2.2 Teaching Evaluations

2.2.1 Math 141A Fall 2012

Math 141A is the first part of a 2 course sequence of calculus. From the course catalog, the description follows:

> **Math141 A,B Calculus and Analytic Geometry I-II** First two semesters of a three-semester unified course in analytic geometry and calculus: progresses from functions of one real variable, their derivatives and integrals, through multivariate calculus; topics from infinite series and differential equations. Prerequisite: 85 or sufficient score on math Placement Exam. Two semesters, 4 credits each.

This course consists of lecture 4 days a week and a lab portion that meets once a week. The lab utilizes the powerful scientific computational tool MATLAB (Matrix Laboratory). Each class meeting was for a period of 50 minutes. Grading was based on homework (20%), lab (10%), two midterms (total 40%), and a final exam (30%). The homework also included graded active learning worksheets from class. I had 15 students in this course. Classes in general consist of short minimal lectures and group active learning work as outlined in my teaching statement above. I utilized IBL as much as possible.

Homework is assigned every week. I assign a significant amount that allows students to see the patterns in solving a class of problems. Quizzes are also administered on a weekly basis, but I have the students, upon completion, swap their finished quizzes over to a fellow student for peer evaluation. The fellow student grades the quiz based on some of my input and returns it to the fellow student for instant feedback. I think that being able to solve problems in a time pressure situation and obtaining fast feedback is key to performance gains. Exams for this class consist of two midterm exams (50 minutes) and a two hour final exam. For the midterms, I grade them on a straight curve. I allowed the students to redo the graded exams for 50% credit back on the first exam and 25% percent back on the second midterm. I made it clear that it was an all or nothing deal. To obtain the full 50% or 25% back on either the first or second midterm respectively, the problems needed to be redone flawlessly. There were students who obtained 0% back due to sloppily redone midterms. By the second midterm, not only were the scores higher overall, the re-dos were all nearly full 25% back. For the exam re-dos, I allowed the students to utilize any resource they needed including myself, fellow students, outside textbooks etc. This would give them the incentive to solidify any concepts that were not fully clear at the time of the exam and motivate them to do the additional work necessary. The reduced percentage back on the graded exams ensured that they would try their best during the exam from the get go and not rely on the exam re-dos. There were also review sessions before all exams so that students had time to ask any questions they had pending.

For the lab meetings, I would have the students pair up with a partner and I would distribute labs consisting of MATLAB programming problems that have many numerical and qualitative aspects associated to them. The goal of the lab was for them to see the connection between the computation and the qualitative and/or theoretical nature of a calculus problem. Being an applied mathematician has allowed me to understand

this connection and all of its intricacies. My goal was to pass on this knowledge to the students. As a byproduct of the labs, the students obtain knowledge of MATLAB, which will be useful for any future computational work they may take part in. For example, in one of the labs, we studied Newton's Method, which is a fast method for finding roots of polynomials. This has far reaching consequences in industrial applications since one utilizes the same technique for finding solutions to systems of non-linear equations that may arise in operations research, electrical engineering, or bio-medical engineering to name a few. The students analyzed the method explicitly by verifying that the method converged as fast as it theoretically should and then applied it to finding roots of non-linear equations like finding values of x that satisfy equations like:

$$\cos(x) = x, \quad \text{or}$$
$$x^4 - 6x^2 + x + 5 = 0.$$

Another application was calculating linear approximations to curves and showing that the numerical error bounds coincided with the theoretical ones. I also had them write three different versions of numerical integration (quadrature) and had them verify that the theoretical error bounds also coincided with the numerical ones. These both have far reaching applications to finance, engineering, and beyond. I had the students save all of their code, which can be used later in other courses or projects (many students are in the 3/2 engineering program and plan to transfer to USC which requires knowledge of MATLAB for example), and also asked them to place proficient knowledge of MATLAB on their resumes. Such programming knowledge increased their marketability by a significant amount over their competitors from other institutions.

In Table 1, the questions pertaining to each element of the evaluation are presented from 1-25 along with the average response score. Questions 1-9 pertain to the student, 10-16 are questions about the course, and 17-25 are specifically about the professor. For this class, the evaluations were quite high across the board. In particular, for those regarding the course instructor, the average of questions 17-25 was 4.97 out of a possible max score of 5. Also, six out of these nine questions had an average response of 5/5. From question 20: "The professor challenged students to think critically and/or imaginatively about the course material," I obtained a 5/5 average response score. My key goal was to get them to internalize the methodology of calculus and to understand some real world applications. I think I was very successful based on the course evaluations and student comments. Some of these comments include:

"Dr. Park's teaching was superb! And his sense of humor made the class extremely enjoyable!"

"I felt it was a difficult course that challenged me."

What were the best aspects of this course? "His humor, knowledge, and enthusiasm about the course material; also his advice about marketability and further education after college."

What are the best aspects of this course? "The way in which he challenged us daily and made sure we understood it 100%"

Table 1: Math 141A, Fall 2012, 15 Students

Evaluation Questions	Average Response
I. Student Self-Evaluation	
1. I attended class regularly.	4.93
2. I was academically prepared to handle the material.	4.53
3. I came prepared for each class session (i.e. have read all course readings and completed assignments).	4.80
4. I actively participated in class discussions.	4.40
5. I attended scheduled office hours if I had questions about the course materials.	4.40
6. I tried to relate course material to other things I know and/or study.	4.80
7. I worked to my full potential in this course.	4.87
8. I was satisfied with my performance in this course.	4.67
9. I had a strong desire to take this course.	4.73
II. Course	
10. This course had clear goals and objectives.	5.00
11. This course was academically challenging.	4.87
12. This course offered useful learning tools.	4.93
13. This course had grading criteria that were clearly identified.	4.93
14. This course improved my understanding of the material.	4.93
15. This course increased my interest in the subject matter.	4.80
16. Overall, I would recommend this course to others.	5.00
III. Professor	
17. The professor used class time effectively and demonstrated preparation for class.	5.00
18. The professor's teaching style and/or enthusiasm for the material strengthened my interest in the subject matter.	5.00
19. The professor was able to explain complicated ideas.	4.87
20. The professor challenged students to think critically and/or imaginatively about the course material.	5.00
21. The professor provided clear and timely feedback.	4.93
22. The professor encouraged meaningful class discussions.	4.93
23. The professor was receptive to differing views.	5.00
24. The professor was available for help outside of class.	5.00
25. Overall, I would recommend this professor to others.	5.00