Teaching Philosophy of Ashok Ramasubramanian

The desire to compete and win is primal; use students’ natural competitive spirit to my and their advantage.

In the Spring of 2008, I was teaching Dynamics of Systems, an extremely math-oriented upper-level class in engineering. During the first three weeks, I struggled to keep the students interested and I could see my pupils constantly yawning, glancing at their watches, and gazing mournfully at the windows. To make matters worse, the time slot was in the afternoon, from 3:30 to 4:35 PM. I then realized that no matter how hard I try, a lecture in applied calculus cannot compete with springtime and everything that comes with it: sunshine, romance, and rebirth to name a few. Spring vs. calculus can never be a fair fight; spring will win every time.

I then decided to try an experiment. I divided the class into three groups and assigned a hard problem. The group that finished first was promised an easier write-up in the next lab report. Students generally dislike writing lab reports and all three groups worked furiously on the problem, which involved material that I had not yet covered in class. I now had a situation where adrenalin and people’s innate competitive spirit were pitted against the lure of spring. Human history indicates that the former nearly always triumphs; this was the case in my class.

The groups were chosen at random. Once a group announced that they had solved the problem, I would call a group member at random to come to the board, explain the solution, and answer my questions. This procedure ensured that even if only one or two people in the group solved the problem, it was the group’s collective responsibility to ensure that everyone understood the solution. I have found that students explaining concepts to each other is often far more effective than traditional lecturing.

Formal and informal feedback indicates that students love having these competitions in class and actually look forward to them. They compete fiercely, have fun, and learn a lot at the same time. I now have competitions in all of my classes with rewards including iTunes gift certificates, organic fresh fruit, and Swiss chocolate.

I am now experimenting with placing two people from each group in a separate computer lab to solve a section of the problem that requires computer use. The remaining group members in the class communicate with their teammates in the computer lab via cell phones. Engineers today often
team with people in other countries and so much communication happens via telephones; I wanted my students to have this experience. Again, student feedback so far has been positive.

The connection between math and real-life situations is important in engineering education.

There is considerable math involved in my classes and often I find that students are ill at ease with it. I believe that math can be made more fun by relating it to real-life applications. Engineering students are highly inquisitive creatures. They like to take things apart and explore what is inside of radios, motors, and the like. A teacher needs to relate mathematical concepts to his or her students’ interests.

For instance, while covering the theory of feedback, it helps to connect the mathematics behind the theory to types of that feedback students encounter in everyday life: temperature control in buildings, the human body’s ability to maintain a constant temperature, and cruise control in automobiles, to name a few. I find that establishing such a connection excites students, improves their confidence, and facilitates learning. “Never lose the connection to everyday life” is an oft-repeated sentiment in my classes.

Be strongly committed to your students and expect strong commitment in return.

I start every class promptly at the correct time and never go beyond my allotted time. I spend considerable time preparing my lectures and I make every effort to promptly grade homeworks and exams. For lab classes, I usually do the entire lab by myself the day before so that I am prepared. Usually I know how each of my students is doing in class and I attempt to fix their deficiencies early in the term. When students realize that I am putting a lot into the class, it motivates them to do the same.

Long years spent in academia has taught me this: if the teacher works hard and is enthusiastic about the material, the students respond with equal vigor. This fundamentally alters students’ perception of class work. Rather than seeing it as a chore that needs to be completed, they see it as a challenge and a source of positive energy, much like playing a sport.

I challenge my students and push them. All my exams are take-home affairs that take between 10 and 20 hours to complete. Often the exams
involve problems to be solved using a computer. Recently, for a WAC course, I challenged my students to write a one-page report about their most-recent laboratory that would be comprehensible to someone who has no background in engineering. I plan to ask non-engineers to read the reports and I will then assign grades based on the students’ ability to convey their ideas to a non-technical audience.

Learn from mistakes.

I love teaching and most days I look forward to coming to work and interacting with the students. However, it is not always smooth sailing. In Spring 2008, I had to fail two seniors for cheating on an exam. I realized that, given the take-home model I use for my exams, my classes needed a strong ethics module.

I believe that it is best to make students understand that it is in their best interest to be honest. The motivation to be ethical should come from the students themselves and not through external coercion or fear of punishments. To achieve this objective I collected ethics case-studies (e.g., Five international students at Dartmouth College plagiarized a journal article, but claimed that the practice was perfectly acceptable in their home countries. Should these students be expelled?) from my friends at other schools. We discussed the case-studies and I solicited input from every student. The students then wrote a one-page report on each case study and recommend avenues to resolve each situation.

Students enjoyed discussing these case studies in class and many had innovative suggestions for how to resolve the issues; these were appreciated not just by me, but also by their peers. Once the climate of fear is removed and free discussion prevails, I find that most students rise to the occasion and become honest and upright pupils on their own volition.

The ethics case studies are now part of every class that I teach and student feedback again indicates that this approach is working. This term, for instance, one student approached me voluntarily and reported that he had purchased an used textbook in which the previous owner had solved all of the exercise problems. He added that discussing ethics in class led him to conclude that reporting the matter up front was the best thing to do.
Conclusion

To summarize, whether it be teaching complex math or ethics, my emphasis is always on motivating and empowering the students, i.e., my students should enthusiastically declare “I want to learn and be ethical, because that is what professionals do.” They should never resign to admitting “I want to learn because I want a good grade” or “I should not cheat because the consequences of getting caught are too severe.”