

Christian Gromoll and I are running a trial in computer assisted student evaluation funded by a TTI grant from the University of Virginia. We present herein a short discussion of the project, the benefits, and our long term goals.

## **Summary**

We are using MapleTA to administer a series of self-scheduled, repeatable exams to students in Calculus II, Calculus III, and Probability. Students sign up for an hour long slot in a reserved computer lab and take each exam at their convenience. If they are not satisfied with their grade, students can retake the exams as often as they want, replacing their scores with better ones and increasing their mastery of the material. Conceptually, this is similar to WeBWorK and other predominantly homework systems, and like those, this promises both to serve as a valuable pedagogical tool and to free up instructor time and resources.

## **Student Benefits**

The student benefit is fourfold.

### **Instant Feedback**

At the end of any sitting of the exam, students immediately know their grade and what they missed. They do not have to wait until the exam is graded and returned, at which point the material is not as fresh in their mind. This allows them to quickly go over their work while still in an exam-mindset, seeing exactly what confused them.

### **Motivation**

Students have the motivation, in the form of higher grades, to return to material they found difficult on an exam and learn it. Using traditional testing schemata, after a student takes an exam, they do not again see the material until possibly on the final. They have no impetus to immediately focus on the things they missed to ensure that they have learned the key concepts. By allowing students to retake tests, they can use the test as a measure of their knowledge, finding gaps in their understanding and filling them without fear of GPA retribution. This transforms tests from a rigid, stressful diagnostic tool primarily for faculty to a flexible, relaxed means for students and faculty to easily ascertain student knowledge.

### **Flexibility**

The self-scheduled nature of the exams decreases the ambient stress of an exam environment by ensuring that the test best fits the students schedule. This allows students to react to the vicissitudes of their lives, be they the in form of student-athlete away games, illness, or extracurricular obligations. This also helps accommodate alternative learning speeds and styles. Students who learn best in spurts can schedule their exams accordingly, while students who need more time to process material can take more time to study.

## **Impartiality**

The exams are graded by the computer at the time they are taken. Students get instant feedback that is independent of the grader's mood, attitude, or any potential bias. Scores are precise and equanimous no matter what time the student takes the exam or who the student is.

## **Instructor Benefits**

The instructor benefits are threefold.

### **No Grading**

All exams are graded instantly by computer. This frees up the instructor from the purely mechanical exercise of verifying student answers. The instructor is not divorced from the process, however, since at any point, he or she can see all of the students' responses to the exam questions.

### **No Loss of Class Time for Exams**

Exams are taken outside of class and at the students' convenience. This means there are no lost class periods to either giving exams or holding review sessions. Class time can be spent on new material, and office hours are focused on specific questions from the students, rather than general, anxious questions like "what should we study?"

### **Flexibility**

Exams can evolve in real-time in response to student feedback. If classes move more quickly or slowly than expected some week, the future exams can be readily changed to reflect the distribution of material. Even perennial problems like typos or mental lapses become less problematic, since corrections to these then appear on all future instances of the exam.

## **Future Goals**

We think that this style of computer-based exam will revolutionize lower-level math teaching across the university. This should convert introductory calculus classes from some of the most frequently failed classes to classes in which students succeed. Given the difficult learning curve for writing problems and using the system, we would like to gradually increase participation by faculty and graduate students, helping building a large repository of questions and tests which can be used to further streamline future courses.

Of course, the primary goal is to help students learn math. This method should transform math classes from a source of anxiety to an interesting challenge, with hard work immediately and noticeably rewarded.