem or idea to a fellow student. This led me to work as a supplemental instructor, where I gained valuable experience teaching in a more formal setting. As a graduate student, I found that while I did enjoy conducting research, I was strongly drawn to my teaching responsibilities. I drew great satisfaction from the personal interaction I had with students, both in class and during office hours. This motivated me to get involved in courses in which I had more control over the course, and to accept a teaching position at UW-Richland after graduation. The ideas of encouraging students to learn, being closely involved with their education, and giving students a deep understanding of the material have been central to my approach to teaching.

These ideas are necessary when teaching mathematics courses. Mathematics is often considered one of the most daunting and inaccessible subjects. As many students experience it, mathematics is simply memorizing rules for manipulating symbols and using those rules to solve problems. This method is almost always unsuccessful, as the students cannot connect the math they know to unfamiliar contexts and situations. However, when they learn the motivation behind mathematical definitions, axioms, theorems, and techniques, students have a much greater appreciation and understanding of math. As a result of my experiences, I feel that the successful teaching of mathematics involves educating students on how and why mathematical axioms, formulas, and methods were developed.

2 Teaching at UW-Madison

While I often taught standard math courses, it was in teacher education courses that I could fully develop strategies for implementing this idea. In these courses, I utilized what could be described as a Socratic way to teach students mathematical concepts. Often, the material in these courses was in mathematical areas that the students had seen before, such as Euclidean geometry, algebra, and probability. Thus, I would design worksheets and lessons, as well as lead class discussions, that would get the

students to think critically about the rules and methods that they had internalized. One example of this is a worksheet I created to introduce the method for calculating probability in which the outcomes in the sample space are all equally likely. Working in small groups, the students investigated the probabilities of certain events, and then as a class we discussed how they came up with their answers. In this way, I challenged the students to take their basic notions of probability and develop them into concrete definitions and rules. This method can further be used to introduce students to unfamiliar topics. For instance, once the students had a firm understanding of probability, they would work on an activity in which they developed the idea of expected value. In this way, the students had a greater appreciation for the math topics they had already seen and were more excited to learn new material.

3 Teaching at UW-Richland

Before I started teaching at UW-Richland, I realized that there were two important changes I would have to make in my teaching preparation. The first realization was that the methods of engaging the students I used in teacher education courses would not apply as well as in courses like College Algebra, Trigonometry, and Calculus. Not only do these courses have different goals than teacher education courses, but the difficulty and unfamiliarity of the material is simply too great to expect the students to develop it by themselves. Yet if one merely tells the students, for example, the chain, product, and quotient rules for derivatives, this reinforces poor learning habits. However, the techniques I developed and used in my teacher education courses, when modified, are effective in getting students to learn the material. For instance, I have had success incorporating small group work into my College Algebra and Statistics courses. To give an example, after introducing algebra students to the methods for solving inequalities, writing the solutions in interval notation, and graphing the solution sets, I would split the students into groups and give them a number of inequalities to solve. Students appreciated the change in class structure as well as the ability to discuss different strategies with each other. It also made the students feel more comfortable in class, and they were more willing to ask questions and ask for help. In addition to small group work, I pushed the students to explain their methods and solutions in front of the class. Because I encouraged the students to think about the problems critically and justify their solutions, they gained a greater understanding of the subject matter.

The second important realization was that as I now had to teach three courses

per semester, my preparation would have to be much more organized. I would have to be able to prepare topics and lectures well in advance, as I had to include more students, college meetings, and academic research into my schedule. In order to accomplish this, I created lecture notes for each of my classes before the semester began and updated them throughout the semester. I wrote these notes in L^AT_EX, so that they could easily be transferred, updated, and altered. When I add to these notes, I begin by examining the syllabus and book to see what topics I need to cover. I then organize how I plan to introduce these topics. I also include several sample problems to illustrate the material I am presenting. This gives me a strong outline of how the class period will unfold. Before each class, I look at these notes to remind myself what I will cover, and I plan exactly what I will say to present the material. I find this method gives my lectures a clear focus and organization, but prevents them from being too rigid and unadaptable. After I present the material, I go back and make any corrections, additions, or rearrangements that I see fit. As a result, I have a continually growing and improving set of notes for the courses I teach.

4 Engaging Discouraged Students

To be sure, in any math course, every student reaches a point where they struggle to learn the material. They find the subject matter confusing and overwhelming. These are very discouraging feelings and, if allowed to fester, can be harmful to the student's attitude toward the course. When this occurs, it is important to remind students that everyone feels this way at times, especially mathematicians. I find that when I relate the history of the material, such as the development of algebra or calculus, students realize that mathematical rules and methods were not established in one fell swoop but were developed and fine-tuned over many years. For example, I often tell students that only 1000 years ago there was not one quadratic formula but six, because mathematicians had not yet accepted negative numbers. While this may not make them feel grateful that they only have one formula to memorize, they do appreciate how difficult it must have been. When students learn of such difficulties that mathematicians encountered, they are less disheartened by their own struggles.

Another way I encourage students is by telling them interesting anecdotes from the history of mathematics. Students often feel that mathematicians are boring individuals who fail to live vibrant and exciting lives. When told of the legend that the Pythagoreans killed the person who discovered irrational numbers, students are simultaneously shocked and amused that someone would commit murder over a math-

emathical discovery. When told that many English mathematicians refused to utilize Leibniz notation because of the belief that Leibniz plagiarized Newton's work on calculus, students are surprised that mathematicians would let nationality cloud their mathematical judgment. When told the story that a mathematician thought the equation $e^{i\pi} + 1 = 0$ was evidence of the existence of God because it contained the five most important numbers, students are astounded by the idea that a mathematical equation could inspire a religious experience. These stories and histories help to humanize mathematics and show students that mathematics was developed by people not unlike themselves. Further, it encourages students to ask questions about definitions and notation, which involves them in the course and often connects the material to the motivations which inspired the topics being studied. In this way, the students feel less anxious about their own difficulties and setbacks, and become more interested in learning the material.

5 Summary

During the semester at which I have taught at UW-Richland, I have found that my teaching methods are largely successful. Utilizing small group work and pushing the students to justify the rules and methods they are using engages the students and gives them a better knowledge of the material. By providing motivation for the particular topics and challenging students to explain and defend their ideas, I find that students become invested in the material and involved in the course. Still, this experience has taught me that each class requires a different approach because of the varying material, course goals, and backgrounds of the students. I have learned that flexibility in one's teaching is a very important trait, as rigidly sticking to a lesson plan or exercise can bore or confuse the students. If I feel a particular method is not as successful as I had hoped, I brainstorm different ways to treat the topic so that the students will become engaged in the class.

Throughout graduate school and at UW-Richland, I have taught a variety of math courses and acquired a great deal of experience. In each class, I found that students reacted very positively to the methods I have outlined above. I know this because of feedback I have received through course evaluations, evaluations by supervisors, and conversations with students. I am excited to begin teaching in a liberal arts setting, where I will be able to interact closely with students and share my love of mathematics with the classes I teach.