TEACHING PHILOSOPHY

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I've never had the opportunity to design teaching evaluations. Hypothetically speaking, then, I would do it like this: At the beginning of the semester, each student gets a piece of graph paper. Each week, he or she makes a mark corresponding to their "happiness" or "sadness". Happiness could be marked on the positive ordinate axis and take values including $+\infty$. Similarly, sadness takes negative values. The same thing could be done with a "knowledge vs. time" graph. Students would turn in both graphs at semester's end. The instructor obviously hopes that each student's plots are both generally increasing and end up on the + side. I have had the pleasure of teaching mathematics for over 7 years. During this time, I feel like I have developed some daily strategies that accomplish this goal.

Organization

The first and foremost of my strategies is to remove myself from being an obstacle to a student's learning. An instructor becomes an obstacle when he or she is coy about success in the classroom. Students need to know what is necessary to achieve their academic goals. To this end, homework assignments and tests should have problems of varying degrees of difficulty. On every assignment, each student should be able to point at the paper and say "Look at what I learned!" This reduces frustration and increases happiness.

Organization is important. Students deserve to receive graded tests and homework in a timely fashion. Their papers should be marked with constructive comments, praise, and gentle rebuke where appropriate. In fact, this is how a teacher communicates with each student about their work. Grading should not be viewed as a chore, but as the pivotal link in the teacher-student relationship.

Class time

Students should always attend class. The instructor should respect the expenditure of their time. However, a good mathematics lecture can be difficult to plan. Successful lecturers must transmit complex ideas within brutal time constraints. They must be interesting enough to keep the attention of the students while covering material that is often despised. Moreover, the syllabus needs to be covered even if a class struggles with a new idea. I find that following a few guidelines facilitates the creation of clear, enjoyable, and productive lessons that never sacrifice content:

- Know what is important and tell them repeatedly.
- It is better to do an example than to prove a theorem. It is best to do both.
- Start with small, almost trivial ideas and questions. Then build up to something impressive. Be obvious. Tell them why things are impressive.

- It's good to backtrack. Offer the class multiple explanations of key ideas.
- Be calm and patient. Be prepared, but be extremely flexible. Stay on target, but not necessarily on track. Be thorough, but don't dawdle! Be quick, but remain transparent. Be funny, but don't be a comedian.

While students sometimes need to learn directly from an expert, they can also greatly benefit from the relative confusion of their classmates. One person knows part of the story and another person knows another part. Together they know the whole thing and they experience the joy of collective discovery. Research mathematics is often conducted by small groups of confused people, so this aspect should also be a part of every student's mathematical training.

Content and Focus

It would not hurt my feelings if after 10 years a former student of mine could no longer remember whether the integral of $\sin(x)$ was $\cos(x)$ or $-\cos(x)$. I would be very disappointed, however, if they could not recall that the derivative is the slope of the tangent line and the integral is the area under the curve. The point of a college calculus course is not just to learn how to integrate and differentiate. Students should be encouraged to think in terms of the bigger picture and should be rewarded for doing so.

Another point I stress in my classes is problem solving. Many undergraduates are highly adept at classifying problems and memorizing template solutions. While this is an undeniably effective coping startegy, it severely handicaps further intellectual development. Instead, students should be learning how to analyze unfamiliar problems and devise original solutions. This is a skill that can be taught especially well via mathematics. Students tell me that when they are stuck on a problem, it helps them to wonder: "What would Micah do here?" People learn how to solve problems by watching other people go through that process. I spend a great deal of time during the semester discussing my own methods. They pick up on it and I can tell it makes a difference in their work.

Computers and Calculators

Computers and calculators can be valuable tools for elucidating theory, gaining intuition, and exploring applications. It is tempting for students to believe that technology supplants the usefulness of mathematics. Those that adopt this viewpoint have failed to ask the appropriate question. It is far less interesting to know the value of a definite integral than it is to understand how the computer arrives at that value. More fascinating still is how the computer knows the accuracy of its computations. Questions that start with "what" are far less interesting than questions that start with "how" or "why". The task of the instructor is to find the right questions to ask with the available technology.

No statement of teaching philosophy can be complete without some often quoted taoist maxim. Sun Tzu says that for a general to be victorious, he must have the will of the people on his side. I think that applies nicely to education as well. When the teacher and students are both on the same page about where they want to go with the semester, happiness and learning abound.