Teaching Philosophy

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If you live in a tiny house, then you will come to understand the possessions that are essential to your life. If you want to get at the essence of an idea, try to express it in one sentence. The process of distilling often vast information to decide what earns the right to occupy that small space is incredibly valuable.

So, what would be my one-line teaching philosophy? On continued reflection, I keep returning to a statement that has been my compass as a parent:

If everything you do is done with love as the basis,
then you can make a lot of mistakes,
and things will still turn out okay.

To adapt it to teaching, interpret 'love' in a broader context—to include respect for individuality and belief in each person's ability to learn and grow. This simple statement gives me the courage and flexibility to explore, providing comfort that a sometimes unexpected result is okay.

There's a lot of mathematics out there—and many ways to travel through it. I take my role as a guide ***very*** seriously. Some groups have time only to glance through the windows; others have the luxury to poke into shadowy crevices. I always want to do more than just meet expectations—I want to give a glimpse of perhaps unexpected beauty and a deep understanding of culture. I want those on the journey with me to ***want to*** return for more. For almost three decades I have been refining and adjusting my teaching. However, certain concrete realizations of my beliefs have proven themselves so universally effective that I would never teach without them, and I will explore some of these here:

- *Passion and Enthusiasm*

  It is the rare student evaluation of my teaching that does not mention one of these three words: passion, enthusiasm, energy. A first step in student learning is capturing their attention and keeping them alert, and this is something I do well. When my students smile and laugh at my unconcealed joy over having renamed an expression in the perfect way "just by adding zero!' then I know my enthusiasm was contagious. I have fun teaching, and this goes a long ways towards my students having fun learning.

- *Organization*

  We have a serious obligation to prepare our students for the next course, for their careers, for life—and we need to do it in n hours. One certainty is this: things will happen to alter even the most carefully-planned syllabus. To guard against the negative consequences of events that are out of my locus of control, I operate by these five words: out of discipline comes flexibility. From the moment students enter a classroom, I have rehearsed and established routines. Here are a couple examples from the beginning of a typical class:

  1. As students come in, they go to the side board and put up homework problems that require discussion; if another student has the same question, they put a checkmark next to it. By glancing at the number of checks, I readily see problems that need attention.
  2. A pile of scrap paper sits by the door and students take a sheet as they enter. As the bell rings, a Quick Quiz (QQ) goes on the front board. Quizzes are graded either with a '1' (one point) or an 'N' (Not completely correct). Points accumulated are bonus points. The QQ gets students to class on time, and they ***love*** the tangible daily benefit for having studied.

- *Crystal-Clear Expectations*

  Anxiety can often be substantially reduced by making expectations explicit. The methods below offer transparency for two common student concerns: What do I need to know? What is my grade?

  1. Index Card Method
     For every concept I teach, I start by creating a $4'' \times 6''$ index card. These become both the springboard for class discussions and the basis for a student's ***own*** cards—they end up with a

stack that embodies every key idea. Cards can be mixed up so learning isn't order-dependent; ones that are well understood can be taken out to focus on those that remain. Students know that assessments will be many and varied—but every one will be an attempt to gain an accurate reflection of their understanding of the ideas on those cards.

2. Grade Sheet
   Each student gets a 'Grade Sheet' that they maintain throughout the course. It's simple math: their points versus total points possible. Whenever an assessment is returned, students look to the side board to update their Grade Sheets. They come to appreciate how a good effort raises their grade; as the course progresses and more points are amassed, they understand the increased difficulty in making a change. This simple ownership and clarity of one's grade has been an outstanding motivational tool.

- *Collaboration and Academic Honesty*

  The more ways you work with an idea, the better. Hearing, seeing, writing, speaking, thinking, manipulating, and collaborating can all contribute to a deeper understanding, so I encourage my students to work with each other. However, I make this very clear: when the time comes to pass in something that is to be graded, it must be a reflection of ***their own understanding***, not someone else's.

- *Teach Students How to Teach Themselves*

  If you don't understand a language, then you don't have access to ideas (even simple ones) that are expressed in that language. I don't want to just teach students math—I want to teach them how they can teach ***themselves*** math, so they won't always need a teacher as a translator. I wrote a little book, called ***One Mathematical Cat, Please!*** that explores basic math language skills, and I weave these ideas into everything I do.

- *Share my Excitement of Math-on-the-Web*

  Every class I teach benefits from my web resources, created over the past decade. Web exercises are used for review of basic skills and course-specific practice. Until recently, a special viewing environment was required since MathML (Math Markup Language) lacks uniform support. However, as of August 2010, MathJax has finally made MathML accessible to the world, and JSXGraph supplies all the dynamic graphing capabilities to complete the job of creating world-class online math educational resources. It's an exciting time for math-on-the-web, and my students get regular doses of this excitement.

- *Keep it Fun . . .*

  Students have a life outside of my classroom. There will be hard days, and a bit of extra fun thrown in at a moment's notice makes it easier to get back to work. When interest is waning, I often throw in a quick math 'Fun Fact'. There are a multitude of free internet resources that can be used for fascinating, short mathematical digressions: three of my favorites are Mudd Math, Number Gossip, and WolframAlpha.

- *. . . and It's More Fun to Learn from Someone You Know*

  I let students get glimpses of who I am as a human being. When a story problem evokes a memory, I may share it with the class. They're likely to find out that I do some of my best thinking on long walks, and that I believe in moderation in all things (even moderation in moderation). It's my responsibility to keep digressions short—but when class energy is low, these little fun facts can again restore it to full speed.

Each person has an obligation to give back to the world, and part of life's journey is in discovering and developing those unique talents to be shared. By giving to those in need, we receive the rich gift of being needed. When I explore mathematical ideas with others—be it in the classroom, one-on-one, or via the web pages I present to the world—then I find deep happiness. The ongoing search for more effective ways to communicate mathematical ideas gives meaning to my life, and my lifelong endeavor is to keep at it.