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Teaching statement

I strongly believe that teaching is a foundamental part for an academic career. As a physicist, I really enjoy explaining physics concept and I receive a great intellectual pleasure whenever I observe students understand them. I also strongly believe that teaching must go beyond imparting facts which is why I encourage the development of critical thinking analysis and synthesis skills. This can be reached actually through an adaptive process according to the students reaction to the course.

A challenging task as an educator is to keep lively the attention of the students. This can be reached through well-organized engaging lecture which possess a core topic clearly stated since the beginning of the class. This topic has to be motivated at various levels: for the course itself, for physics more broadly intended, and, crucially, for current research. We need to make the students aware that even basic physics offer method which is currently in use in actual research. I also believe that understanding of a particular issue can be easier by teaching also a bit of of the history and steps which have lead to the present understanding of the discussed topic. *Learning from the past* indeed can provide the students with a real practical example of a successful scientific and critical method.

Interaction with the students is vital for a teacher and provide the indispensable energy to keep motivated the teacher himself. Interaction can occur at various level. With a single student, or small group, which comes with question and clarification I try to push him/them to analyze the problem again, offering the solution step by step, or even better posing bite-sized questions they can answer so that at the end the logically come to the right conclusion. Whenever you deal with large class instead understanding the real comprehension of the topic, apart from resolving textbook exercise is more complex. Furthermore often students can be intimidated from the professor and interaction become complicated. Different methods have been proposed to overcome this issue. Among the other I would like to try the so-called *Muddy cards* method. It consists at the end of each lectures (or of a series of lecture cycle) to distribute anonymous cards where students must provide feedback on which topic they consider as the more complicated, and in the need for clarification. Once reviewed the teacher could decide to provide answer in different ways: by posting questions and answers (Q& A) in the course web site (which could serve also in the following years), by preparing handouts to be distributed the following lecture or addressing the problem directly in the next class meeting. Any abuse of this method is actually discourage both for the excessive deal of work for the teacher and also for preventing the method to become an not useful routine, but an appropriate choice of the moment where to perform this exercise (for example after a cycle of lectures which conclude a sub-program, or after challenging lecture) can provide immediate feedback of possible misconceptions and assist the teacher to tailor following lectures.

Another method which I think I would apply, in particular in big classes is the so called *Peer Instruction Method*, originally introduced by Eric Mazur [1]. The method engages students through activities where they both have to apply core concepts presented, and at the same time they need to explain those concepts to their fellow students. The process of *Peer Instruction* process as follow: 1) the question is aksed. This question, dubbed by mazur as ConceptTest, is a primarily multiple-choice, small conceptual question 2) The students have then the time to think and 3) the answer are recorded. Different method could be implemented, as color cards, or even electronic classroom response. 4) The students discuss their answers with neighboring class mates and 5) a new record of revised answer is recorded. Finally the teacher explain the correct answer. In principle the method can be applied multiple times in within a single lecture and can be used as an active method to accompany traditional lecture. This method differ from the common practice of asking informal questions which typically engages only a few highly motivated students, and provide the teacher with immediate feedback on the rate of comprehension in the class. Furthermore including the discussion within the class help the students to present his knowledge in a clear a structured way in order to convince the others of the rightness of the proper choice.

Finally, a good method to introduce the students to the practice of doing scientific research is to stimulate the students to present their weekly homework to their peers in the form of an oral presentation. This help also to student to gain the capability to explaining science which is, according to me, a part of the activity of a scientist.

So far I have always taught in small class-room where some of these methods are actually less needed, because you can create a personal contact with the single students. I always tried to encourage students to think critically, analyze and synthesize and I'm eager to apply some of the aforementioned methods to future classrooms.

As a mentor I had followed students for Batchelor, Master and PhD thesis. Being a mentor is actually a big responsibility, because you need to teach the young person not only concepts but also independence, critical spirit, method, strictness. You need also to provide the enthusiasm to overcome the possible difficulties you can easily run into when doing research. But having the possibility to mentor a student, seeing him to accomplish his duty and finalizing his effort can also be very rewarding and I believe is one of the more important task for a faculty member.

References

[1] E. Mazur, *Peer Instruction*, A User's Manual, Pearson Higher Ed, (2013).