Teaching Statement

Hilary (Smallwood) Freese

1. Introduction

I can remember as far back as first grade having always enjoyed math and excelled in math. I enjoy the challenges that math problems present, the necessity of logical and deductive reasoning to work though the problem to get to a solution. It wasn't until the Foundations for Advanced Mathematics course at Fort Lewis College, taught by Professor Carl Lienert, that I really understood how deep the study of mathematics can go; and even then, the course offered only a scratch at the surface. Once Carl suggested I become a math major (and I did), it wasn't much longer until he had me involved in the calculus tutoring center on campus, and was encouraging me to attend summer programs in mathematics and apply for graduate school. Thanks to Carl's encouragement, and my desire to learn more mathematics, I decided to attend graduate school.

As a graduate student at Colorado State University one is expected to teach, starting in the very first year. Up to this point in my life teaching had never really appealed to me, while I had enjoyed my time as a tutor at Fort Lewis, I had never imagined that one day I would be responsible for a classroom of students who expected me to teach them what they ought to know. But on my first day of graduate school at 8:00 AM I walked into my very own calculus class, handed out the syllabus, began lecturing, and haven't looked back since. I know now that teaching is what I want to do, it is something I enjoy, and something I feel very passionate about. Being able to share my knowledge of and enjoyment for mathematics with students is a privilege that I am thankful for each time I walk into the classroom.

2. Teaching Experience

At CSU I have had the privileged opportunity of teaching every semester, including summers. By teaching for more than a dozen semesters I have gained significant experience with various courses, and class sizes, as well as with teaching both coordinated and non-coordinated courses. I have taught each level of the standard calculus sequence, calculus I through calculus III, as well as specialized calculus courses for biologists and business majors. Within these courses I have taught small classes, ranging from 20 to 60 students, as well as classes upward of 150 students. What I particularly enjoy about the smaller class sizes is the close interactions with students it permits. On the other hand I like that larger class sizes still allow for student-teacher interactions through

office hours, and also present the challenges of effective classroom management and being able to teach to a wide range of abilities.

Other variations in these courses have been that some have been coordinated, meaning multiple sections are being taught concurrently by different instructors, while others have been non-coordinated, meaning I have been mostly in charge of how the course is run. Coordinated courses require that instructors work closely with each other, and cover the necessary material at the same pace. Teaching courses which are run in this way has been a useful learning experience in that I have seen what is necessary to effectively run a course, and I have worked with experienced professors and instructors, learning from their examples as teachers.

The summer courses I have taught have been non-coordinated as there is typically only one section of a course that runs during the summer. This has given me an opportunity to be responsible for outlining a syllabus of topics for the course; selecting, assigning, and grading homework assignments; scheduling, writing, and grading exams; and managing any issues that arise during the semester. I have really enjoyed the flexibility that teaching during the summer allows. Most recently, during the summer of 2013, I was able to implement a more interactive style of learning and teaching with my calculus II course. With longer class periods allotted in the summer I was able to structure class sessions to run in the following way. Typically class would begin with a brief recap of where we left off from last class or a brief introduction to the section to be covered that day. This would be followed by a worksheet I had created for the students. These worksheets were either a self guided introduction to the topic of the day, or some practice problems covering a topic from the previous day. The intent of the worksheets was to get students thinking on their own and working together on problems that asked them to explore the topics at more than just a computational level. Once the students had been given sufficient time to work on the worksheets, I would ask for volunteers to present their solutions at the board. This was again another way to get students to be active in their learning, and to allow them practice with talking about and presenting math. I always asked that they talk through what they were doing as they did it at the board so that their classmates could follow along. Even if the solution was not exactly correct, the presentation helped to begin a dialogue among the students about where things had gone wrong, and what the correct step should have been.

3. Teaching Philosophy

As evidenced by the implementation of the worksheets in my summer calculus II course, the two main goals I have for students in my classes are to: (1) walk away from the course with a

firm understanding of the mathematical knowledge and mathematical concepts emphasized in the course; and (2) to gain or improve critical thinking and problem solving skills.

Of course being able to walk out of a math class with mathematical knowledge should be an obvious goal of any math instructor, but more than just the knowledge I want the students to walk away with a conceptual understanding of the material and even an appreciation for the mathematical tools that are at work. It is a goal of many courses and professors at CSU that students walk away with a conceptual understanding of the material as well as a functional understanding. I have come to value this goal as well and have adopted it as one of my own. While I understand that all many students hope to gain from a math course is simply computational knowledge, I feel that if they are exposed to the concepts and expected to understand the concepts, their computational knowledge will have a more firm foundation.

> *"I've taken calc before, but Ms. Smallwood actually helped me understand it. She is an outstanding teacher with good knowledge of calc and very good at explaining concepts."*
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> Student comment, Calculus I

Homework and classwork can be designed to emphasize mathematical concepts. An online homework system can be used to assess students computational proficiency, but a written component to homework or classwork can be used to get students discussing and explaining the mathematics at work in the problems they are working. On a written homework assignment students might be asked to do a direct computation, but then will be asked to interpret the result physically, generalize the result, or explain at a deeper level what is actually going on within the computation. The interpretation or explanation of the mathematics is something I tried to emphasize in the construction of the worksheets. Not only are the worksheet questions posed in a way that expects students to think more conceptually, but the group work on them and the presentations at the board get students talking to each other and allows them practice with explaining mathematical concepts.

> *"I thought that the work sheets were really helpful, specially during the class. The discussion was the best part of the work sheets because it lets students benefit from each other."*
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> Student comment, Calculus II

Not unrelated to the concepts of calculus, is problem solving and critical thinking skills. Once students have been armed with some basic mathematical mechanics, it is reasonable to ask them to use those tools in applications, generalizations or even derivations of other mathematical ideas. In introductory level math courses expecting students to make these generalizations or derivations on their own from scratch might be asking too much, but if they are guided through the necessary steps it is possible that with a bit of critical thinking they can get to the solution on their own. By

expecting students to understand mathematical concepts they are obligated to think critically about the material they are learning; and by expecting students to make generalizations they are required to problem solve and figure out how the tools they have allow them to make the generalization they want.

Such expectations were the goals of the worksheet, and students agree that these worksheets allowed them to think critically about the material as well as to better understand the mathematical concepts behind the problems:

> *"The worksheets that we did over the summer were very helpful. I thought that being presented those concepts in a sort of guided, step-by-step 'proof' was great. Knowing and understanding the concepts behind the operations we learned made it much easier to remember the mechanics."*
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> Student comment, Calculus II

Problem solving and critical thinking skills are skills which are applicable beyond the mathematics classroom, and by expecting students to use and hone these skills through mathematics, they will hopefully be prepared to use these skills elsewhere in their lives.

I have chosen these goals for my courses because first, by understanding the mathematical concepts behind the computations gives students a more firm foundation for those computations. And second by allowing students the opportunity to work out problems for themselves, it forces them to critically think about how they can take the tools they have, and use them to develop something new, or to solve a new type of problem.

4. Conclusion

I look forward to a career in teaching where I will have the opportunity to interact with students both in the classroom and outside the classroom; where there is the prospect of helping students learn and appreciate math at a deeper level; and where I can help students hone their problem solving and critical thinking skills.