

Development of Elite Programmes at Aalborg University

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Abstract

The Commission of European Communities concluded in a report from 2005 that “knowledge, research, skills and education will be the currency of success in the face of globalization” and that there should be support for excellence in European universities. This paper gives examples from Europe and the United States on higher educations tailored to challenge the most talented and motivated students. Further details are provided on the current situation in Denmark, where the government has decided to support the development of highly specialised elite programmes at the master level. Aalborg University was able to respond to this challenge as the first university in Denmark as the problem-based learning concept characterizing the university proved well-suited as a general framework for elite-programmes. This framework is described in details and results from a survey conducted among the elite students are reported. Many of the objectives of the programmes such as involving the students in research and having them to contribute actively are met. Students have been able to submit journal papers and patent applications. More importantly, up to 84% of the elite students are potentially interested in pursuing a career in academia.

Keywords: elite students, honours programmes, curriculum development, problem based learning,

1. INTRODUCTION

During recent years, governments, institutions and companies all around the world have been forced to focus on the effects of globalisations. The Commission of European Communities concluded in report in 2005 that global competition has intensified and that:

“cutting-edge knowledge is no longer confined to Europe or North America. Indian universities are turning out more than a quarter of million engineers every year. Research spending in China is set to catch that in the EU by 2010.” [1]

The report states that “knowledge, research, skills and education will be the currency of success in the face of globalization” and that there should be “support for excellence in our universities”. A number of countries and universities have already responded to this challenge by planning or starting up specialized programmes for the most talented students. These programmes are called honours programmes or elite programmes depending on the traditions in the country.

In an international perspective there are many different implementations of programmes for the most talented and motivated students. In the following some examples of such programmes are described.

1.1 International background

In the Netherlands the first programmes for talented students were started in 1993. Since then interest in these programmes has grown tremendously. In 2005 more than 25 honours programmes have been developed and most Dutch research-based universities are offering these [2]. Although the majority of the honours programmes are for undergraduates the diversity in their implementation is remarkable. Some programmes are disciplinary while others are interdisciplinary. They are mostly additional to the regular programmes although there are examples of activities from the honours programmes that substitute parts of the regular programmes. Many of the honour programmes function as test beds for educational innovations. If the innovations prove successful then they are implemented in the regular programme. In 2003/04 about 0.7% of the Dutch university students were involved for a shorter or longer period in an honours programme.

In Germany the most notable initiative is the Elite Network of Bavaria (Elitenetzwerk Bayern) started in 2003 [3]. This programme is intended to stop the migration of especially talented and motivated young students. The means is to create a framework as attractive as possible for outstanding students and graduates. The program has to prepare students for an academic career or a science-based work position. In 2005 eight different universities in Bavaria have either started or planned a total of 26 elite programmes (graduate or doctorate). These programmes are established as an alternative to already existing programmes. The primary requirements for admission include: a bachelor's degree, outstanding grades, personal dedication and fluency in spoken and written English. The best applicants are invited to a personal interview.

In some countries such as France, England and the United States a number of universities have evolved into de facto elite universities. In France the 'Grandes Ecoles' are institutions offering highly specialised studies in parallel to the ordinary university system. The 'Grandes Ecoles' are either run by the state or public fee-paying establishments and are often seen as the pinnacle of the French higher education. The admission is based on competitive written and oral exams of students that have spent two years completing dedicated preparatory classes. The usual duration of studies in the Grandes Ecoles is three years including internships in companies. This is awarded with a total of 180 ECTS. The number of students in the Grandes Ecoles equals approximately 1% of all students in the French higher education system.

Both in England and in the United States some universities have a long tradition of attracting top researchers, talented students and lucrative and prestigious research projects. As such they have status as elite institutions. In England these comprise most notably the universities in Cambridge and Oxford while universities in the United States with similar status include the big three: Harvard, Yale and Princeton. All of these universities offer both undergraduate and graduate programmes.

The Danish education system had until 2006 no tradition for special programmes for talented students. But an analysis of the possible effect of globalisation stressed the need for attracting and retaining the most talented and motivated students to the Danish universities. The development of specialized elite programmes for graduates is one of the means to achieve this.

1.2 Elite programmes at Aalborg University

Aalborg University was in 2006 the first Danish university to offer elite programmes at the master level within fields where the University is recognized internationally for its high-level research. Initially seven research fields covering social sciences, humanities, engineering, natural sciences and medicine were selected. Later five additional research areas were approved as part of the elite initiative, see table 1. The specific programmes offered as elite studies may change from one year to the next.

The Faculty of Social Sciences

Industrial Dynamics¹
Comparative Welfare Studies and Industrial Relations¹
Social Differentiation²

The Faculty of Humanities

Persuasive Design¹
Tourism²

The Faculty of Engineering, Science and Medicine

Wireless Communication¹
Health Science and Technology¹
Protein Science²
NanoOptics²
Products, Processes and Production Design –Sustainable Planning²

¹From 2006²From 2007

TABLE 1. Elite programmes at Aalborg University as of January, 2008

Up to four students are admitted to each elite programme each year. It is required that the students have a bachelor degree within the field and have received the top grade for their bachelor project. Students with the second highest grade can apply for a dispensation. Students have to submit a motivated application and after thorough evaluation of these and the student's track records, a number of students are invited to a personal interview.

Students can either take a full master's degree or just a single semester on the elite programme. Students that do not perform according to standards will be transferred back to an ordinary programme.

It is expected that the elite programmes will prove advantageous to all stakeholders. For the university it is important to be able to attract and retain the best students, for the staff the programmes can contribute to their research and for the students it is a chance to be challenged according to their talent and to get closely connected with internally recognized research groups.

Before giving further details on the implementation of the elite programmes it is necessary to introduce the pedagogical models that the students are exposed to from their very first day at Aalborg University. From this description it will be evident that the elite programmes are easily implemented within the existing framework.

1.3 Pedagogical Model

Aalborg University was inaugurated in 1974 and has since then applied problem based learning with students organised in small project groups [4]. At the beginning of each semester students are presented to a catalogue of project proposals each taking point of departure in a theoretical and/or a practical problem. The project proposals may originate from the students themselves, companies, university staff or others. Before the project proposals are being presented to the students they have to be approved by a group of staff members assigned to the semester. It is checked that the proposals are realistic taking students' knowledge, the available time and the learning objectives of the semester into account. The students form small groups of approximately 6 students on basis of their interest in the presented project proposals. The groups will be the basic working units and stay together for the entire semester. Each group has a lockable group room. Furthermore, a supervisor is assigned to each group and will assist the students during the semester. The students and the supervisors meet on a regular basis - often once a week - and discuss ideas, work progress, working sheets etc. However, the students themselves are responsible for proper progress in the project.

Normally, projects last 15 weeks during which they also attend lectures. Approximately, 50% of the time is spent on courses and the remaining 50% is devoted to project work. Each semester has a fixed suite of courses that students have to attend. These courses are divided into two categories: study courses and project supporting courses, see figure 1. The study courses provide the students with essential knowledge and skills within their chosen scientific field, such as e.g. math, physics, statistics, programming, etc. The students' level in the study courses are evaluated at an oral or written examination. In contrast to this, the project supporting courses do not have separate evaluations but are designed to support the students in analyzing the problem, synthesizing and assessing possible solutions. The evaluation of these courses is therefore an integral part of the final project evaluation.

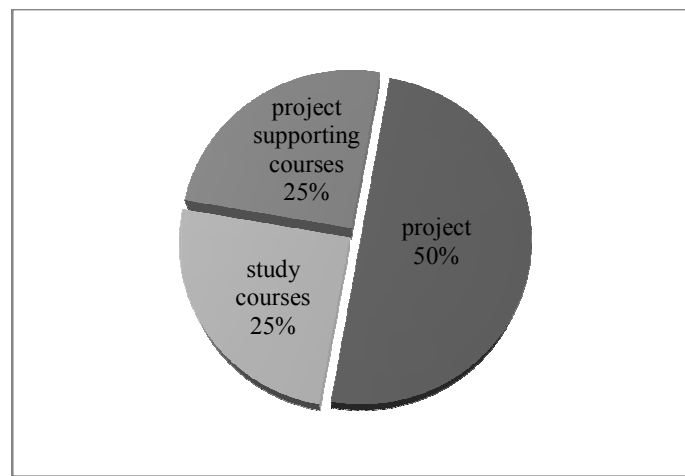


FIGURE 1. The relative weight of courses and project on each semester.

The point of departure for all student projects is a 1/2 - 1 page project proposal describing the problem. The first steps for the students include detailed analysis of the problem, a literature survey, studies of analogue problems, interviews etc. As the next step students will come up with a number of ideas for solving the initial problem. One or more of the solutions will be selected for theoretical analysis, implementation and testing.

The results of the projects may vary considerably. In some cases the result may be a pure theoretical analysis while in other cases it may be more tangible such as e.g. a working demonstrator. However, students will always have to document all their work – from the initiating problem to the conclusions – in a report typically comprising 100 to 150 pages in either English or Danish. All students are responsible for every part of the report and are evaluated on an individual basis two to four weeks after the submission of the report.

1.4 Implementation

The problem based learning model provides a unique context for setting up specialized elite programmes. The project element is flexible and can be adjusted to the ambitions and skills of the students. For the elite students the project proposals are of much more complex nature and require intensified literature studies, laboratory tests and empiricism.

Furthermore, students are guaranteed the supervision of the renowned professor heading the research group. Other researchers may assist on ad-hoc basis depending on specific problems at hand or in case of the professor's absence. Students will be closely connected to ongoing research and are expected to be able to contribute.

The students are supposed to attend the same courses as the ordinary students. However, on some of the programmes students are allowed to select from the full suite of courses offered at the university including PhD courses. This enables the students to tailor the courses to their interest and the specific project that they are working on. However, the selected courses need to be approved by the professor to ensure relevance and proper level. The workload for students including courses and project must add up to 30 ECTS each semester, which equals the workload for other students. However, it is expected that elite students due to their enthusiasm and motivation will work significantly more.

The elite programmes have admitted students twice: in September 2006 and in September 2007. A total of 52 students have started on one of the 12 specialisations, see table 1. The percentage of elite students equals 0.4% of the total student population at Aalborg University.

2 ASSESSMENT OF THE ELITE PROGRAMMES

An online questionnaire was distributed to the 52 elite students in January 2008. A total of 33 students completed and returned the questionnaire.

2.1 Examination grades

Initially the students were asked about the grade they were awarded for the most recent completed project. Some of the students could not answer this question either because the examination was not completed or because they were graded according to the pass/fail criteria. This left the query with 25 replies. An impressive 84% of the students were awarded the top grade i.e. A on the ECTS scale, see figure 2.

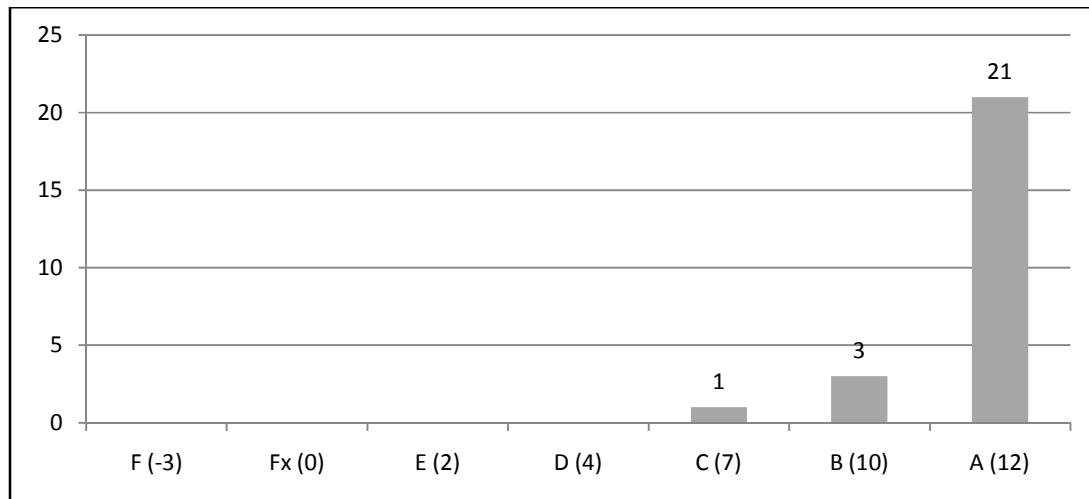


FIGURE 2. Distribution of grades awarded to elite students at project exams in January 2008. Grades are given according to the ECTS grading scale. The numbers in parentheses are the numerical values used in Denmark.

2.2 Contribution to research

One of the objectives of the elite-programme is to have the students involved in front edge research. The results from the survey show that 50% have attended research meetings organized between Aalborg University and external partners. The partners include both national and international companies and universities such as Kirk Telecom A/S, Denmark, Wyeth Medical Research and, Ansaldo Segnalamento Ferroviario, Italy and many others.

More than 55% of students have in 2007 contributed to research projects and 5% have worked on the preparation of research applications.

Nearly 29% of the students have submitted articles to international peer reviewed journals while 37% have submitted papers to international conferences and workshops of which 76% were peer-reviewed. The list of conferences comprises: Neuroscience 2007, EUSIPCO 2008, ASIPC 08. IEEE Radar Conference and IEEE International Conference on Communications.

Furthermore, two students have filed a patent application within wireless communication.

2.3 Pros and cons of being elite-student

The students were asked about their view on the elite-programme. In general they find the setup to be very motivating. They value that their fellow students on the elite programmes are at the same high level and as dedicated and hardworking as themselves. They also appreciate the closer collaboration with research groups and the easy access to equipment and laboratories. Furthermore, elite students find it positive that they can apply for financial support for participation in workshops and conferences.

In contrast to the ordinary programmes which have a pre-determined set of courses for each semester, some of the elite programmes give the students the option to tailor the set of courses to their interests and projects. This is also considered to be an asset of the programme although it requires more planning and administrative work.

Of more critical remarks about the elite programmes some students mention that they feel the pressure from the increased expectations to them and a higher focus on the grades. For some of the students the demands on the elite programmes prevent them from having student jobs and participate in recreational activities. Some feel more isolated as the number of elite students is very limited. Some feel bad about being denoted as elite-students and have had annoying comments about this.

The programmes are considered by some students to be too focused on an academic carrier and would like to see closer collaboration with industry.

Finally, it is noticed that organization around the elite programmes have not yet been sufficiently streamlined. For instance the administrative procedures have not in all cases been able to guarantee a proper information flow to all the students.

2.4 Other students view on the elite programmes

Most elite students have had joking comments about their special status at the university. The ordinary students are primarily concerned about the possible devaluation of their education. Furthermore, they are worried that resources will be taken away from ordinary programmes.

2.5 Proposals for improvements

From the survey a number of proposals for improving the elite programmes have surfaced. Students would like the programmes to support careers in both academia and industry. It is felt that the industrial track has been omitted in the current implementation. Another possible improvement concerns arranging common activities for all elite students at the university. This would allow them to exchange ideas, work habits and discuss the special situation elite students are in.

2.6 The elite students' future plans

The students were asked whether they have plans to pursue a PhD degree. As illustrated in figure 3, 46% are interested in this while 40% have not yet decided.

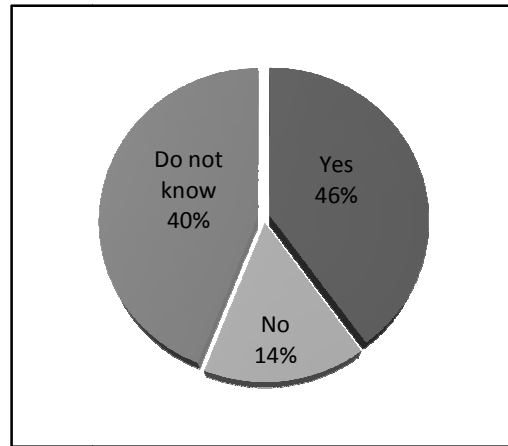


FIGURE 3. The elite students' interest in pursuing a PhD degree.

3 CONCLUSIONS

The increased globalization has forced governments around the world to develop strategic plans for ensuring future competitiveness. Often such plans include sections on higher educations. More students need to complete a university degree and in an increasing number of countries it is prioritized to develop specialised programmes for the most talented and motivated students.

A number of examples of specialised programmes demonstrated that the implementations can be quite different. In some cases the elite student are at separate universities while in other they attend the same courses as ordinary students but have extracurricular courses as well. Some universities have elite programmes at undergraduate level while others have them at the masters' level.

The Danish government plans that at least 50% of the youth cohort in 2015 should complete a higher education and that the most talented students should have challenging options. Aalborg University was in 2006 the first Danish University to commence elite master programmes. The main objective of the elite programme is to bring the best student together with most renowned professors and the best laboratories. It expected that this will contribute to the research and make the students interested in a career in academia.

In this paper it has been described how the problem based learning model is well suited to challenge the best students. From a survey among the students currently admitted to the elite programmes it has been documented that the programmes have already contributed to the research in terms of journal articles, conference papers and even patent applications. Students admitted to the programmes do generally appreciate the additional options the programmes offer and at least 46% would like to pursue a PhD degree afterwards. Only 14% are definitively rejecting a career in academia while the remaining 40% of the students have not yet decided.

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