STUDENT BASED LEARNING IN A MULTI CULTURAL ENVIRONMENT

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Background

Considerations of student based teaching and learning programmes must inevitably concentrate on the two questions of fundamental importance to the student, namely who is responsible for your learning and who owns your time? In discussions with colleagues at engineering conferences about the learning and teaching methods used on the European Project Semester (EPS) and when explanations are given of the concept on which it is based, in attempting to achieve the maximum involvement of the individual student, the same question is asked again and again; how did you manage to do it? The answer is fairly simple: Don’t overfill syllabuses. Most learning programmes fill the subjects with too much information, they continually add to the contents but never seem to take anything out of the course description. The result is well known: Factually overloaded students and frustrated lecturers and professors. They simply cannot cope with this situation any longer. It is necessary to move away from the situation where the professor dispenses wisdom in the classroom in front of the students and they absorb it. This is no longer appropriate as the main concept of teaching. Many years ago the EPS course team realized that to break down traditions and to move away from formally taught courses is difficult; but it must be done in order to be able to cope with the fast growing field of new technology.

Introduction

The paper reports our experience gained from the learning and teaching methods used on this international teamwork semester known as EPS. This 17 weeks semester programme is about group project work performed by interdisciplinary and internationally mixed teams of 4-6 students. EPS emphasizes the development of technical as well as personal competences to meet identified needs of society, industry, university and students. On this course participants are given the opportunity to use their acquired knowledge to develop a deeper understanding of technical subjects and integrate them through international teamwork in an integrated engineering context. All participants have completed at least four academic semesters at university or college in engineering, business or technology. The course structure is short intensive and project supportive subjects in 16% of time and team-based project work in 84% of time. During the first two weeks of the semester short intensive and project supportive courses are taught. All projects stand in the real world and are provided by industry. They are located in the technical engineering areas with supportive wide-range activities including marketing and business elements. Further, the paper provides information relating to the assessment methods used to assure and control the quality of the learning programme. Our experience shows that an instruction that actively involves students...
is more effective than straight lecturing. There is no doubt that the teaching and learning methods we practice on this course teach students how to tackle unstructured problems and solve them. We try to minimize spoon-feeding and maximize involvement of each individual student. Since the start of EPS in 1995 we have gradually developed and improved our proficiency in supervising teamwork. We now provide a benign international environment where students can develop a good knowledge of cross-cultural business behaviour and simultaneously a deeper understanding of technical and business subjects. It is important that we at university help students develop their interest in a subject that will inspire them to take a deeper approach to studying it.

How are students involved?

Students must be involved and learn to identify and develop skills needed to communicate, cooperate and collaborate in groups and in environments with people from diverse cultures and disciplines. We have found that the way we do project-based learning inspire and encourage students to involve and take ownership of their project. This method of teaching allows students time to wonder and to use their acquired knowledge and find new information. They do take responsibility of their own time and learning. Simultaneously they express themselves and feel comfortable to develop in this cross-cultural environment. Each team is involved in defining, systematizing, planning and navigation of their own project. On mandatory weekly meetings things such as project progress, teamwork problems, communication problems and cognitive and political problems are discussed if needed. The success of the project organized teaching on this semester is measured by the way in which the participants handle situations and problems that occur during execution of their team-based project. At the weekly mandatory meeting with the team supervisor, members of the team are asked to rotate duties such as chairman and secretary functions. This is done to ensure equity and responsibility and assessment. Twice during the semester group members grade each other using a self and peer assessment system provided. Further, students attend tutorial discussion sessions with oral presentation exercises, and they participate in arranged group meetings to report on the progress of their group project to other groups. At those group meetings full use of visual aids facilities is expected and each presentation is followed by a discussion. An active interest is expected of all participants in the meeting. Through this programme students learn to recognise their own learning style and their own strengths and weaknesses through the exercises they are exposed to. In addition, in their teamwork they learn that synergy exists in a group of people working together on a project towards a common goal and take advantage of it. All students participate in the beginning of the semester in a team design and teambuilding course, where they learn the value of diversity of roles in a team. In fact over time participants learn good judgement tinged with sagacity. The main goal of the EPS programme is the maximum active INVOLVEMENT of the students. This learning and teaching concept shows those students, who come with a rather dual perception of things, such as right and wrong or black and white, develop to become more responsible and independent learners.

How are professors involved?

To be able to cope with the fast developing trends in all areas of the modern world requires, that the professors of tomorrow make unprecedented changes. They must involve themselves not only in research but also in education in interaction with student teams. The main contribution of a good professor on EPS is to be a good and helpful supervisor, who guides the people involved to understand what their task is all about. Further, it is to nurture and
facilitate the project group and the teamwork and ensure that progress is made and that the advantages of working in a group are sustained. It can happen that advantages are lost because of faulty group processes. The reason for that is often found in existing cognitive and political problems in the team. It is important to help team members to develop a shared commitment and guide the group in the right direction in its seeking for solutions. Each professor on EPS works with a maximum of three project groups per semester and are involved in the following activities:

- A weekly mandatory team meeting with the project group.
- A monthly supervisor meeting to discuss matters of concern
- Weekly consultation i.e. 2 hours per week (open door)
- Tutorial discussion sessions with oral presentation exercises.
- A group-seminar where all project groups in turn report to the audience on the progress and status of their project.
- Lectures in accordance with expressed need.
- Discussion of self and peer assessments performed by the teams.
- Marking of the documentation submitted i.e. the group project report.
- The final exam that typically lasts 2.5 – 3 hours per project group.

The assessment techniques used on this course are given a special attention since all student teams perform a self and peer assessment, which counts towards the final mark.

How do universities get involved?

Universities interested in the EPS programme can sign an agreement of cooperation with one of the providers of the programme. See [www.eps.ihk.dk](http://www.eps.ihk.dk) for further information. At present EPS is a network of more than 40 international universities and colleges. In education we must follow development trends that may illustrate where engineering and business careers are going. We must try to predict what knowledge and base skills are needed by the future graduates, if they have to make transition from education to work smoothly and perform successfully\(^1\). With EPS we have shown that education becomes more efficient and effective. The efficacy of the learning process has increased. We must understand the learning process and try to maximize the transformation into knowledge. The present educational format needs to be revised to cope with requirements from the outside world and the fast developing technology. International cooperation and concern is of paramount importance and understanding of cross-cultural behaviour is needed. Some universities in Europe have expressed their wish to become providers of the EPS educational programme and implement the scheme. So far Copenhagen University College of Engineering in Denmark, University of Professional Education in Den Bosch in The Netherlands and University College of Oslo in Norway have implemented EPS. From spring of 2005 EPS will also be provided by The International Faculty of Engineering at The Technical University of Lodz in Poland. EPS has developed to become a trademark. Every second year a seminar is held at one of the universities to exchange experience and to discuss matters of importance to providers and users of the concept. Steering committees at provider universities keep in touch via e-mail and telephone to communicate and coordinate activities of concern. I will end this section with a few personal statements. The education should attract talented and motivated students. Universities and colleges should attract the right people to perform the teaching staff. Universities should be involved in international cooperation. There are many good reasons why universities should be involved.
Learning in teams

Teamwork, communication, cooperation and collaboration are tools to success of any project. If just one of those factors is low or zero the value of the task completed (the project) is low or zero. No question about that. That is why EPS pays great attention to exactly these four words in trying to teach what teamwork really means. In most instances and in many companies, teamwork and communication are tools toward success. Joint efforts – cooperation and collaboration – as much as possible are vital to success of any project group. In an integrated engineering set-up like the EPS the students have more opportunities to learn from one another, than in a traditional class teaching where the professor dispenses his wisdom and students absorb it. It is important to INVOLVE students to learn. Once they get committed they know what learning is about. If they support each other’s efforts they can do better than if they try to handle things individually. They can make the most of the strength that the participants possess. They need to take advantage of that and share experience and information as much as possible. If they can find a way to complement each other and cooperate, they can together level out some of the strengths and weaknesses professionally as well as personally. This ensures that they can satisfy the project goal and company requirements to the benefits of the team, the company and the university. They learn to take charge, to take ownership of their project and to be responsible of their own learning and their own time. In order to challenge the students we tell them what is expected of them. Such as: We consider you all as responsible grow-ups, we expect you to take an initiative if needed. Don’t just sit on your butt pretending everything is ok, if it is not. Do something about it. Teamwork on EPS is concerned with not just the professional content of the group report submitted with individual professional contribution from each team member. We pay great attention to the 3 P's i.e.:

1. The PRODUCT produced (the documentation set submitted)
2. The PROCESS performed (teamwork i.e. interaction between people)
3. The PEOPLE involved (multicultural and multidisciplinary participation)

During a compulsory weekly meeting between a team and its supervisor, the meeting agenda touches - upon all three areas mentioned. Other points on the agenda are approval of suggested agenda, approval of the minutes of last meeting, Any Other Business (AOB) that should be mandatory on all meetings. Students are taught that and can see the meaning of it. They all take turns in chairing and preparing the weekly meeting and in doing the minutes. They learn the value of a good and efficient meeting and the importance of being prepared for the meeting.

Teamwork

Normally the task of working together in a group improves over time as people get to know each other. In the beginning, the group seems like four different individuals rather than a true team. This is not very effective for building teamwork skills, as emphasized by the quote “There is no “I” in “WE”. Each individual feels a need to carry out his own idea through until completion. So, it is often difficult for the individual to realize that someone else may have a better idea, or another idea in addition to his own. In the beginning you can experience negative repose, such as: A member of a group may be critical rather than constructive. Due to initial uncertainty some people try to sound knowledgeable or assert leadership. This often leads to competition rather than co-operation. Here is what one team expressed: “ One characteristic of the team was that we were all able to be together, in non-academic settings, and be social with each other. It seemed to make the team feel more comfortable with each other, more able to express ideas openly and discuss them without
feeling shy about it”. Further they wrote: “Basically, each team member’s team working skills can be seen by the work that was completed towards the end of the project. The work was more divided for effective time usage, but still reflected all thoughts and opinions of the team, not just of the individual. We experienced a constant input from each team member for the different aspects of the project. That is what a team is all about, of course, working together towards a common goal of understanding and, perhaps, completing a project.”

Student statements about project performance

As part of the assessment, all team members are asked, individually, to submit a written answer to the following four questions:

1. What is your professional contribution to the work done?
2. What is your opinion of the group performance?
3. What is your social contribution to the work done?
4. What is your opinion of the work done?

Following is an example of what such statements typically contain. This international team had four group members coming from: Spain, Germany, Poland and United States. Mrs. Mindy Jensen of Michigan Technological University (MTU) who participated in EPS 2003 spring semester wrote:

1. My professional contribution to the work done has, of course, been related to my field of study, but I have also contributed to the project in a more business sense. What I mean by this is that the mechanical side of the project is very important, and I have contributed to the technical topics that arose by performing research and analysis. I have also contributed to the actual documentation of the project though. I have made two presentations, along with writing of agendas, minutes and a status report. I have made several outlines regarding the written papers and the work to be completed in a certain amount of time. I think that these short-term work reports are very beneficial at keeping a team on task. I was able to use the knowledge I have obtained through the course of my studies to contribute to any discussions, or analysis, that was related to the development of the actual design.

2. The group performance has been very good throughout the entire semester. Each member had the ambition to create a quality project from the very beginning. Although there were times that the ambitions was lower than others, overall, the team had a desire to create a project that we could take pride in. The performance could bee seen just by the interactions of the team members. Although we may have had different responsibilities we were all willing to provide input on all aspects of the project. And, as the English language abilities of the team members have improved drastically as the time progressed, the communication factor between team members is important in any international team working. It is crucial that all members understand the project and what has occurred during the work. There were times when the communication was not so good, but the team worked together to work through them. In the end, with the help of all individuals, communication had improved and therefore greatly increased the level of group performance.

3. My social contribution to the work done has had to do with my English abilities. Having English as my native language, I am better and able to put into words the thoughts expressed by the group. This has been used during many group meetings with the supervisors and also with some of the representatives of the different companies that we worked with. So, I guess I could say that I was often “voice “ of the group. I feel very lucky that I could contribute in such a way, as something I often take for granted (my language) was used as an advantage for the team. Also,
apart from my English language ability, I am often able to take the initiative and introduce a subject or topic within the group. At times, the subjects I have introduced may have been "touchy" topics like deadlines or reality checks. And even though these sorts of things are not always positive for the group, it is totally necessary that they are discussed and sorted through in order to complete the project in a timely and efficient manner.

4. I think that the work that has been done is of great quality. The team has worked very hard to progress through the project. But, as progression is important, it is just as important that the work completed be relevant and of good quality. If the work is poor quality then progression means nothing. This has not been the case of our group. All of the work that was completed was done with effort and pride, and this was why the progression of the work was so efficient. I am very pleased with the amount and quality of the work that has been completed during this semester. The project is definitely one that I can take pride in and be pleased to say that I have contributed to its final completion.

The group concluded with the following statement.

The EPS, European Project Semester, is a great way to learn efficient team working skills and gain a large amount of practical experience. Too many students seem to go to school and obtain a degree without participating in any practical experience. The practical experience though, is most important, and that is why the EPS is such a good program to participate in. The semester has contained much project work, but also great amounts of cultural experiences and new friends. This is what makes EPS such a unique program; it provides students with practical experience in a setting less formal than an actual career setting would be. On the other hand, students are treated as responsible adults who can produce a project with the same amount of quality as professionals. This creates a working atmosphere much better than, say, when a worker is just given a task by their supervisor to be completed in a timely manner. This is more desirable, and thus completed with much more effort than in the later case. Overall, the EPS creates a working environment for individuals to grow; to grow in their team working skills, work abilities, and also in the social sense. These attributes can be applied, in the future, to all aspects of life.

Guidance for assessment of project performance

The following characterize a good work process and a good product (the group report):

1. The work follows an agreed-upon plan developed by the project group. Its point of departure is an approved problem statement and rules for working together. The group must also have defined the aims and objectives of the project. The plan must involve everyone in the group.

2. The work process must inspire and stimulate the development of both independent specialist skills as well as a collective responsibility towards the project group and the project. The synergy effect prevailing in teamwork of this kind must be made explicit and exploited to the greatest possible extent for the benefit of the work process and the group report. The group itself solves communication and cooperation problems with the help of a third party, if necessary. The group must hold a meeting with the group adviser at least once a week.

3. The result of the international teamwork is evaluated in the work process and the specialist contribution in the group report. The group must be able to document their
competence in working together on a major project assignment. Great emphasis is placed on this point. As proof of this, every individual participant in the group must answer the following four questions in writing:

- What is your specialist contribution to the completed project product (the group report)?
- What is your opinion of the work process you have been through and how have you contributed to it?
- What is your social contribution in connection with the performance of the process?
- What is your opinion of the completed work?

The adviser and the student him-or herself grade the individual group members’ contribution to the performance of the project (self and peer assessment) both with regard to the specialist contribution as well as individual contribution to the work process. The following statements are to be used when grading individual contributions to the performance of the work process:

- Willingness to build upon the ideas of others
- Understanding of the team process
- Leadership at appropriate times
- Positive attitude
- Initiative shown

The group’s adviser gives an overall teamwork grade from his or her knowledge of the work process performed. The group must agree to distribute 100 points among themselves, which indicate how the workload has been in the group that is how each individual in the group has contributed to the completed product and the performance of the process.

Project Supervision

Supervisors are encouraged to give guidance and help to students in formulating their documentation, but they should under no circumstances undertake any detailed revision or re-writing of documentation. The main function of the supervisor is to provide to the students, on a regular and continuing basis, advice, encouragement and aid in defining, planning, executing and reporting of the project as described. It is particularly important, however, that, as the project progresses, more self-reliance is gradually invested in the student and team. It is necessary for the supervisor to carefully note this process of disengagement and the acceptance of self-responsibility, since it is an assessment criterion.

Student statements

Kahreem Hogan, participant on EPS 2003 autumn wrote:

As a participant in the European Project Semester I will assure that teaching by involvement of students has been the most advantageous method of educating students. This program not only requires students to use their technical and academic skills but it also forces the participants to use their creative imagination in every day activities. I have learned more about the importance of teamwork, communication, and diversity in the past four month than I have in the past four years of my college career by participating in this program. I would definitely recommend any students who want to learn how to effectively utilize their technical skills for this vastly evolving workforce to participate in a program such as this. It will change your viewpoint on life.
Kristin Parker, participant on EPS 2003 autumn wrote:  
I can whole-heartedly agree that people learn by doing and not by sitting in front of a lecturer with a bunch of overheads. EPS has given me an opportunity to apply my knowledge and see what I can really do. I have a lot more confidence in my skills after having put them to what I call the final test. To help you out along the way you work in teams and take turns learning from one another as well as from each other’s mistakes. You cannot make all the mistakes in the world yourself. It just takes too much time.

Renee Dulong, participant on EPS 2003 autumn wrote:  
My decision to join EPS was a result of two factors; my personal love for being able to experience other means of thinking and the fact that EPS would fulfil my senior design credits at MTU. The competition for the four places available to MTU students was stiff and I was happy to learn that I had been chosen to participate. Through the first couple of weeks at school we did team and project development. The first day was mostly devoted to team building exercises that I feel was a great way to start out the time. At the beginning of the project it was interesting to watch my entire team struggle with their English. I was the only native English speaker in the team of four. The three other team members came from Spain, Finland and Lithuania. I had to constantly remind myself to speak slow and be patient with my other team members when they did not understand something. Being the only Mechanical Engineering student in the group it often fell on me to try to teach the other members in the team some of the basics of shock and vibration. This was very difficult in the beginning with the language barrier, but through perseverance on all team members parts we managed to get through. I have to admit that the improvement in the English skills of my fellow team members was amazing. I just wish I could have picked up Danish as fast as they picked up on English. To work in an international team proved to be very interesting and everything I could have hoped for. Each member of my team came from different educational and cultural backgrounds. Estela was from Spain studying Electronics and Electrical Engineering. Denis from Lithuania who grew up in a Russian home studied Export Engineering. Anssi from Finland studied Telecommunication. As much as possible we tried to make sure that that people with a background in a certain subject worked with that subject on the project and taught the others in the group. This resulted in each of us becoming “experts” on different subjects. I have been involved in group work previously and always disliked the groups I worked with. This group on the other hand has been a pleasure to work with and is by far the best group I have ever been a part of. I had to learn an incredible amount of information and apply it in a very short time. I probably learned more in these circumstances about transient shock that I would have learned in any advanced vibration class at my home university.

Overall conclusion and recommendation

We must emphasize the development of professional as well as personal competencies to meet identified needs of the Society, Industry, University and Students. We give our students on EPS the opportunity to use their acquired knowledge, to develop a deeper understanding of technical and business subjects and include them through work in an integrated engineering context. It is crucial that we help students develop their interest in a subject that will inspire them to take a deeper approach to studying it. It is our experience from years with EPS that instruction that actively involve students has been found more learning effective than straight lecturing. In addition participants learn to appreciate diversity and to recognize their own learning styles, their own strengths and weaknesses is such a multicultural environment. Our main goal is to allow more time for project work and

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simultaneously improve supervisor support. We recommend you to remember the following statements:

1. It is not enough to tell and show students, they must be involved to learn
2. Don’t spoon-feed students
3. Get rid of overfilled syllabuses whatever it takes
4. Everybody will benefit

Bibliography

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Biography

ARVID ANDERSEN
Following 17 years in Swiss, American and Danish industries Professor Andersen, EurIng, MPhil/PhD joined the academic world in 1978. In 1982 he implemented Project-Organized Teaching at his institute. In 1995 he invented and started the European Project Semester (EPS). For the last nine years he has been programme director of EPS. Although Dr. Andersen partly retired 1st of October 2003 from Copenhagen University College of Engineering, he retains an active level of involvement in a number of industrial and University based projects.