

## Teaching: My Views and Experience

Alan K. Haynes

The best teachers of mathematics combine their ability to communicate ideas with the experience that comes from years of working with students. The truth is that, when I began to teach, I possessed little of either of these attributes. However, this actually worked to my advantage, because it forced me to try to discover the secrets of teaching mathematics. After consulting some literature and listening to professors speak about their experiences of teaching, I began to experiment on my own in the classroom. In the beginning my goal was to help students to understand and apply course material. Eventually I became aware of the ways that my teaching style and classroom management affected my students, and I was brought to the realization that there is a higher goal. Now my idea of successful teaching is to help my students to enjoy and appreciate mathematics while they are maintaining a high academic standard. In this paper I would like to present two of the secrets that have helped me in my pursuit of this goal. First I will discuss the role of the teacher in facilitating the learning process, and second I will talk about the advantages of using collaborative learning.

The first principle that I learned as a teacher is that you must know who your students are and where they are in their understanding of mathematics. Then you must customize a plan to help them to achieve their academic goals. As a student most of the math classes that I took had the same format. The professor came in and lectured and we were expected to take notes, go home, digest the material, and work some problems. This system worked for me and for all of the math nerds in my classes, so I never questioned it until I had to teach precalculus. The students in my first precalculus class brought with them a predisposition against the subject and a deeply rooted feeling that they were not good at mathematics. They did not like having to take math classes, they did not take notes, and when they did not understand something they used it to strengthen their case against math. I learned a lot about teaching that semester. At the end of the semester, after I read through the student evaluations, I realized that I was going to have to reformulate my teaching strategy. Eventually I was able to identify that one of the main issues that had inhibited my students' learning experience was the lack of accountability in the way that I had structured the class. When I taught precalculus again the next summer I tried to fix the problem by implementing in-class group work and question-answer sessions that allowed me to frequently check the students' progress. Sure enough, the students began to excel. It was wonderful to look out and see all of their smiling faces, and it made me realize that one good math class can change a student's entire feeling toward the subject. This experience also showed me that the quality of the teacher and his or her teaching style is much more important than how we may perceive the quality of the students and their learning abilities. As I continued teaching these realizations were reinforced again and again.

After a few semesters of teaching precalculus I was given the opportunity to participate as a teaching assistant in a Research Experience for Undergraduates in

Computational Number Theory. The students in the program were selected from among the top undergraduates in mathematics and computer science. My job was to help them to formulate and conduct research projects related to primality testing. This was quite a change for me but I have to admit that it was one of my favorites among teaching positions to which I have been assigned. When I began working with these students I treated them the same way I had treated my precalculus students, explaining everything carefully and in detail. At one point I tried to explain something to them, but I could not get the explanation to come out coherently. I became frustrated, but my frustration turned into amazement when I realized that they actually understood my opaque explanation. When I thought about this later I came to the conclusion that I needed to discard my previous way of approaching these students and to try to customize my time with them to maximize the use of their intellectual potential. That summer I helped the students to labor together on several projects. The result was that all of us learned a lot and had a great time in the process. My main point in presenting these cases is that the contrasting experiences of teaching students with different mathematical abilities taught me that different types of students need different types of care in order to achieve the level of academic success that they are seeking. Part of the teacher's role is to discern what kind of students he or she is dealing with and what the best ways to help them succeed are.

The second principle that has helped me in teaching mathematics is that students learn more and work more efficiently in small groups than they do on their own or in a large lecture setting. I was introduced to Uri Treisman's research supporting this statement during my first year of teaching and I had the desire to experiment with small groups to see what would happen. I discovered that the benefits of incorporating collaborative learning into the learning process are tremendous. I would like to mention a few of the top reasons why I have chosen to use this teaching method. First, many times students are able to answer each other's questions in a way which helps them more than the teacher's explanation. Second, you can place students with similar dispositions together so that students who are normally quiet feel freer to ask questions. Third, collecting feedback from the groups allows the teacher to accurately assess how well the class understands the course material. Fourth, working together in small groups helps the students to get to know each other and gives the teacher the opportunity to meet the students in a more personalized way. This changes the classroom dynamic by encouraging student participation and it promotes the formation of study groups outside of the classroom. Overall, the use of collaborative learning has been a very positive experience for me. This method of teaching has enhanced my function as a teacher, helped my students learn more effectively, and promoted a comfortable atmosphere to conduct the learning process.

Teaching is a challenge and a joy. It is a challenge because the teacher must actively participate in helping students overcome the obstacles that present themselves in the learning process. It is a joy because the teacher becomes a mutual participant in the students' success. It is rare to find a person who is naturally endowed with the ability to easily communicate mathematical knowledge to students of all backgrounds. It is more common for most of us to learn how to teach by doing it and, not too surprisingly, the most

valuable lessons are learned through our mistakes. However, the desire to constantly improve our teaching presses us onward. In the end it is well worth the effort when we hear our students say, "Oh! Now I understand!"