

European Project Semester - how engineering students can achieve important competences.

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Abstract – Engineering education is facing many challenges today. The ever increasing amount of knowledge makes it difficult to teach students all what they need to learn, and it is often difficult to motivate students. Engineers need international competences and good skills of cooperation because most big companies are international and most engineers today work in teams with other people with different skills. Denmark has a long tradition for project organised and problem based learning. In consequence, at Copenhagen University College of Engineering we have made an exchange semester for engineering students. This semester is called “European Project Semester” or EPS, and so far we have received 1148 students from 35 countries in EPS. EPS has been a great success and students acquire international competences and soft skills at the same time as they learn from the technical project work. Very often when students do projects in teams, some students will lean back and let the other students do the work. In consequence, at EPS we have an assessment system that gives students individual marks and secures that all students are contributing to the teamwork. Supervisors are not only technical supervisors. They also have to help students with the team process and their cooperation and help them to solve conflicts.

Index Terms -International competences, project organised learning, teamwork.

BACKGROUND

At Copenhagen University College of Engineering we have made a semester for exchange students based on following facts:

1. Denmark has a long tradition for problem based and project organised learning. In consequence we know how to benefit from those learning methods and we know the challenges.
2. Thanks to enormous progress in science and technology most universities and professors want students to acquire an ever increasing amount of knowledge. It is not possible, and much of the knowledge of today will be outdated in a few years. In consequence, it is more important to learn to learn.
3. Because technology is very complex today, an engineer cannot create technical devices alone. Engineers have to work in interdisciplinary team with people with different skills. In consequence they need good skills of communication.
4. Almost all big companies in all countries are operating internationally today. In consequence, engineers need to have international competences. This implies language skills and knowledge about other cultures.
5. In many countries there is a lack of engineering students. Further, many students today find it boring to sit down and listen to professors who are talking, because they are used to all kinds of entertainment. It means that we have to motivate students and teach them in a motivating way.

Based upon those facts, we have made a “European Project Semester”.

WHAT IS “EUROPEAN PROJECT SEMESTER”, EPS?

European Project Semester, EPS, is a semester for international engineering students and other students who can contribute to an engineering project. Students are working and studying together in international and interdisciplinary teams. The semester is a mixture of courses and project work.

The courses (9 ECTS) include teambuilding, communication, systematic innovation, international marketing, project management, project review, environmental subjects, international law and language and should help the students to do a good project work.

The projects (21 ECTS) are usually interdisciplinary and done in cooperation with a company which means that they are realistic, real life projects. However, some of the projects are more academic projects without a company, and some are not interdisciplinary, but go more into depth in a specific field of engineering.

WHERE AND WHEN?

EPS started in Denmark in 1995, but it has been a great success, so many other universities have got our help and permission to do an EPS. Today it is also done in 's-Hertogenbosch in Netherlands, in Oslo in Norway, in Lodz in Poland, in Kiel in Germany, in Valencia and Vilanova in Spain, in Vasa in Finland and in Tarbes in France. In the autumn it will also start in Antwerp in Belgium and in Porto in Portugal. We don't interpret the other EPS-providers as competitors, but as good partners, and we have annual meetings so that all of us can benefit from all our experiences.

HOW IS AN EPS INITIATED?

When exchange students arrive to a foreign country, a foreign culture and a new university, they can lose a lot of time if things are not well organised. So, EPS starts before students arrive. The students receive descriptions of the projects they can choose two months before the semester starts, and shall send a list with three projects they would like to do. The teams are organised so that there are four or maybe five or three students in the teams and all teams are international. Further, the skills of the students should meet the demands of the projects. One month before they start, the students receive an e-mail with information about their project and the other students in their teams. Further, they are told to contact a professor in their home university and to find out how they should contribute to the project. Finally, they are told to do a "Belbin test" online.

THE BELBIN TEST

This test tells the student about how their different characters are related to the teamwork. In a team there is a need of different personalities, so it is important that the students know which personal qualities they have related to the project work. It makes them aware of the importance of different personalities and that all personalities have positive and negative sides. They should appreciate diversity, although diversity at times can make the cooperation more difficult!

PROJECT WORK

Project work can be a challenge for many reasons:

1. Students should take ownership of their project and find out what is important and what is not. Based on this, they should define the projects. Many students are reluctant to do that because they are used to and maybe prefer that a professor simply tells them what to do.
2. It is a challenge to organise an extensive project work. We have to teach them this and how to organise meetings etc. The supervisors are not only technical supervisors; they should also help the students with the team process.
3. Conflicts can arise for several reasons. Their different nationalities and cultures will easily cause misunderstandings. Maybe they have different opinions about the project. This is of course legal so they have to learn to negotiate. Supervisors follow the team process and help the students with all kind of problems and conflicts.
4. Some teams have problems with lazy students. It is a well-known fact that some students get credit for project work other students have done, so it is very important to prevent this, which we do by our assessment system.

In consequence, supervisors should not only help students with questions about technology, but also with the team process. Supervisors at EPS follow closely the team process, and when conflicts occur they teach students how to deal with conflicts.

Some conflicts are open; others are hidden because some students find conflicts embarrassing. So, it is important that supervisors can detect hidden conflicts.

ASSESSMENT

There are two assessment procedures in the EPS.

Self and peer assessment: Twice during the semester, the students in each team shall assess themselves and their team fellow. Each student will get an anonymous feed-back where they can compare their team-members opinions about them with their own opinion. Some of them can really learn from that! It can also help the supervisor to detect hidden conflicts.

The exam: At the exam the students get individual marks. 35 % of the marks come from the quality and quantity of their teamwork. Before the exam students have to write and sign a document about how they want to distribute this part of the mark. If they agree that they have contributed equally, it could be 25 % for each team member, but if e.g. somebody has been lazy, they usually know how to use this system. It can be motivating for lazy students (they know the consequences of being lazy!), and some conflicts are avoided, because students accept that they don't contribute equally and in consequence get different marks.

OUR EXPERIENCE WITH EPS

So far, we have had 1148 students from 35 countries, and our experience is very positive:

Students usually become motivated, creative and committed.

Students take ownership of the project and their learning.

Students mature significantly.

Students learn about other cultures.

Students improve their communication skills.

Students get an international experience which they really appreciate.
EPS-students keep in touch and they get an international network.

We have received many positive statements from EPS-students and professors who know EPS.

CONCLUSION

My conclusion is not that all learning should be project organised and/or problem based with students working in teams. Students, professors and subjects are different, and in the long term all teaching or learning methods will become boring, Students should learn in many different ways. However, I'll conclude that almost all students can benefit from a semester like European Project Semester.

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