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## TEACHING PHILOSOPHY

In an interview by George Sylvester Viereck in the October 26, 1929 issue of the Saturday Evening Post, Albert Einstein was asked if he believed in progress from human effort. Einstein replied, the only progress he could see was progress in organization, and added:

"Being both father and teacher, I know we can teach our children nothing. We can transmit to them neither our knowledge of life nor of mathematics. Each must learn its lesson anew."

In the same interview, which was conducted in the quiet comfort of the Einstein residence, Viereck further noted how Einstein momentarily succeeded in bridging the abyss of his journalist ignorance about higher dimensions, only for Viereck later to find Einstein's words were "as difficult to interpret as the fantastic network of a dream".

Although the stated anecdotes were told in the same article, Viereck never connected Einstein's view of teaching, knowledge, and progress, with Einstein's transitory success at teaching him something, which his mind was unprepared to integrate. Clearly, however, the latter provides excellent support for Einstein's opinion.

Some years later, another famous physicist, Richard Feynman, was asked more directly about his own experience with learning, to which he provided the following wonderful answer:

"When you are thinking about something that you don't understand, you have a terrible, uncomfortable feeling called confusion; it's a very difficult and unhappy business. Most of the time you are rather unhappy, actually, with this confusion. You can't penetrate this thing. The confusion is because we are all some kind of apes that are kind of stupid, working against this thing, trying to put two sticks together to reach the banana, and we can't quite make it. I get that feeling all the time, that I am an ape, trying to put two sticks together. So, I always feel stupid. Once in a while though, the sticks go together, and I reach the banana."

From my perspective, Einstein's idea about teaching, and Feynman's idea about learning, ought to be basic to life at universities. These ideas are highly congruent with those of Jean Piagets and the Constructivists. Feynman is talking about a situation where his mind is working intensely to integrate some information, but he is not ready. His mind is out of equilibrium, but then something happens. Information is received, and somewhere in the structure of his mind pieces fall into place, and he now understands.

What Feynman's story highlights is the relation between the environment and our mind. Information streams are not like liquid, the mind is not like an urn, and the former cannot simply be poured into the latter to make our knowledge grow. Instead, our knowledge appears to resemble the game of scrabble, something to be constructed, where sensory information can be integrated into existing knowledge if, and only if, the piece of information finds an appropriate place. Because that depends on what was previously integrated, the growth of knowledge is highly path dependent.

For the relation between teacher and student, this metaphor of scrabble supports what Einstein believed, namely that each of us must be active in our own acquisition of knowledge, from the child learning what letters and numbers are, to university professors grappling with black holes, or heterogeneity among companies. What is puzzling to one person may be simple for another, because they have developed different structures in their brain to integrate new information. Consequently, learning must per definition be idiosyncratic.

The role of teacher is not meaningless, however. While teachers cannot simply pour new knowledge into the minds of students, they can facilitate the integration of new information by asking the right questions at the right time in the process. This requires sensitivity to the heterogeneous stages in the learning process that different students have.

In my view, the good teacher therefore seeks to interact with students, and through such interaction begins to learn things about student adeptness. By interacting with many students, the teacher acquires the ability to moderate questions to the problem complexity, which the individual is able to handle; advanced students should be asked different questions than beginners, but each student should be challenged.

Of course, not all students are motivated to learn, which can often explain the level of knowledge obtained so far. Teachers can only hope to ignite motivation in the student. This can best be done if the teacher discovers what motivates the student, i.e. finds out why the student is present at that time.

What the university teacher must always do, however, is wear the amazing cloak of The Scientist. There is something truly special about the progress of science, and this spirit can ignite people to spend hours of time in solitude, actively trying to find some piece of information, that is missing for them. It can make students highly independent in that way, which is imperative for learning, as each learn their lesson anew. And it can make students constant critics, who question things that cannot easily fit into the structure of knowledge they have grown so far. It is at that point confusion arises, the mind moves out of equilibrium, and people learn.

## **TEACHING EXPERIENCE**

Since I started my PhD, and until this moment, I have conducted 177 lectures, totaling 498 hours, across five different courses. During this time, I have also supervised 17 students as they wrote their Master's thesis, and 16 students as they wrote seminars or Bachelor projects.

## **TEACHING SKILLS**

I have completed the mandatory pedagogical training program for Danish university teachers. Part of the program involved specific courses on knowledge communication, including "An alternative to PowerPoint: Prezi", "Engage Your Students with Blogs and Wikis", and "Supervision – Roles and Relationships".