



086

# International Best Practices of Engineering Education

## Discussion from student point of view

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Engineering education is often found by students unimaginative and it suffers from lack of motivated applicants and high drop-out rates. Educational research has concluded that the learning styles of many engineering students don't match with the teaching styles of most engineering professors. In order to make engineering education more appealing, motivating and rewarding for students, it needs to be reformed by taking the students' learning experience as the starting point.

We've conducted a study with the objective to gather and assess European students' great learning experiences and define the educational methods that have behind these experiences, in order to spread these best practices around in engineering education. In the first phase of the study, we collected learning experiences

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with a qualitative questionnaire. In the second phase, we interviewed teachers who had been mentioned by name as having given an especially good learning experience to a student. Finally, we assessed the answers of both the students and the teachers in order to find what were the particular nuances which made the learning experience great to the student, and what was teacher's role in facilitating this experience.

Based on study results obtained until now, we have defined five broader factors that seem to contribute most to the best learning experiences. They are: interaction with the teacher, continuous feedback, application of theory to practice, logic in explaining broad concepts first and then delving deeper, and lastly flexibility.

Firstly, interaction with the teacher and exchange of ideas is crucial. We found out that students feel they learn more through discussion and group work, even when the teacher is just throwing out rhetoric questions and answering them himself. Enough time is needed for thinking, and a setting for reflecting ideas with peers and the teacher is essential.

Secondly, continuous feedback during the learning process and encouragement from the teacher keeps students motivated through hardships in learning. To learn continuously through the course, students need to keep on track of whether they are learning the essential and really understanding it or just memorizing things superficially.

Thirdly, coherence of theory and practice, together with application of theory to real life cases is found very important in technical and applied sciences. This might be considered self-evident but the student experience is that the connection of theory and practice should be smoother. Instead of teaching 'theory' and 'practice' separately, they should be integrated to prepare for solving real engineering problems. Knowing how the things we learn are applied in real life is the key to students' motivation.

The fourth principal found was that teaching a complex phenomenon requires first breaking it down in simple terms and gradually compiling its building blocks together. Learning a complex and intricate matter is performed in the brain by processing and reorganizing knowledge of more simple sub-concepts. To start a learning process in the brain, the new matter to be learned needs a touching point to what is already familiar.

Lastly, we found that students value flexibility of learning methods and focus of content according to individual interests and preferences. Within the framework of learning objectives of a course, the focus of individual interests may vary, and encouraging students to pursue what personally attracts them leads to more profound learning.

The results of this study remain preliminary at this stage and we will proceed with a more widely spread questionnaire, more extensive interviews and a deeper analysis on the findings. However, these results should encourage professors to combine different kind of teaching methods to suit as many learning styles as possible. Providing time and space for reflection and exchange of ideas, giving continuous feedback, including practical applications and breaking complex problems into smaller ones in a logical manner should be principles taken into account at every course – the method naturally depending on the subject and external restrictions.

We are bridging the gap between professors and students. Our vision is to see teachers using innovative teaching techniques that students perceive as effective and motivated students enjoying their learning even when it's hard work. ■