

TEAM TEACHING AND THE HARVARD CALCULUS PROJECT

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Abstract. In the fall of 1995, Southeastern Louisiana University adopted the Harvard Calculus materials for our Calculus I and Calculus II sections. In addition, several of the sections (both Calculus I and Calculus II) have been team taught. We will discuss our experiences as well as our student reactions to both the material and to the team teaching concept.

Southeastern Louisiana University is an open-admission state university with 14,000 students. In the past two years, SLU has been one of the fastest growing universities in the country. We have a diversified student body with a high percentage of non-traditional students. The average ACT score in mathematics for the beginning freshman is approximately 17 with the highest possible score being 36. A typical student in the calculus must take either college algebra or precalculus and trigonometry before taking calculus. In a typical semester we offer three sections of Calculus I and two sections of Calculus II. Each section has about 30 students. The majority of students taking calculus at SLU are pre-engineering majors, science majors, computer science majors, mathematics education majors, or mathematics majors.

One of our main goals in teaching calculus to our students is for them to have a conceptual understanding of calculus and obtain certain problem-solving skills so that they may be able to apply these ideas and skills to a wide variety of problems. These problems include those that they may encounter in their major fields of study. One other main goal is to improve the students' ability to communicate mathematical ideas both orally and in writing.

We have been exploring different teaching methods and have experimented with a variety of textbooks. One teaching method that we feel may help us achieve our goals is team teaching. Professor Steve Ligh first suggested the idea of team teaching in the Dept. of Mathematics. It materialized in the spring semester of the 1994-1995 academic year when he teamed with one of us

to teach a section of Calculus I. Since then the four of us have team taught. In the fall semester of the 1995-1996 academic year we adopted the Harvard Calculus book. One of the many reasons we chose to use the Harvard Calculus book was because it can be easily read by the students. Students need to actively participate in the learning process and having a readable textbook transfers some of the responsibility back to them. The Harvard book de-emphasizes algebraic manipulations while emphasizing conceptual understanding of calculus. This fits perfectly well with our goals and our students. With the power of today's technology we feel that manipulative skills are no longer as important as the conceptual understanding of the ideas of calculus together with the ability to apply these concepts to solve real-life problems.

In all the classes that we have team-taught each team consists of two instructors. Both instructors determine jointly all the aspects of the course. This includes the course policy at the beginning of the semester, the day-to-day class activities, and ends with assigning the grades to the students at the end of the semester. The two instructors attend class meetings together and participate in all class activities including the presentation of topics and guiding students in group discussions. Instructors alternate in the presentation of topics. The instructor not presenting sits with the students which provides an opportunity to observe the class from the student's point of view. This gives a good feel for the effectiveness of the presentation and the student's reaction to the presented material. Since there are two instructors alternately giving presentations, students are exposed to more than one style of teaching. The subject matter is presented from more than one point of view. This gives a student more opportunity to understand the material. From the instructor's point of view, team teaching allows the participating instructors to see how colleagues present material and may provide new ideas and methods of presentation to be incorporated in their future teaching. In particular, when a junior faculty member and a senior faculty member are teamed together, the junior faculty member is presented with an opportunity to learn effective teaching methods from the more experienced faculty member. In team-teaching, the two instructors meet weekly to discuss the progress of the course. They write and grade quizzes and exams jointly. Final course grade are assigned jointly. We feel that these activities promote collaboration, team work, and better communication among the faculty. Thus this helps the department create a more uniform standard for multi-section courses and helps create an atmosphere where faculty members can work together towards a common goal.

Students in our team-taught calculus courses regularly work exercises in groups. After working on the exercises a representative from each group will present their findings, usually a solution to a certain problem. These presentations inevitably lead to lively classroom discussion. With two instructors present, students get more one-on-one interaction with the instructors. In the past, instructors asking students to do group work find themselves unable to help all students because of

the limited class time. Outside the classroom students can avail themselves of the two instructors' office hours. This gives more opportunity to seek needed help.

Based on our experience in the past two years we feel that team teaching together with using the Harvard Calculus textbook is an effective teaching method. The Harvard Calculus book requires students to do more thinking and make connections among various topics. It is our common belief that students cannot learn mathematics by just listening to a lecture. They can learn mathematics by listening, observing, thinking, and most importantly by actively solving problems and communicating the results. Team teaching makes it possible for students to be actively involved and play a more important role in learning. It helps students succeed in studying calculus and other subjects. Preliminary results show that team teaching is effective. The response from faculty and students to team teaching and the Harvard Calculus book are positive and encouraging. Students begin to think more, move away from rote memorization, and assume more responsibility in their study of mathematics. Their reading, writing, communication, and analysis skills improve. Our efforts and our students' efforts will be in vain if we do not continue trying different teaching methods such as team teaching. Most instructors have a desire to become better teachers and one can learn from colleagues to improve teaching. Team teaching is an excellent vehicle for this. In order for the team teaching method to be effective one must have the support of the administration, a willingness to sacrifice, and most importantly, the two instructors must work as a real team both inside and outside the classroom. The two instructors must also be able to freely communicate with each other.

The mathematics department here at SLU is currently facing many challenges as do other universities. To improve the success rate of our students we are willing to experiment with various old and new classroom delivery methods together with the use of modern technology and more relevant textbooks. The success of a student in a mathematics course does not depend on his or her instructor alone. We owe the public no less than the best we can do and should make it clear to our students that we do care deeply that they learn.