Teamwork as a tool for successful experience for exchange students

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Abstract - **Copenhagen University College of Engineering in Denmark has cooperation and student exchange agreements with many countries around the world. Most of the exchange students are from EU countries. Exchange students usually come to our university for 1-2 semesters, and after 2-3 years of studying in their home countries. At our University College most of the courses use educational methods based on teamwork and project-based learning. In this paper we describe several cases of international teams working with different projects. We describe the problems they met during their participation in the teamwork, and how we managed to keep them together to a successful conclusion – the working model of their engineering project. The evaluation results are analyzed. The most important part of this is the students' own opinions about this way of learning engineering design and their experiences in working with international teams; we analyze their feedback. In conclusion we describe the benefits from this program to all of us, students, teachers and the universities, and the problems we met during this period. We are still in touch with some of the "old" exchange students.**

Index Terms - Project based learning, student exchange, teamwork,

INTRODUCTION

At the Copenhagen University College of Engineering we have more then 15 years successful tradition in receiving exchange students from all over the world, but most of the students come to us within the European SOCRATES-ERASMUS programme for student mobility.
We have developed several one-semester programs [1,6] especially suited for exchange students:
- European Project Semester
- International Business Semester
- International Design Semester
- Innovation and Entrepreneurship Semester

It is also possible to make an agreement for a more specified course-program as an Individual programme (½-1 year).
In addition, we have a full Bachelor Degree program in Electronics and Computer Science, presented in English, and exchange students can usually join all the courses within this program. From September 2007 we will additionally offer two full bachelor programmes taught in English:

- Engineering Design and Industrial Innovation
- Information and Communications Technology

COMMON ELEMENTS OF OUR INTERNATIONAL PROGRAMMES

More than 70% of the courses offered for international students use educational methods based on teamwork and project-based learning. Many of the projects come from different Danish companies and these companies are highly involved with the students during their project work, often as supervisors for the teams. The projects are real-engineering projects involving all aspects of design or development of high technology engineering products. In some cases the business and the marketing aspects are also taken into account. The courses in the Electronics Department (EIT) are also based on teamwork and projects [5]. The perceptions of international students of how to work in teams with projects differs greatly depending on the educational traditions of the students' homelands. In some cases it is necessary to make short introduction courses in teambuilding, project-based design and communication. We also help them to form the teams, and usually we prefer to mix the students from different countries in one team [4]. Most of the students adapt very quickly, and are highly motivated to work very hard in order to finish the project and see the result of their engineering work. Most of the exchange students choose project-based courses. Figure 1 shows the distribution of the courses taken by exchange students.
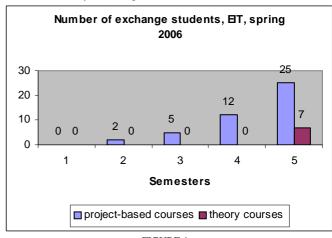

FIGURE 1
NUMBER OF EXCHANGE STUDETS.

Project based learning gives the students' opportunities to develop their individual interest and to study latest technologies to a higher degree than classical theoretical courses do. The students develop a number of practical skills such as:

- To schedule their own effort during the project.
- To deal with engineering design problems, starting with the specification and finishing with the working model.
- To deal with more than one solution to the design problem.
- To study new subjects independently.
- To keep agreements.
- To implement technical solutions into a working model.
- To communicate clearly both orally and in writing.
- To co-operate with other team members.
- To choose solutions where the "correct" solutions to the problems in real-engineering projects do not exist.

The most common problems we met:

- Some team members do not keep to their agreements and hence contribute to the delay of the project – teams must be always helped with these problems.
- Conflicts according to cultural differences in mixed groups, like who decides how to hand out the tasks. It is very important for the supervisor to write "a contract" where all group members are obliged to solve certain parts of the project.
- Communication or language problems. It is easy to avoid these problems if the supervisor requires frequent meetings, more than once a week, or a written report at each weekly meeting.
- We have had some cases, where a single team-member left the team, mostly because of the insufficient contribution to the teamwork, but also due to cultural differences.

EXAMPLES OF PROJECTS IN THE ELECTRONICS DEPARTMENT OFFERED FOR EXCHANGE STUDENTS

All courses in the Electronics Department are taught in English, and exchange students can freely choose the courses during their exchange period. In the following list are some of the projects run with exchange students:

- mathematical modelling, simulation and design of electronic scale
- design of metal-detector
- development of software for fitness-centre
- development of DSP algorithm for a production-line
- design and control of small autonomous robots

The projects listed above cover different theoretical disciplines such as:

- Analogue electronics and filter theory
- Digital electronics
- Applied microprocessors and programming
- Differential equations and Laplace transformations
- Mathematical modeling and simulation
- Dynamic systems.
- Continuous and digital control theory
- Digital Signal Processing

The typical schedule for project based course is shown in Figure 2.

In the EIT-department we try to make the students form "mixed teams", consisting of Danish and international students. However there are several cases where we have to deal with pure "exchange teams". Depending on cultural traditions, these teams could have difficulties in communication and may fail to ask for help in good time, when getting stuck with practical or theoretical difficulties.
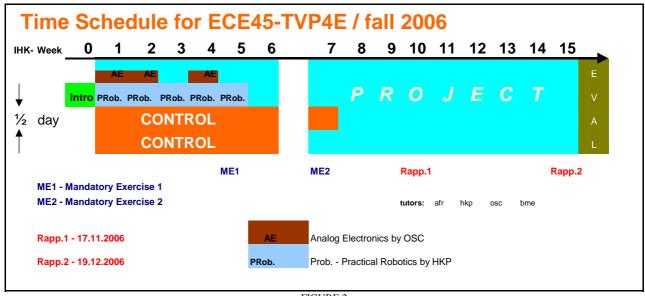

FIGURE 2
THE TYPICAL SCHEDULE FOR A PROJECT BASED COURSE

STUDENTS' EVALUATIONS

Evaluation forms were sent to the exchange students and 78% of the students answered; the most important comments are shown below. Statistical analysis of the data from evaluation forms is to be finished at the moment, and will be presented at the conference.

TABLE 1
STUDENTS' EVALUATIONS.

Part 1. Study programme

1. Please write the courses you had here, with ECTS credits for each.
2. What do you think about the educational form / teaching methods?
   - Class teaching?
     I really like the teaching methods at IHK College and the friendly relation between students and teacher. Furthermore working in relatively small groups during the lessons provides more attention of the supervisor to the students.
   - Group work?
     Working in a group is a hard task but at the same time very useful. I think that after finishing a few projects in a team the student should not have problems in working with other people. In my opinion such a system prepares for work in a future job.
3. Access to laboratories and components?
   The college is available 24h every day for all students it they have a student card. It gives the opportunity to work whenever the student wants. It really helps.
4. Possibilities for practical/experimental engineering work?
   In my opinion all courses, which I chose, provides the theoretical background as well as practical work on a given subject. So as soon as theory is covered we are working on some problems related to that theory. This kind of approach gives much more understanding of a given subject then any other.
5. Do you find the course important to the main subject of your studies
   Yes/ no? YES
6. Were the courses difficult?
   It depends on the course.
7. Was it difficult to study in English?
   In my opinion the language is not the most significant factor when we are talking about difficulties in studying abroad.
8. What do you think about the teaching materials ?
   - Books?
     The library is great!! It is very well equipped, has a lot of useful books. However, if I were to buy those – it would be too expensive. That's very good that almost all the books available in the library are in English.
   - Notes?
     They are very useful. It is good that the teacher provides students with hers\his point of view (way of understanding). This helps in studying.

9. What was good?
   Students – teacher relationship
   Way in which courses are run (laboratories + lectures)
   Non – stop access to school and internet
   Buddy – in the beginning he really helped
   All those organized parties and trips
10. What was bad?
    Accommodation - private room, too expensive, no internet access!
    All the immigration stuff – takes a month to get all papers, so I can neither go to a doctor nor open an account in Danish bank.
11. Give your comments how to improve the educational form.
    I have really no idea what should be improved in the educational form. It is really ok right now.

Part 2. General impression.

12. What do you think about our facilities?
    - Building
      Nice – I like the trees inside
    - Classrooms
      Nice, big – very comfortable
13. What do you think about?
    - Relationship to teachers
      The biggest surprise… It's really nice that you don't have to call teacher prof. or doctor… you can use his name.
14. Administration services
    Very good.

15. What do you think about accommodation (student or private room)?
    1st sem – private room – a little bit to small – for that price – but close to University
    2nd sem – student house (DIK) – GREAT !!!!!
16. What do you think general about Denmark?
    I must say that it's really nice country. It's very nice to live here. People are very friendly and all speak English – so no problem to communicate.
    Maybe the prices are a little bit shocking at the beginning but with some experience possible to survive.
17. Would you recommend other students to come to IHK for exchange?
    Yes!! This stay in here has changed me and my life completely. I don't know if it is because of the college itself as I have no other comparison to it, or if it is because of the people I met here (I think both had a great impact), but it was adventure I will never forget.
18. Give your comments for improvements.
    When I came here for the 1st time I didn't know that I would need a laptop. And it's really hard to live without one. So – I think its good idea to tell that to people before they come.

CONCLUSION

About 75 % of our international students achieve grades above the average, their motivation to learn is very high and the teams worked very hard to finish their projects [2,3,5,6].

Our department has a tradition to invite the students' family and friends for the final event, which takes place on the last day of the tuition period, before the examination period begins. Students at all levels are present and demonstrate their projects for the guests and all the other students. This is an additional motivation factor for the teams. Some of the exchange students ask to stay for an additional semester at our college, because they liked our project-based learning method and practical approach to the theory during their stay at our university college.

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