

In my more than 12 years of teaching, I have worked with students of all ages, from young children to senior citizens. While all of my teaching experiences have been rewarding, I most enjoy teaching at the college level. I love to see my College Algebra students realize what an asymptote is or my elementary education majors finally understand what it means to divide by a fraction. Beyond working directly with students, I have also enjoyed developing new course materials. These have included revising the lab manuals for two physics labs at the University of Wyoming, creating worksheets and projects for middle-school classes, and working with a team to compose the syllabus, readings, and exercise sets for a new course in Quantitative Biology. I look forward to continuing to teach throughout my career.

I see my role as a teacher as being a facilitator for the students' learning, rather than as a dispenser of knowledge. At all levels, students must be actively engaged in the learning process in order to master and come to own the material. To this end, I try to structure the classroom environment so that students can work together on problems and ask questions freely, without allowing the class to descend into chaos. I like to provide activities that lead students to discover solutions on their own, rather than telling them how to solve particular problems. I also ask students to share their solutions with the class. This not only engages students in the class but also helps them learn to articulate their thoughts. I then ask them to extend their thinking by explaining not just how, but why, their solution works. The goal with these extensions is to build both communication and analysis skills, which I feel is important in all mathematics classes. To assess these skills, I make written explanations a required part of homework assignments.

One of my favorite courses to teach has been the course on Understanding Elementary Mathematics for elementary education majors at the University of Arizona. The course is required for the major, and students come in with a range of mathematical backgrounds, but at least half of each class of students has some level of math anxiety. To help address that anxiety, I seat the students in groups of four and keep them in the same groups for four weeks at a time. Working in groups helps my students to develop their abilities to work together with a variety of other people, share strengths and weaknesses, practice skills they will need as teachers, and deepen their understanding of concepts through collaboration. One group activity that we do early in the semester is to invent a new numeration system using only five symbols. This activity helps students realize that our base ten system is neither as simple nor as natural as they thought. We continue to work in other bases throughout the semester. Having to do problems in other bases brings home to the students the fundamental importance of place values in all of the standard algorithms they have learned for doing basic arithmetic. In my student evaluations, one student wrote that as a result of this class, she was now considering becoming a math teacher.

I have especially enjoyed having my students work with manipulatives. For example, we use sets of base blocks consisting of small cubes, longs, flats, and large cubes to model arithmetic operations in different bases. Laying out the blocks in a rectangle to model multiplication provides a strong visual and hands-on connection to the idea of areas and to the partial products of the standard multiplication algorithm. The same layout can also be extended to multiplication of fractions and mixed numbers, and later to multiplication of binomials in algebra. For me, a key goal of all introductory mathematics courses is to develop multiple representations of problems and solutions, including graphs, words, tables, mathematical expressions, and diagrams. I have seen that working first with manipulatives and then with drawings and other representations leads students from the concrete to more abstract and generalized ways of thinking about problems. I remember one student in one of my Elementary

Mathematics classes who recognized that he could not represent one fifth of a hexagon using the available block shapes, but would not accept that it was impossible to somehow show one fifth of a hexagon. He tuned out from the rest of the class and spent about half an hour drawing pictures of hexagons and dividing lines. He found a solution before the class was over. Moreover, he was able to explain his method to me and to the rest of the group, and applied those insights to his next assignment.

I approach the development of lesson plans by first identifying the main goals of the lesson. I then look for activities that will support those goals, and think about what basic information the students will need in order to achieve those goals through the activities. Giving students free rein in activities often leads to confusion and missing the point, not efficient or effective learning. The challenge is to provide enough guidance so that the students can achieve the desired learning goals, yet let them discover the connections for themselves. Students have told me that they are most engaged in a class when they see that it has some relevance to their own lives. I therefore try to use real-life situations when I devise projects and examples in class. As a Peace Corps Volunteer teacher in Zimbabwe, I had my secondary school students gather leaves from the eucalyptus trees on the school grounds and measure their lengths for a lesson on statistics. While working with a middle school pre-algebra class in Tucson, I supervised a project on water loss from dripping faucets. When my College Algebra students explored blood alcohol levels in the unit on exponential functions, they scored higher on the following test.

I also make formative assessments of students' understanding frequently throughout the semester. As a lecturer in physics at the University of Wyoming, I used a "clicker" system in some of my large lecture classes. I would project multiple-choice questions on the screen and students would click on their choices with a hand-held device registered to their ID. This system allowed me to collect and download data on overall understanding as well as individual participation. In smaller classes, I prefer to use a more low-tech version in which students simply hold up cards with the letter corresponding to their choice of answer. I can then quickly scan the classroom and tell whether a majority of the class has understood the concept or is still confused. When a significant portion of the class misses a question, I usually ask the students to talk to their neighbor for two minutes and try to convince each other of the correct answer, without telling them what the correct answer is. I then survey the class again. This method often results in most of the class answering correctly; when there is still confusion, I review the concept.

I believe it is particularly important to encourage creativity, to help students see mathematics as a creative endeavor—a process of solving problems and puzzles, not just memorizing facts. An important way to reinforce this viewpoint beyond the classroom is by involving undergraduates in research activities. Although I have not supervised any undergraduates in research projects yet, I have worked with younger students on Science Fair projects, and I participated in Research Experience for Undergraduates programs for two summers as an undergraduate myself. The aspect of teaching that I find most rewarding is mentoring students one-on-one, and I look forward to the opportunity to mentor students in longer research projects outside the classroom. My current research is in modeling of biophysical processes, an area rich with open questions and mathematical applications. My prior background in astronomy and planetary dynamics also lends itself to many interesting modeling problems. I believe that a successful research experience for undergraduates should help the students understand the time it takes to carry out a project and the steps involved in beginning to explore a new question, as well as learning some specific skills and content related to the project. I have listed some ideas for specific projects in my research statement.