

A PRECALCULUS EXPERIMENT: SELF-TAUGHT VERSUS LECTURE
THE INSTRUCTORS' IMPRESSIONS

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Many students that enter college with a mathematics or science major are in a hurry to take Calculus. Often they are not prepared for the class and fail. To help alleviate this problem, Bloomsburg University introduced a Math Placement exam in the summer of 2000. Since the majority of Bloomsburg University students in majors requiring Calculus now place into Precalculus, we are working hard to make Precalculus a successful first college course. The students enrolling in the course currently fall into three categories: namely, those they need a brief review of certain topics, those that need a complete refresher course, and those students who are seeing much of the material for the first time. This has led us to develop a self-taught Precalculus course in which students have some control over how fast they cover the material.

In the self-taught course, students are given a complete set of lecture notes to use as reference, even though no lecture takes place. They also have the choice of using Addison Wesley's My Mathlab computer software as an additional learning aid. During the class, students work through assigned homework and may receive help from either the instructor or a student aid. The students have set deadlines for each of the exams, though they may take a test early if they are ready to do so. Another aspect of the class different from the traditional course is that students now have the opportunity to take the chapter exams twice.

In this paper, we are going to give our individual impressions on teaching the self-taught Precalculus course at Bloomsburg University. Our paper "Self-Paced Problem Solving Versus the Traditional Lecture: An Experiment in Precalculus", in the journal Louisiana Association of Teachers of Mathematics, Volume 2, Number 1, contains a detailed comparison of student performances for the first year that the self-taught course was offered. We are currently in the process of writing a follow-up paper that will include how the course was started, how it developed over the years, and a detailed comparison of the students who took the self-taught class versus those that had the traditional lecture. For any interested in reading this paper, feel free to contact either of the authors.

Dr. Lister's Impressions:

Currently I have taught this course five times over the past four years and I really enjoy the class. Since the instructor serves more as a facilitator, I have of an opportunity to get to know my students better. In the traditional classes, I know all my students names, but

I get to know only a few very well. In the self-taught course, we are interacting one on one, so I have the chance to learn more about all my students. I get to know their personalities, what their interests are, and I just have the opportunity to talk with each of them. Knowing my students allows me to be better able to help them succeed in the class.

The structure of the self-taught course is also more suitable for many of the students. They can spend the time they want on the material they need and go more quickly through the material they already know. This freedom allows them to direct their own learning. The fact they get two chances on the chapter exams also aids their success. They have the opportunity to go back and learn the concepts that they are missing, an opportunity we cannot afford to give them in the traditional course, due to time constraints. I have found that the students who stay on track and come to class everyday and really work all succeed. In fact, no student in my classes who has taken full advantage of this alternate class structure has gotten below a C.

This is not to say that there are not problems. Many of the students taking the class are freshmen that are experiencing their first taste of freedom. Here we are giving them more. In a course like this, students need strong time management skills, so any student who has not learned such skills will find this method to be challenging. They are responsible for staying on track and completing their assignments. I do let the class know where they should be at any given time, but it is easy for some to fall behind.

This class is also very difficult in that for the majority of the students, this is the first time they are responsible for teaching themselves. Learning anything new is challenging, but being responsible for learning mathematics on your own is very difficult. As the facilitator, I must always be positive and enthusiastic about what they are doing. I must make them believe in themselves and their abilities and help them when they begin to fall. Many students are very afraid of tackling math on their own and I must help them overcome this fear. This is especially true for those students who are in the third category, those seeing the course material for the first time.

Another draw back, is that often I find myself answering the same questions repeatedly. Obviously, some concept is not getting through and they cannot seem to get it on their own. It would be very easy to lecture this topic, but then the students would expect lectures all the time. Instead, I often give them extra notes with examples on the subject and have them try a couple problems following these examples. I try to make the notes on the topics as "step-by-step" as possible, so the students can see the process they need to follow. For most, this type of activity will help them over the hurdle they are currently facing.

The final problem is that students often feel they are lacking unity. They do not feel like a class, but instead like individuals. I encourage them to work together and I am in the process of developing some hands-on real world activities, that we will spend some class time doing together. Not only will they be able to see the value of the material they are

learning, but hopefully, they will start to feel like a unified group and not like a collection of isolated individuals.

Ideally, this style of teaching would be for the students who have seen the material and just need a refresher. These are the students who are our target audience for this class. I am very up front in the beginning and tell the classes that this course is a lot of work. In fact, they will spend more time on this class than they have ever spent on any other math course they have taken. Students need to understand that I will help them in any way I can to succeed, but ultimately, they have to do the work and put in the effort themselves.

I have been asked, that if I feel so strongly that this is a good method for the Precalculus students, why don't I try this method in my other classes. The answer to this is simple; Precalculus is unique. For most of the students enrolled in the class, the material is not new. They have seen it before, either in high school or college. Since for the majority of students the class is review, they are teaching themselves something they have already seen. They are able to follow the notes and read the material with some understanding. I have found that those who have taught themselves learn the material much better. In fact, last time I had a section of the self-taught class, I also had a section of lecture. The students in the self-taught class did on average 7% higher on the common final than the lecture students did. There are many factors that play a role in students' performance, but as all teachers know, what you teach, you know much better than what someone else teaches you.

Dr. Polhill's Impressions:

I have now taught the course Precalculus at Bloomsburg University during four semesters, two of which were lecture style and the other two the self-taught method. In the fall of 2001, I was the first to attempt to teach with the self-taught approach at BU. To say the least, it was very challenging for me and the students, as was evident by the fact that the students in these sections scored on average 15 points below the lecture sections on a common final. This could be attributed to the fact that there is often a period of adjustment whenever someone tries something new. In the fall of 2004, things went much better in the self-taught course and students seemed to learn at a reasonable level.

Despite the fact that I recognize that there is some potential to this newer method; my personal preference is to teach in a more traditional way. I enjoy teaching through a combination of lectures, student exercises, and in-class projects. I get to know most of the students fairly well regardless of how the course is taught.

Do I think there is a place at Bloomsburg University for the self-taught Precalculus? Yes. Some students excel in the less structured environment. As Dr. Lister mentioned before, pupils needing only a little refresher on certain topics are able to focus on those things that they do not already know well. Also students with greater motivation and time management skills can succeed. It turns out that many but not all of our math and science

majors in Precalculus are in a position to succeed in the self-taught sections. However, many general education students take the course also, and most of these students are not ready for the self-taught method.

Should other colleges consider courses like this one? Perhaps. There are some great success stories with self-taught mathematics courses, such as the Math Emporium at Virginia Tech. Of course Virginia Tech has mathematically advanced students relative to many colleges. If the typical student in Precalculus (or College Algebra?) at your school has a weak mathematical background, then this might not work. If instead you have a considerable number of students who simply need a refortification of their algebra and trigonometry skills, then perhaps this might work. At Bloomsburg University, we have a mixture of these types of students. Therefore, I personally feel there is potential for making this an asset to the Department of Mathematics, Computer Science, and Statistics even though I myself would prefer to teach the more traditional courses.

Conclusions:

As you can see, both instructors find that the self-taught course has value if you have the right audience. So if you are considering trying to develop such a course there are three main points to keep in mind. First, you must know your audience. Are your students ready for such a course? Secondly, you must know yourself. Are you ready to hand over the control of the class to your students? For many, this will be the most difficult part of the self-taught course. Finally, time is the most important factor. You must be willing to give the course time to work and commit your time to making the class a success for you and your students. As Dr. Polhill stated, there will be a period of adjustment for all involved in this process.