

Statement on Teaching

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Teaching, in very broad terms, consists of three elements:

1. **Exposure:** This part involves presentation of ideas and concepts. In particular, as a causal set of events. Earlier ideas motivate and lead to later ideas, smoothly, without gaps in the arguments. It is necessary that every piece in the presentation follow from an earlier conclusion, preferably sequentially. This seamless integration of thought process forms the foundation block of teaching.

It should be emphasized that this integration of ideas is a dynamical process. The missing pieces in the logical flow are often revealed during the actual teaching process. This is what it means to say that one sharpens their own knowledge by teaching. I believe, penning down ones thought also has the same effect, which is way to teach oneself.

2. **Problem solving:** The second part involves refining the concepts that one has been exposed to. Generally, mastering and perfecting the concepts a student is exposed to requires practice. This is traditionally accomplished in the form of homework. Today, in the digital era, homework can be administered using online tools.

It should be stressed that making errors and mistakes while practicing is a very essential part of honing the skills. To incorporate erring as a core element of learning is not easy in the traditional form of homework. But, online tools, today, allows students to take multiple trials and gives instant feedback on the correctness. It also allows students to discuss with their peers, take help from Teaching Assistants and Instructor, and it also allows them to take professional help.

3. **Critical thinking:** Honing the art of critical thinking plays the most important role in the process of learning. Critical thinking is best cultivated by being a researcher, by questioning your own analysis, by depending on your intuition that has been fine-tuned from experience.

It helps to differentiate a research problem from that of a homework problem. By construction, a homework problem is solvable. This awareness lets oneself push the boundaries of thought process, and in essence makes the process easy. Without this awareness of the

limit, and the recognition that a line of thought could be endless, the process seems to be frustrating, never-ending, and hopeless. This realization of the uncertainty also begs for insight, without which, often, the process is impossible.

A big challenge in a research problem is to convince oneself that the solution found is indeed correct. Since research involves original work, the correctness of the solution can only be verified by critical analysis. Critical reasoning is an art that is cultivated and in the course of time serves as your instinct. In a typical physics problem this would involve dimensional analysis, and checking for limiting cases in the solutions, to list the most standard methods. Critical reasoning can also be compared to the art of finding an error in a computer program that does not spit out an error during compilation.

As a teacher my task is to present ideas without gaps in logic, and to pass on the art of critical thinking. Reflecting on one's own thought critically, honestly, without bias, is what one learns by teaching. Effectively, it is cultivated by teaching in a manner such that none in the audience can find a hole in the logical presentation.