

Does language and different educational background influence the learning outcome on international Bachelor educations?

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Keywords: Problem based learning (PBL), Language issues in engineering education, Engineering education research, Tools for PBL.

INTRODUCTION

For more than 40 years, Aalborg University (AAU) has used Problem Based Learning as the educational model. Each semester the students work in groups using half of the study time to solve and document a real-world engineering problem.

Working with problems in project groups gives the students a very deep learning of the subjects they study and also very good problem solving skills and team work competencies both highly appreciated by the Danish companies [1].

In autumn 2014 a new International Bachelor education in Robotics started. It is an interdisciplinary education involving mainly automation, production, electronics and IT. The teachers for the first-year students come from five different departments and have experiences with international students on master level but lack experience with international freshmen. The first cohort consisted of 31 students; 9 foreign and 22 Danes. Most of the students had no experience with English as the primary language when studying.

During the first semester, the supervisors noticed that not all students were fluent in English and 3 out of 5 groups struggled with problems concerning members of the group not participating in group meetings and supervisor meetings.

We therefore decided to investigate the students' performance focusing on

- The influence of having English as the official language on the education
- The student's differentiated educational background
- The students understanding of PBL and how they manage PBL

The objective for the investigation is to identify and analyses the influence of these parameters on the individual student's performance.

1 BACKGROUND

The Faculties of Engineering & Science build their educations on the “Principles of Problem and Project Based Learning – the Aalborg PBL Model” [2] throughout the studies. The central principles are:

- Problem orientation
- Project organization
- Integration of theory and practice
- Participant direction
- Team-based approach
- Collaboration and feedback

The engineering students have lectures that support this approach during the first semester.

1.1 First semester Robotics

The first semester in the new BSc education in Robotics is organized as seen in *Fig. 1* like all Engineering studies at Aalborg University with three parallel courses each crediting 5 ECTS and two projects crediting 5 and 10 ECTS.

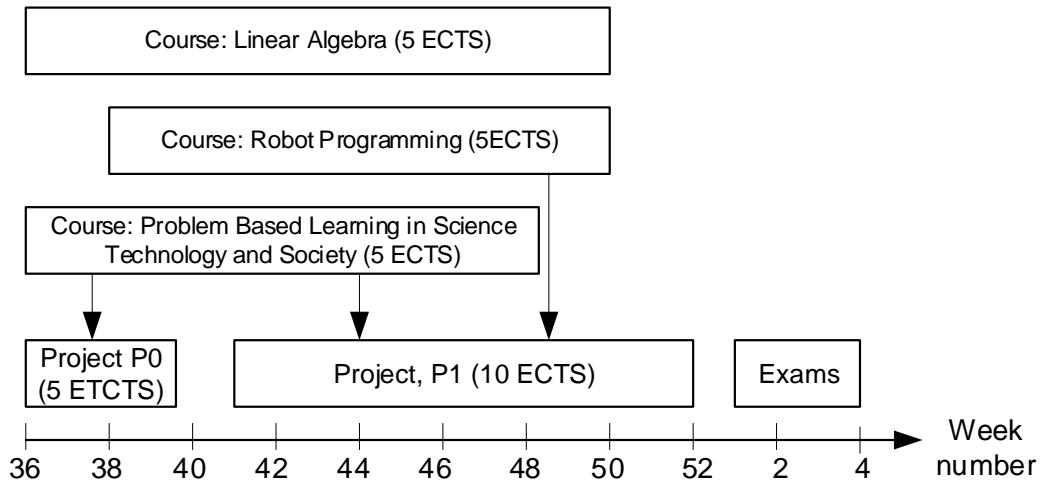


Fig. 1. Structure of first semester Robotics.

Two of the courses are directly supporting the projects: Robot Programming is essential for the technical solutions in the P1 project and Problem Based Learning in Science Technology and Society (PV) is supporting the students' project-work and collaborative learning in both projects.

The project-groups generally comprise 6-7 students and each group is allocated a group-room. Each project-group is allocated a supervisor / facilitator that have weekly or bi-weekly meetings besides communication by more flexible channels such as e-mails. The students develop their own projects within a given thematic frame with fixed learning goals (this means there is a strong focus on construction of knowledge rather than reproduction) and these projects are assessed through group exams.

1.2 Problem Based Learning in Science Technology and Society

A course introducing the Aalborg PBL Model (PV) is offered to all first-year engineering students. This course has for several years provided both theoretical and practical support for students' project-work and collaborative learning when planning and conducting a scientific problem-based project with societal relevance. There is thus a clear focus on:

- Introducing methods and tools for process-competencies;
- Providing feedback through consultation and commentary to the groups' process-analyses; and
- Securing an experimenting and reflective space for groups.

The structure of the PBL-course is illustrated in *Fig. 2*.

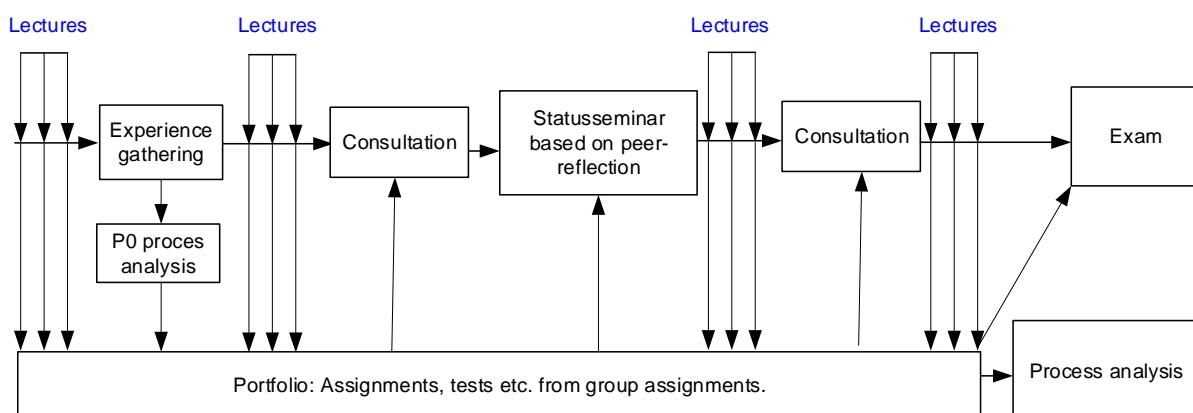


Fig. 2. The structure of the PV course for the first semester engineering students.

The PV-course consists of the following main elements:

- 12 lectures where a number of tools for both group work and problem analysis is presented. For the group collaboration, the focus is on tools for learning, project management and collaboration such as learning and working styles, collecting and sharing knowledge, timetables, management of meetings, writing and structuring reports, project management and reflections on project work.
- One experience gathering (with guided reflection) where the students discuss with students from other groups in order to create a basis for reflecting upon their own experiences after the first project (P0)
- Written process analysis where the group evaluate their process in the P0- and P1-projects, and use the analysis to reflect upon "good advice" for their own future group work. The lecturer makes written comments and suggestions based on this analysis.
- Status-seminar where the project groups present for a peer-group how they handle both their project and collaboration, learning and project management
- A portfolio where the group collects their written reflections and the assignments they have made during the course.

- Two consultancy meetings held with the group based on their portfolio assignments and reflections on the use of the assignments in their daily teamwork.
- A written exam where the individual student's capabilities of applying the tools in a predefined case is evaluated.

One of the main aims of the structure of the course is to secure that the groups reflect upon their process and project work several times during the semester, in order to secure that they learn from their own and other groups' experiences.

2 METHOD

We want to investigate if teaching in English for students with a diverse educational background with different perceptions of PBL are influencing the students' learning and performance in project work and writing. Three sources of evidence are applied in this study; interviewing the students, being an action researcher at the study-program and analyzing the students' process analysis. The action research and analysis of problem analysis forms the background for the hypothesis that are tested through the interviews.

2.1 Action research

The first part of the research process is through action research. The researchers are also developing and teaching the PV-course and at the same time collecting data documenting the outcome. This means that the researchers have been in an ongoing dialogue with the students throughout the semester, and this have formed a basis for identifying the challenges that forms the background for research at hand. It also means that the researchers have a profound knowledge on how the PV course is implemented and the context formed by the semester projects and other courses.

2.2 Structured interview

The data collected via action research is supplemented with interviews. The interviews are structured By 6 hypotheses formed to investigate if either language or background had influenced learning and individual performance. The interview guide had 63 questions, that were asked by one of the authors. The answers were noted directly by the other author but also recorded. Each interview took 25 to 55 minutes, shortest time for the Danish students who were interviewed in Danish.

The interview was tested on 6 students but this only lead to small changes in the interview guide. 12 Danish and 6 international students were chosen as respondents, making sure that at least two students were included from each student group, and more students were interviewed from the groups that had most trouble getting the teamwork to function.

Using structured interviews made it possible both to quantify similarities and differences in the answers and to get a deeper understanding of the individual student's situation and individual challenges. The respondents were allowed to discuss the individual questions with the researchers, when they were in doubt of how they should be perceived and in practice the interviews were somehow semi-structured.

2.3 Analysing process analysis

After each project each student group write a process analysis documenting the student teams' use and development of group work competencies (see 1.2). These

documents are applied to gain deeper insight in the performance of each group forming a better understanding of differences and similarities in the interviews.

A comparison is made of the process analysis from the robotic education with process analysis from similar educations. This shows if the robotic students are similar to other students when looking at how they collaborate in the teams and how they have developed their teamwork skills.

3 ANALYSIS AND RESULTS

In the following is presented the main results of four hypothesis that was analysed through the interviews.

3.1 The linguistic challenges have influence on student collaboration and learning process

Most of the respondents described their own English skills when they began studying at Robotics as good. The exception is two of the Danish students that had a very untraditional educational background. Most of the foreign students was not used to speak English when they started at Robotics, but they rapidly improved their skills by practicing every day at the university and their team members was very helpful.

"In the beginning it was difficult to formulate sentences, and I didn't say much in the group. It is not a problem anymore"

None of the students found that being taught in English created any important challenges for their study.

"I had to learn to understand the accent of the lecturers but it is not a problem after that. We can also help each other in the group after the lecture if there is something we did not understand"

On the positive side, the students found that teaching and learning in English is very well aligned with textbooks. The groups did however spend extra time to help each other to understand the lecturers and to write and review the project report. This additional time consumption is as positive experiences as it helps the group members to be united as a group.

Except for two international students who recently had studied more than one year in U.S. all students weren't speaking their mother tongue when discussing with their team mates and this is perceived by the students to create a more friendly atmosphere, as no one dominated the group discussions. Compared to the experience we have with pure Danish groups (Speaking Danish) this seems to be true.

3.2 There is a big difference in how professional the students is about their group work

All the respondents report that tools for collaboration (cooperation agreements) and project management (Time and resource planning) are important for the success of their project. However only two groups was successful in using tools for both purposes at P1.

Two of the groups had great difficulties in establishing common rules for how to collaborate e.g. how often to meet in their group room and how much to work at home (see also 3.3) and even when they succeeded in making a written collaboration agreements they were not very successful to comply with the rules.

"We had a member in the group that reads the agreements different from the rest of us he kind of stretches it in a way we did not expect when we formulated it"

These different ways of reading the agreements was addressed in the process analysis from both groups and the respondents emphasised this in the interviews.

3.3 There is a big difference between the students expectations to group collaboration

Only Danish students educated at a technical high school had any experience with projects done in groups in high school, and these projects had a extend of around 1 ECTS. The rest had no experience besides solving assignments in groups for a maximum of 4 hours. The respondents claimed that their expectation to their team members was that they would keep the agreements made in the groups. Knowing (see 3.2) that some students did not keep all agreements in the collaborations agreements these expectations might for some of the respondents be more of a hope for the future than actual expectations based on experience.

When it comes to more details about when and where to work on the project and how many hours a week the students have very different expectations. One group agreed on doing most of the project work at home, so they only met in the group room once a week to report progress in work and control the project. The two groups mentioned in 3.2 ended up with some members working in the group room all the time and others working at home

"I didn't know that we were working in groups all the time. I only expected a project with instructions on what to do every week".

Two students did not participate enough and ending up being expelled from the groups.

The two most well-functioning groups had agreed to work in their group room and lecture hall 7-8 hours each day. This includes helping each other in the exercises in the courses and working with their project in the group room. The project work is often done in smaller groups or individually but includes ongoing interaction with the group. This way they could better control the project and inform each other about what they were doing creating an excellent environment for Peer learning. Although the groups had agreed on working this way and it turned out very successful in terms of both collaboration, learning and good social relations some students reported that they would have preferred to do more work at home:

"We should be together in the group room when establishing the rules and dividing and sharing the tasks, but we can do the work at home."

This tendency increase among the students, and they explain it by the possibility to be in online interaction while they work. In addition, they prefer the freedom to work whenever they like, and not within a fixed schedule.

3.4 Educational background affects the experience of guidance and the way the students are ready to receive guidance

The Danish students seem to find it easier to accept that PBL is a learning method that is not just a matter of group collaboration, but also a way of teaching and learning.

"You have to surrender to PBL, and understand that it is a good way to learn."

The respondent also described that not all foreign students had understood this, and that influenced the way that the group collaborates.

None of the respondent had any experience at all with supervision or facilitation in project work. Even the few Danish students who had experience with project work in groups (see 3.3) had not received any formal guidance and help with their projects and how to write them; a teacher had been present in the classroom but was only there to help with specific technical questions. Although having no experience the Danish students found it easier to adapt to the supervisor and understand the facilitation given about what was expected in the project work than the international students. None of the international students had ever tried working together with other students and their educational background was clearly more individualistic than the Danish students.

"It surprised me that our first supervisor just waited for us to do something, so we were forced to be the spark for everything, which was good"

Another point brought up by the respondents was their surprise that they received guidance as a group, and that the supervisors did not address their competences individually before the exam.

DISCUSSION

The results presented shows that there are big differences in the students' expectations to group collaboration and also in how successful the groups have been in complying with common rules. Does this differ from groups in the traditional danish speaking engineering educations? We examine this by comparing the process analysis from Robotic with those from other Engineering educations in the same area e.g. electronics and IT.

This cohort of Robotic students ended up with two groups being really well functioning complying with very good collaboration agreements and two other groups struggling with all decisions and never agreeing on how to collaborate. The last group agreed on a few very simple rules with only few hours each week for collaboration and project management and most of the project work done individually at home.

We seldom see the same pattern in Danish engineering educations, where most students spend more time in the group rooms, and in most years the percentage of successful and well-functioning groups will be higher and the percentage of problematic groups' lower.

Based on the limited empirical knowledge from only one semester it is not possible to state that groups with international students have more difficulties in collaboration than others. It seems more reasonable that the differences in expectation and personality are responsible for the difference in the group performance when it comes to collaboration.

A suggestion is therefore to address the individual experiences and expectations more directly in the PV course, and facilitate that these differences are made visible and considered when developing the collaboration agreements in the groups. The collaboration agreements should be specific enough to form a base for the way the

groups collaborate, and most of all make sure that the groups discuss important matters such as when to meet and how to plan their time, when they formulate the agreements. As the interviews showed that even within the same groups the students did not agree of how to implement the things that they agreed upon in the collaboration agreements, it is also important to make them reflect upon their collaboration agreement during the semester.

It is an interesting side effect of communicating in a foreign language that no one in the groups dominates the discussions. Both those that perceive themselves as “powerful” in a discussion and the more silent students agree about this. Speaking a foreign language somehow makes the students equal in the discussions in the group.

CONCLUSION

Our hypothesis that linguistic challenges would influence the students' collaboration and learning negatively showed in the analysis not to be true. On the contrary, the students find it positive that the language of the lectures are aligned with the textbooks, and they do not find it hard to understand the lectures and supervisors.

Some students found it hard to speak English in the beginning of the semester, but their skills improved fast and by the end of the semester, this did not constitute a problem.

The students have very different educational backgrounds and tradition for learning methods, and some of them have not “surrendered” to problem based learning the first semester. This means that they find it hard to understand both why they have to work in projects based on problems (not just technical solutions) but also that they find the group collaboration challenging.

A suggestion for teaching PV in future international engineering programs is that we should improve the way we address the differences of the students, before they form their collaboration agreements, and facilitate that the groups reflect more upon their collaboration during the semester.

The supervisors role is different in international project groups. They need to spend more energy to “convince” the students about the PBL model, and support the groups in working with the processes in PBL, such as time and resource management and collaboration.

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