Philosophy of Teaching

I feel that the most important thing I can teach my students is that science is an ever-changing body of knowledge which can be revised by any human (even themselves) through the scientific method. In everything I do as a teacher, I try to present, demonstrate, and allow students to discover this: my philosophy of teaching.

First of all, science is ever changing. I feel that part of the excitement of science is in this changing aspect: that science is not memorizing facts, but understanding ideas.

In the classroom I make extensive use of current periodicals such as *Science News* to give my students that sense of change. I also emphasize in lab work that students results, whatever they may be, are what is correct. One of the ways I have learned to do this is to have students calculate the constants[1] (such as the speed of light) and to have student calculated values be the accepted values in class for homework and tests. If students need a better value to do some calculation, they have to do the lab better themselves (and an open lab night may make this easier to give the students time to do). As they do better work, their physical constants change.

Students are expected to report what they find even in disagreement with their textbook because they may be discovering something new. This includes their own determination of physical constants as well as any phenomena which seem at odds with what

[1] This idea comes from conversations on styles of teaching which I have had with Sandra Wyman on Mr. James DiCarlo's 2002-2003 physics class at Philip's Exeter Academy in New Hampshire.

the students learn in lecture. One activity we're doing is to measure whether the strength of a magnet decays as it is left in an opposing magnetic fields. This came from a student question, and we did a lab around it which is still running. We'll report whatever we find (though I suspect we will not find a decay). When we get a result, we'll investigate how it makes sense in the standard model of magnetism.

Secondly, science is a body of knowledge represented by the textbook. Despite its ever changing nature, there is a certain part of science which is common knowledge and standard theories. While it isn't necessary to know that two pieces of metal which repel each other are called magnets in order to investigate this phenomenon, it does help the students relate this information to other scientists and back to their text (for my current class, the text includes *Science Plus*, *Science News*, *Science World*, and any other sources they happen to be using for that particular unit). This is the part of science which students do need to know and memorize. It is the foundation upon which the changing world of science is based. It is the giants on whose shoulders Newton stood that he saw further than most. Any scientific classroom would be remiss in omitting the established body of knowledge.

In the classroom I emphasize readings from the text as the main source of common knowledge. Students are expected to remember certain facts, such as vocabulary, and understand other concepts such as organizing theories of the nature of the universe. This information is important not only for communicating with other scientists, but for organizing their own discoveries in more general ways. These are not only demonstrated in, but also taught through tests. For all I have against

testing, there is something to be said for the studying for a vocabulary test that does get the words into the brain.

Third is revision, represented by the scientific experiment. Not only are established laws subject to revision through professional science experiments, but students' understanding is subject to revision when presented with contradicting evidence.

In the classroom, this need for evidence can be shown in many ways. First of all, in lecture students are actively encouraged to challenge any fact and ask what evidence supports it. Second, I intend to put up oversized post-its where students can give me anonymous feedback. The three such post-its shall be "this I understand…now prove it to me,"[2] "I don't understand this," and "ways you can improve lecture." Finally, I am a big fan of running the same experiment on more than one day to examine how one can refine one's results.

Finally, we have the human being who is there thinking about new theories, establishing new ideas, and running experiments. Science is a human endeavor with it's own history. In a scientific classroom this can be demonstrated through biographies and experiments which allow the students to realize that they too can establish new scientific theories.

This is my philosophy of science teaching, and it is what I attempt to demonstrate in the classroom.

One final point regarding teaching in general, but not necessarily the teaching of science: I believe very strongly that teachers should know the language(s) of the students they are

[2] The idea here is that students may understand the concepts of "Earth" and "sphere," and therefore they don't need me to clarify "the Earth is a sphere" because they know what that means, and yet they may not believe that the Earth is, indeed, a sphere. They want to see the evidence for that, and therefore they can ask me to prove it to them.

teaching. I feel that any student living in the United States has an opportunity to learn English here, an opportunity which cannot be paralleled in their home country. I feel it is important that every student avail themselves of this wonderful opportunity and I feel it is the teacher's duty to encourage this, however, I feel that anything we expect of our students, our students have a right to expect of us. I feel our learning of a student's language can be an invaluable asset in teaching students. Even using a few key terms which we (or our students)[3] put on a simple cheat sheet can help the students when we transition from one topic to another. I also feel this is an ideal opportunity to expose American students to some foreign terms.

[3] One way that has been suggested which would make this very little additional work on the part of the teacher is to have a dictionary of the correct language in their classroom, to put key terms on the board, and to have students (different students each time, and there's no reason why non-ESL students can't participate) look them up in the various languages. On vocabulary tests, students could answer in whichever language they like (since the teacher already has a list of definitions), and other languages could be extra credit.