Discussion group 2 – New Teaching Methods and Technologies

1. Introduction

The aim of this discussion group was to give new ideas on how teaching should be developed. It should help setting up the guidelines for developing teaching towards a more interactive form. On the same time, discussions should also evaluate the restrictions and possibilities of using new teaching methods and technologies.

The group consisted of on Estonian, two Finnish and one French student. Because of the small group, results are only guidelines and ideas on how teaching could be developed. We found out that there are a lot of differences between these countries, we can draw the conclusion that even bigger differences exist between countries in Europe.

During the discussions, we found out that discussion about teaching methods is more useful than discussion about teaching technologies. After all, technology is only a mean to execute the selected method. It doesn't really matter wether the course in a www-course of if it is a traditional lectured course, as long as the teaching methods serv the learning goals, and the choosen media is used to its full potential.

The discussion group was also asked to point out some topics that need further research, and to point out what kind of prematerial is needed for futher discussions around the topic.

2. Methods

The discussion group worked together for four days, following a prepared schedule.

The first day could be described as introduction day, or brainstorming day. We used most of the day to compare our countries and to get a better view on where the changes of teaching methods are mostly needed.

The second day we mostly spent on discussing about how students really learn. We discussed about two different problems, a basic course in mathematics and a special course in a major subject. During the day we also visited Life Long Learning Institute in Dipoli, were we learned about their view on the learning process. This day we had a visiting member, Professor Günther Krütz, who teaches basic courses in physics in **University of xxxxxxxxxxx**, Germany.

The third day we concentrated on new methods of teaching. How students can contribute to the learning process, support systems for students and new ways of combining learning goals. This was also the day for presentations, and a part of the day was spent on planning and preparing the presentation.

The fourth day was reserved for report writing.

3. Some ideas to develop teaching

Developing teaching is an issue that has been discussed a lot in different forums with different results. Usually the biggest problem has been that there is always somebody missing in these discussions. Since that is the case, even in this discussion group, we are not giving any "perfect solution", but instead give new ideas on how to develop teaching towards a more interactive form, and how to combine teaching of different topics in a natural way.

3.1 Combining teaching of different skills

Often courses are constructed only for learning a specific skill, getting knowledge on a strictly specified area. This is seldom the case in working life among engineers. An engineer needs to use several skills at the same time, take several aspects into count when solving an engineering problem. How about environmental issues? What about production costs? Logistics? Marketing value?

How could an engineer that is specialist in a small field, work as a part of a bigger project, is he (or she) can't see the whole picture? Therefore we think it is essential that students have a chance to learn these skills already before entering the working life. How could this be done? Our suggestion is to combine learning of different topics in a natural and creative way:

A product development project is not all about getting the best possible product. It should also be cheap enough for customers to buy. It should be easy to produce, and it should be designed for the customer. Therefore such a project in University should also include more than just pure design.

Including economics to the project gives a whole new view on the problem, and is also a practical way of learning the basic laws of economics. Then we could think about how the user acts. Here we get the design of user interface and psychology. Could these be added, as example, to a course about designing an industry robot? Why not, in fact this is only a small part of the problems an engineer has when working on such a project? In real life there is also legal restrictions, company policy, environmental issues, marketing, logistics… Just to mention a few things to be considered.

This is of course for students who have already the basic knowledge, but even basic courses, like the first course in mathematics, can include some "extra" learning. If we use textbooks in a foreign language (English) and have lectures in native language, students can learn technical English on a basic math course[1]. It is a bit harder in the beginning, but most likely easier than learning both skills separately. And as an

[1] This method is used in Finland, where most of the books are in English.

additional value, there are a bigger variety of books available, so students get the best possible material.

We could think about doing projects together with students from other faculties, or even with other Universities. A person studying Industrial Arts and a person studying Production Technology could learn a lot from each other.

Combining teaching doesn't have to mean that there is more work to do to complete all courses. It would however mean that co-operation between teachers would have to increase, so that those students don't have several overlapping assignments with almost the same criteria, but with topics that are impossible to combine.

Doing a product development assignment, collecting material for a seminar in material science and doing exercises in strength analysis could easily be combined within one project.

3.2 Using students special knowledge and/or student activity as a part of teaching

Students that are active in student associations or some kind of student clubs learn a lot outside of University. Especially student clubs that are interested in scientific issues are valuable. Serious scientific clubs organize happenings that have high educational value, like designing competitions of robots, seminars about the current trends in the field, excursions to high-tech companies, small projects together with industry, and so on.

The student clubs often have their own "specialists" in a specific field. As en example, a car club might have people like; drag race mechanic, rally driver, truck driver, somebody might rebuild old cars… all these people have a huge amount of both theoretical and practical knowledge is their own field. In some cases even a lot more than the professor, if the topic is precise enough. This kind of knowledge should be used for the benefit of students, and professors should engorge students to join this kind of clubs. Why not even organize a seminar together with the club.

Some of the skills can't be thought in classroom, but these skills come naturally in student unions, like budgeting, meeting procedures, personnel management, teamwork, finding information about laws and regulations…

Student organizations are also a good place to practice decision making and responsibility. When a small mistake in a student club usually becomes quite cheap, a similar mistake in working life could cost the company millions.

Being active in a student organization, like student union, could even replace some practical courses. For instance, doing some public presentations for a big crowd, like representing the University while doing presentations in high school, could replace a speech communication course, in which the presentation is usually only for a small crowd.

3.3 Case study: Basic course in Mathematics

The context: a hundred students for a teacher, in first or second academic year.

The difficulties: too many students during the lectures make the teaching not enough individualized and interactive, the result is a lack of real motivation (we mean by real motivation a will to do more than just pass the final exam).
What we try to improve through the case study: we tried to give some practical advice's in order to build a "better" course (as "better" we mean liable to make the students more involved and active in their way of learning).

Before the course:
In order to give the students all the keys of the course, we think that they have to be well informed. So we propose the following "recipe".
First the teacher should prepare with older students[2] (in a special working group) a presentation which has to mention the following points:
-Questionnaire of student's expectations
-Aims for the whole course and more precise objectives (with a precise time horizon and level test)
-Plan with the number of lecture, practical courses, labs, the main titles
-Expected level of knowledge and know-how
-Information on how the course is fitted in the studies provided by older students (from the same or from other departments)[3]
-Formation of self-studies group for the students who chose the "alternative" way of learning (we will give a more precise definition after)

During the course:
According to the Finnish point of view, lectures are not so useful and might be replaced by self-studies groups (2-5 people) and better materials. But some students in Finland and outside Finland would prefer to keep the lecture, if they are improved. In order to improve the lecture we have the following proposition. To divide the teaching period in smaller ones (2 month could be a good duration for the basic unit).
Some other aspects that came up during the discussions:

- In addition to classical and theoretical examples, teacher should provide some concrete examples connected with the other field of studies (for instance shows the connections between Fourier calculation and wave propagation).
- Visualization of the problem is a good help for some students to understand theoretical explanation. When using help material, like computers, one shouldn't forget to discuss problems that can occur because of that (computers tend to round the answer, and that can cause serious problems in complicated solutions).
- To provide a FAQ web page in order to give the students the possibility to ask the teacher for questions linked with the former lecture, and takes the ten first minutes of each lecture to give some answers.
- Exercises in smaller groups (20-30 students) are an important part of math course. To do a good course, exercises should not only teach knowledge (the ability to follow a certain method), but also to adapt that knowledge to various problems.
- To propose seminars of which subjects have to be found in the border or depth of the main topic (for instance, what was the way to solve wave propagation problem

[2] Older students, mean students that have already taken the course and have learned to adapt the knowledge. It could be kind of feedback group for the course.
[3] This can also be provided in some other, more general way (big brother/sister, student club…). We feel that only if older students that have been in the same situation just a short time ago provide this information, it becomes useful and important enough.

before Fourier theory). The reason for seminars would be to teach a deeper understanding of the topic.

After the course

We consider that the teacher should form the whole picture of teaching process. He or she has to have in mind that lectures, practical courses, labs, exam, seminars, questionnaires, are only steps in a whole process. So some practical advice could be followed:

- Let the students complete the questionnaire they filled in during the first lecture, thus they can compare their expectations with their final assessment. Of course, the students need some time! One has to separate time devoted to assessment from time devoted to exam.

In this case study we discussed about how a basic course in mathematics could look like, to get students more involved and support students to learn in a bit different way.

4. Suggestions for further research

We think student support systems and support from student organizations is a valuable thing, and has great potential in making studies more efficient. Therefor we suggest that further discussions should be around these topics.

4.1 What kind of support system is needed for efficient studies?

Support for students is especially important when entering university from high school, since the culture changes a lot. When students get a vision of the goal[4], he/she can start working to achieve that goal.

How should a support system be constructed to best support learning goals? Who are the different participants in such a support system? What kind of tools should be used?

4.2 How could student activity contribute to teaching goals?

How can students participate in improving existing courses? How could student activity help to achieve teaching goals? Could student activity play an in the normal curricula?

5. The discussion group

This discussion group was the smallest one during this IBS. We were only 4 persons, from three countries. Therefor the results of this group represent only the view of a small part of Europe. However we have tried to consider also views from other parts of Europe, as far as our knowledge and experience has allowed it.

Svante Forsblom (Facilitator)
Helsinki, Finland
Mechanical Engineering; end of studies.
Major: Automotive Engineering
Minor: Interactive Digital Media
Teaching experience:

[4] Goal is here a wider definition than a diploma. The goal should be seen as the complete package of values, knowledge and know-how, supported with a contact network and confidence in knowing how act in different situations.

- Assistant in "Preparing Hypermedia Dokuments", 97 and 98
- One of lecturers in "Introduction to University Studies", 96 and 97
- One of lecturers in "Information about Each Degree Programme", 96, 97 and 98
Student Support:
- Bilingual (Swedish/Finnish) Student Advisor in Mechanical Engineering 1.1.1996->
Student organisations:
- PUS-hockey (92-95), revisor -95
- IAESTE LC Helsinki (95-), president 96, vice president 97 and 98
- BEST LBG Helsinki (97-), IBS-webmaster 97 and 98.

Monika Kärema
Tallin, Estonia
Econimics, 2nd year
Student Support:
- One of organisers of freschmen week 1997
Student organisations:
- BEST LBG Tallin, organising committee of: international week and job fair.

Maël Raffin
Superlec, France
Electrical Engineering, 4th year
Student Support:
“Student” organisations:
- Groupleader in scouts.

Maria Karttunen
Helsinki, Finland
Electrical Engineering, 2nd year
Student Support:
Student organisations:
- BEST LBG Helsinki (97-), Board member, IBS-organising committee 1998.