

Statement of Teaching Philosophy

R. P. Feynman said, anything found in research is lost and not usable unless it is taught to others in a *comprehensible* way. For teaching physics understandably, it has to be transformed in a way that students can actually learn effectively.

Reflections on learning

I believe that it is essential to reflect on the question on how deep learning (instead of surface learning) occurs. First one has to realize that students bring many experiences about physics into the classroom. Some conclusions that are based on previous experiences are misleading common-sense descriptions of nature. Before students can begin to learn a more appropriate physical model of nature it is necessary to address incorrect common beliefs in general and individually.

My own experience as well as research shows that making students aware of misconceptions and learning of new material seldom occurs in passive environments, where only so-called 'facts' are regurgitated. Therefore active participation is an elementary part of understanding, growth, and generating knowledge. Students also need opportunities to take active responsibility for their learning.

New skills, e.g. applying general principles to a specific problem, can only be understood by students when they are allowed to transform them into their terms. Such a transformation can be supported by providing the material in a variety of input formats on different language levels and from different sources. The variety of sources includes professors, teaching assistants, text books, visual media, the internet, and peers. Interactions amongst students also strengthen the newly learned material by providing opportunities to teach the new skills to others.

Principles

Based on this description of the learning process one can conclude some principles for teaching. First of all teaching has to be student-centered. Care for each student and personal contact are necessary to notice individual misconceptions and for creating a safe and enjoyable learning environment. I believe that everybody can achieve the goals of the course, and I try to relay this to my students.

Second, as teacher I have to keep in mind that the principles and also the language of physics is new to the student. I have to make sure that these new ideas and the new terminology are conveyed in an understandable manner. Since students have different backgrounds and different learning styles, this requires repeated and varied presentations and relating the material to the students' lives and backgrounds.

Third, to encourage successful and deep learning, I have to involve students and facilitate activities. I also have to make clear to my students that it is their choice if they want to join our adventure of learning and if they want to earn a good grade; I only can provide the opportunity. I give my students the responsibility for learning and I tell them so. I am available for them as guide. It is one of my goals to teach the

students that “The more I can get you to think through the issues involved in a problem the less you will depend on me for how-to instructions”. Students should grow to think critically, even in a natural science class.

Of course, I have to know the subject matter myself and I have to be prepared for each class period. Thereby, I am available as information source and discussion partner. On the other hand, I’m not afraid of showing students that sometimes I still have to learn something, too. Finally, students should also be motivated by seeing that the subject matter can be fun.

Examples of activities

I try to implement these ideas and to create a safe learning environment by the following methods, for example. It is essential to begin with such a simple thing as learning the students’ names. I also encourage students to correct my English pronunciation. Usually, they are proud to be able to teach me something, too.

I give frequent feedback to the students about their participation in the lab and about their lab reports. This way they can change their involvement in labs and they know where they stand in comparison to my learning goals. I also use the feedback to challenge students to think more about their lab reports by making comments appropriate to the level of expertise shown by the student. When students ask me questions during the lab, I usually don’t just answer the question, but I try to lead the students to find the answer themselves.

I try to get feedback from the students with the ‘two minute exam’, where they answer the two questions “What’s the most important thing you learned today?” and “What the biggest question you have right now?”. This provides opportunities for the student to collect their thoughts and questions and this increases deep learning. We also get to know each others thoughts about the teaching and learning process better. I also utilize take-home quizzes to encourage students to think about problems using their own methods and means, for example by working as a group.

It is also important to provide interactive activities that involve all students in small groups. The quote “Tell me and I’ll forget, Show me and I’ll remember, Involve me and I’ll understand.” describes this in a short and memorable way. Additionally, I encourage participation in the classroom by frequent questions and I call quiet students directly to answer some of them. I also try to create a relaxed environment, where embarrassment (for example, because of wrong answers) is avoided.