

Introduction

In addition to research and service to the university, I consider furthering mathematical knowledge through instruction to be one of the primary responsibilities of a mathematics professor. As an undergraduate at Millersville University of Pennsylvania, the dedicated and enthusiastic instruction I received transformed me into a focused student who pursued independent math courses, a research experience for undergraduates, an honors thesis, and ultimately a PhD. By modelling my dedication to excellence in education after my previous instructors, I hope to provide the same opportunities to students that I was lucky to have. In this document I will describe my teaching philosophy, experience, and future goals in education.

Teaching Philosophy

As a beginning instructor I taught in the traditional lecture format in which students were passively engaged in their learning. By attending seminars on mathematics education and working with experienced instructors, I have evolved my teaching style to more actively engage students in the classroom. To engage students I create a dialogue in the classroom, use instructional group work, and I have students communicate mathematics in words and writing.

To create a dialogue in the classroom I carefully structure my lectures to include many directed questions that guide what is being learned. For example, to introduce a lecture on sufficient conditions for the existence of a limit, I could use a question like: "If $f(x)$ is a positive function whose derivative is negative, what can you tell me about $f(x)$?" As another example, I have used the following to introduce related rates: "If a sphere is being filled with water at a constant rate, sketch a graph of the height of the water in the sphere as a function of time." The responses to these questions and follow up questions flesh out the lecture and helps me gauge precisely what the students do or do not understand.

I also engage students in their learning by regularly using short instructional group assignments to teach and motivate a concept. For example, when teaching limits I have a worksheet that has the students fill out tables of function values to compute limits of the form $\lim_{x \rightarrow 0} x^{-1} \sin(4x)$, $\lim_{x \rightarrow \infty} (1 + x^{-1})^x$, etc. When the students have completed these worksheets I then provide a shortened lecture on the concept. The benefits of this approach is that it provides an immediate exploration of the concept that provides a context for understanding the lecture. I strongly believe that students learn abstract concepts – such as the definition of a limit – through exploration. Furthermore, when the students are working on these group assignments I can provide immediate feedback to facilitate their understanding.

Finally, to improve my students written and oral communication skills I work closely with them by requiring mathematical statements to always be written clearly and concisely and by having students be as precise as possible when discussing mathematical concepts. For lower level courses, this means simply writing a sentence or two incorporating mathematical symbols to answer a question. An example of such a question would be: "If the function $L(T)$ measures the length of a rod in *cm* as a function of temperature T measured in degrees Celsius, describe the statements $L(10) = 4$ and $L^{-1}(3) = 8$." By having students write complete sentences in their solutions to such questions it solidifies their understanding of the material. In more advanced courses, where detailed proofs are required, clear writing is essential. In this setting it is important that the students learn that the proof itself is conveying mathematical knowledge and must be clearly written so that it will be understood by a broad audience. Moreover, I feel that concise, clear writing illustrates a solid mastery of the material. In assisting students with the development

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Teaching Statement

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of their writing skills, I assign weekly assignments that always include some writing component. I carefully grade these assignments and provide clear feedback.

Experience

As a graduate student at the University of Arizona, I had the privilege to serve as the full instructor for the following courses: college algebra, trigonometry, precalculus, and calculus. My responsibilities for these courses included all lectures, grading of homework assignments and exams, and exam preparation. I am particularly proud of a summer precalculus course I taught for the New Start Summer Program for minority students. I worked very closely with these students on their algebra and trigonometry skills and many of them enrolled in my calculus course in the fall. These students did exceptionally well in this course and have had incredibly successful college careers.

I have also mentored two semester long undergraduate research projects through the University of Arizona's mathematical modelling course. In these projects I guided the students research and assisted them in learning how to use Matlab, use Latex, write mathematics papers, and create academic posters.

Furthermore, I have instructed graduate students by preparing first year students for our qualifying exams and serving as a teaching assistant for the course Principles of Analysis. In preparing students for our qualifying exams I conducted weekly review sessions twice a week. These sessions generally consisted of me teaching short lectures on topics that students were struggling with such as point set topology, complex analysis, measure theory, etc. As a teaching assistant, I assisted students in their course by holding weekly sessions discussing the current topic they were learning. The topics I helped students with include metric spaces, basic inequalities, point set topology, normed linear spaces, etc.

Future Goals

In the future I would like to continue my growth as an educator by having the opportunity to teach the following courses: calculus, differential equations, partial differential equations, real and complex analysis, and the differential geometry of curves and surfaces. In these courses I would like to include a technology component with some instruction in mathematics software such as Matlab, Mathematica, etc. In addition I would like to teach a topics course at the graduate level on the calculus of variations and its applications to studying nonlinear partial differential equations.

Also, I would like to mentor an undergraduate research project based on my research on modelling swelling thin elastic sheets. I have two ideas for projects: studying the buckling of swelling sheets and constructing finite difference schemes for sheets with various boundary conditions and swelling patterns. These projects would allow the student to develop a solid understanding of numerical modelling, basic differential geometry, calculus of variations, and applied analysis and would prepare the student to pursue graduate studies in applied or pure mathematics.

I look forward to my next teaching opportunity in mathematics. By using my own enthusiasm for mathematics and dedication to teaching I hope to increase the number of students pursuing advanced mathematics courses and to make a positive impact on student's educations.