A Pilot Project on Teaching and Managing Mathematics Courses Online

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1. INTRODUCTION

Described here is a pilot project on teaching and managing mathematics courses online, specifically, Math102 Multivariable and Vector Calculus [2-1-0:4] for Math major students, (eventually to go toward teaching some basic level math courses online using "MyMathLab" with minimum number of traditional lectures offered by instructors).

This initiative will support one of the math department's main goals: "To experiment using mathematical software" and also "To investigate the usage and implementation of "MyMathLab" and other lab formats". Another aim is to engage students in the active learning mode in tutorial classes.

In my courses, I try to illustrate mathematical concepts by drawing on examples from real life for both simple and difficult ideas, so students can relate them to their own degree program. Hopefully, through these examples, students find mathematics an interesting and stimulating subject, useful to their fields. In my lecture notes, I deliberately leave gaps in some worked examples for the students to fill in, with the objective of encouraging active learning and participation.

I firmly believe that learning can be more effective with an enthusiastic instructor and active participation by the students. Some inevitably fail to grasp all the concepts being introduced in a lecture, and it is essential that students comprehend them during the tutorial class. In the past, a large number have not come to tutorial classes because they feel that the teaching assistant just repeats materials from the lecture. Or it may be students do not adequately prepare for the tutorials, they do not know what questions to ask and are just passively receiving information as in the lectures. Even if the TA assigns problems to be done in the tutorials, most students will not attempt them because we just don't have enough manpower to grade every problem. Ideally, it would be better if each student actively participates in problem solving in the tutorial class so as to maintain his or her interest, i.e. active rather than passive learning. We are adopting the MyMathLab software to resolve this issue. MyMathLab is a Prentice-Hall/Addison Wesley product which matches online content to a regular textbook. Most of the work by students during a tutorial will be completed on computer, with teaching assistants occasionally delivering a traditional lecture. Midterm and final exams will still be in the traditional paper and pencil form, and the instructor will still give out-of-class assignments.

2. MYMATHLAB (MML)

MyMathLab is a dynamic, interactive online teaching and learning environment that provides instructors and students with access to rich online course materials complementing my own lecture notes. This software offers a variety of invaluable resources, including, but not limited to:

1. Homework online. This constitutes more than the normal time spent on doing homework for lecture classes since students are provided with instant feedback on whether they are correct, as well as being provided with worked-out examples for each problem. The proposed software also provides step by step interactive help for homework. If the student gets it wrong they are given another similar problem to try. This basically replaces a portion of the normal class time spent on going over homework. The instructor selects homework problems from a set provided by the publisher corresponding to regular text problems. In the traditional setting, students are often not given their homework back for a week or two. By this time, it is usually too late for them to go back and correct their misconceptions. In my experience most students do not take the time to look at their mistakes, I have often seen students throwing their graded homework away as they leave the classroom. Students need immediate feedback, and MML gives it to them.

2. Quizzes online. Students can review the quizzes afterward and are informed online of their wrong answers. They are guided to content that helps with the problem. The instructor selects quiz problems from a set provided by the publisher corresponding to regular text homework problems.

3. Slide presentations of material showing step by step explanation of example problems.

4. Videos showing an instructor explaining topics with a voice over as he or she works the problems.

5. Access to online version of text.

Student grades are available online, including their overall average, so students are always updated on their overall progress.

MyMathLab comes packaged with the textbook and contains vital information and tutorial referenced-problems directly related to the material in the textbook. Students gain access to the software by purchasing a textbook with an access code used in conjunction with an instructor's access code for security. The software can be accessed by students on and off campus via the Internet, using standard Internet Explorer web browsers.

As a learning management system in the classroom, the MyMathLab software will be used mainly as a means of communicating with the student, and grading homework assignments and quizzes. Classes will be taught as traditional lecture sections, initially meeting 100 minutes weekly (two 50-minute periods) with required texts and class attendance strongly enforced. However, as an additional feature, students could use the MyMathLab software to view streamlined video lectures connected with any topic in the book. Students could also do sample homework problems and sample tests on any topic in the book with immediate feedback on their work to help them learn.

The interactive nature of the web-based materials will allow for individual student growth and self-directed learning coupled with assigned problems from instructors and teaching assistants. The use of MyMathLab, and its associated textbook, will provide a learning environment fostering active learning, building upon provided resources.

The impact of this redesign in student learning will be assessed at the end of this course. Scores will be compared with historical data from 2004 to 2006. In addition, we will distribute satisfaction surveys to students.

Hopefully, the redesign will enable us to serve more students with fewer teaching assistants. The use of course management software and automated grading will reduce the number of hours faculty members spend on these repetitive tasks and will mean more time will be available to better prepare the lecture materials.

Informal discussions with students who have taken the course indicate they enjoyed the redesigned tutorial more than the traditional format. They enjoyed the active learning environment, using the software for homework, the immediate feedback they received from online testing and the help available whenever they needed it. To the delight of the teaching team, students did more homework using MyMathLab tutorial tools than in previous years.

The immediate feedback is the key. Students know in an instant if they understand the material or not. If they are in our lab, they can get help the instant they need it.

3. STUDENT COMMENTS

What do you like about the software?

"It can guide you through a problem."

"Instant feedback. Great for practice."

"Homework is corrected immediately so you know what you did wrong."

"It gives examples and helps solve problems. I also like knowing my grade throughout the course"

"To lay out each problem step by step. That for me is the biggest help."

"It tells me I did the problem the right way. I get credit for the homework & it explains the problems if I don't get it."

What do you not like about software?

"No partial credit—wrong answers are wrong."

"It takes a long time to input the answer."

"Difficult to input fractions and exponents."

“I need more person-to-person learning.”

“I felt like I had to learn everything on my own.”

“I don’t learn much from online homework.”

“I don’t like it because when I don’t understand something there is no one there to help. I would rather go through the material in class.”