One of my students recently described me as "the most laid-back serious person" they know. I am proud of this designation as it reflects my personable demeanor in conjunction with my expectations of rigor and high quality work.

Teaching philosophy

Mathematics is not about calculations, but ideas. My goal as an instructor is to provide students with the opportunity to grapple with these ideas and to be immersed in the process of mathematical discovery. Repeatedly engaging in this process hones the mind and develops mental maturity marked by clear and rigorous thinking. Bertrand Russell wrote that

> "mathematics, rightly viewed, possesses not only truth, but supreme beauty."

This philosophical view of mathematics resonates deeply with me. Like music and art, mathematics provides an opportunity for enrichment. The medium of a painter is color and shape, whereas the medium of a mathematician is abstract thought. As an instructor, I attempt to convey the elegance and aesthetic value of mathematics, and I regularly remind my students that the creative aspect of mathematics is what captivates me and fuels my motivation to keep learning and exploring.

It is also crucial that we expose students to the myriad of ways mathematics is applied in the "real world." Students develop a more intimate relationship with mathematical concepts if they can ground the abstract in concrete examples. In addition, most people (math and English majors alike) become more engaged with a subject if they perceive some broader relevance.

Teaching experience

Over the past twelve years, I have taught students at four different colleges, and during this time I have developed a reputation as a teacher who shares his love of mathematics with his students and has a genuine interest in their learning. This reputation is reflected in the high ratings that I have consistently received from my students and peers. Moreover, I have been the recipient of several teaching awards, most recently being named the 2009 and the 2011 *Plymouth State University Distinguished Mathematics Professor*, an honor determined by the mathematics majors at PSU.

I have taught a broad range of courses that includes lower-level algebra courses, the full calculus sequence, linear algebra, and upper-level courses such as introduction to proof, abstract algebra, number theory, and real analysis. In addition, I have taught courses for prospective elementary school teachers, graduate courses for in-service high school teachers, and a variety of quantitative reasoning courses for non-STEM majors. My experience also includes designing new courses. For example, I recently created a course for first-year mathematics majors to introduce them to the discipline and culture of mathematics while creating a tight-knit cohort. This is now a required course for all mathematics majors.

During the 2006–2007 academic year, I was the Lead Graduate Teacher in the Mathematics Department at the University of Colorado. My main duty in this role was to act as a liaison between the department, graduate students, and the Graduate Teacher Program (the GTP offers teaching-focused professional development). As Lead TA, I mentored first-year mathematics graduate students, consulted with them on teaching-related issues, and taught a graduate course titled *Math Teacher Training*, which is a one-credit course devoted to pedagogy. My preparation as Lead TA included over 30 hours of training in learning styles and teaching techniques.

As a result of my experience and commitment to teaching, I was chosen as a 2008 Fellow of Project NExT, which is a professional development program of the Mathematical Association of America. Through my involvement in Project NExT, I have attended numerous workshops on teaching-related topics. Moreover,

Project NExT has provided me with an invaluable network and has acted as a catalyst for new and innovative ideas.

Teaching practices

In lower-level courses such as calculus, I spend a majority of my time lecturing; however, I would not classify the atmosphere in my classroom as traditional. I design my lectures to be a dialogue between me and my students. My duty is to carefully guide the discourse, often via Socratic questioning, toward a predetermined goal. The more my students interact with me, the better I can assess their understanding. Instead of handing them the next piece of the puzzle, I make them anticipate it. Whenever possible, I take the opportunity to pursue methods of attack suggested by students, as it is important for students to learn how to verify whether their ideas are valid. While lecturing, one of my goals is to provide students with an appropriate role model to mimic until they develop independence.

I transition to a more student-centered acquisition of mathematical knowledge in upper-level courses. In courses such as introduction to proof, abstract algebra, number theory, and real analysis, I have been employing an inquiry-based learning (IBL) approach. Nearly all class time is devoted to students presenting their proposed proofs to assigned theorems. My role in these courses is to keep the class on task, facilitate discussion, and provide feedback and mini-lectures as appropriate. This educational paradigm has transformed my teaching. Unlike many modified-Moore method approaches, I promote collaboration. Having experienced success using IBL, I believe that it has the potential to be a transformative experience for the students; however, care must be taken. In particular, an instructor in an IBL classroom needs to market the approach, convey expectations, and set up a safe and comfortable learning environment.

Beyond my experience in the classroom, I have attended the last two Legacy of R.L. Moore Conferences and was a participant at the IBL Workshop that took place prior to the 2010 conference in Austin, TX. Largely due to my success with IBL, I was asked to be a mentor for the Academy of Inquiry-Based Learning, and I am currently a co-mentor for seven faculty members in the Northeast. Inspired by anecdotal evidence, I am in the midst of conducting a couple of small-scale studies with mathematics education specialist Angela Hodge (University of Nebraska at Omaha) about student perception of the effectiveness of IBL.

When appropriate, I mention open or novel problems, or possibly snippets of my own research. It is important that students see mathematics as a growing and vibrant field. Furthermore, I use my classes as a recruiting ground for attracting undergraduate research students. Of course I am interested in working with strong students, but more important to me is identifying students that are intrigued by interesting problems.

Anytime my office door is open, students are welcome, and they take full advantage of this. My office hours play a pivotal role in my success as a teacher. One of my colleagues recently remarked that he had stopped by to chat with me three days in a row and each time I had several students in my office. He was amazed that I was sitting in my chair while students were at the board explaining mathematics to each other. This is a regular occurrence and something in which I take great pride.

On technology

My peers often approach me about technology-related issues in education. I do not consider myself to be a technology expert, but it is something that I am passionate about. At the 2010 MathFest, I was invited to speak about the use of technology at the *Issues for Early Career Mathematicians in Academia* panel discussion. My talk was titled *Technology Sampler* and was designed to introduce the audience to a few pieces of technology I find useful for mathematicians/educators. A secondary goal of my talk was to get the audience thinking about some of the potential pitfalls of technology. I was also invited to speak at the 2010 and 2011 *Spotlight on Faculty Using Technology* at PSU about my use of technology in the classroom.

Technology, such as graphing calculators, applets, and computer algebra systems, can expedite and deepen a student's understanding; however, we must be selective in its use. In my own teaching, I have tried to incorporate technology in appropriate ways. For example, I regularly incorporate applets generated using GeoGebra (http://geogebra.org) to illustrate various concepts in calculus. Applets can quickly convey a concept that is difficult to grasp with a static picture and a verbal description (e.g., tangent line as a limit of secant lines).

Many Web2.0 tools have the potential to transform how knowledge is acquired and how educators interact with students. Over the past several semesters, I have made extensive use of course forums in Moodle, as well as a few different wiki platforms. I have also used wikis in my courses by having students collaborate on generating online content such as chapter summaries. Recently, I have started incorporating aspects of the "flipped classroom" approach in my courses. In particular, I have been generating short screencasts for my students to view outside of class.

Online homework grading platforms can be extremely valuable since they reinforce student learning through practice and instant feedback. As an instructor, I have experience with WebAssign, WileyPLUS, and WeB-WorK. My use of WebAssign in calculus has been successful, but I have plans to transition to WeBWorK since it is free and open-source. Despite the advantages to online homework, I strongly believe that it should supplement written homework. It is important that students receive feedback beyond whether their answer is correct. For example, no online homework grading platform will be able to tell a student whether they are making correct use of equal signs or using proper notation on intermediate steps. Solely grading the answer a student provides is analogous to an English professor only grading the last sentence of a student's paper.

Recently, I have been making extensive use of Sage (http://sagemath.org), a free open-source mathematical software package. My calculus, linear algebra, and abstract algebra students complete a few assignments each semester using Sage that are designed to enhance student understanding and to promote algorithmic thinking. In addition, I regularly incorporate Sage into my lectures to illustrate key concepts or to quickly generate examples. Because Sage embodies many of my core beliefs about software, I am a member of the Sage community, and in particular, I contributed code to one of the recent releases.

In addition to free and open-source software, I am inspired by the growing open-source textbook movement. I have adopted open-source textbooks in several of my courses, including calculus and linear algebra, and will continue to do so when viable alternatives exist. For my IBL courses, I either write my own theorem-sequence or utilize free course materials available from sources such as the Journal of Inquiry-Based Learning in Mathematics (http://jiblm.org).

I archive all of my teaching resources on my web page (http://oz.plymouth.edu/~dcernst) and openly share everything. I frequently receive messages from students and instructors at other institutions thanking me for providing access to the materials on my web page. In addition, I maintain a blog (http://danaernst.com, however, this is currently in the process of a major overhaul) about technology and its use in mathematics and education.

Conclusion

One mantra that we often hear in a mathematics class is, "When are we going to use this stuff?" My response is that much of the time they will not use it directly. Of course, this shocks them; most students are used to hearing things like: "You'll have to know this when you take Calc III" or "If you ever want to be an engineer, you'll need to know this." At the beginning of each semester, I provide my students with the following analogy. Have you ever seen a football player running through old car tires during a game? So, why do they do it in practice? The answer is that they are training quickness and agility. In a similar vein, one purpose of learning mathematics is to train the mind to be quick and agile.