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# **The Group-organized e-mentoring Program for Female Engineering Students at Aalborg University**

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## **Introduction**

In Denmark there has been a severe shortage of engineers especially within the classical disciplines during the 1990-ties. At the same time the distribution by sex at engineering universities is very uneven. Within the traditional classical engineering disciplines as electrical, electronic, mechanic and civil engineering the rate of female students is about 15% and it is going down. In addition the drop out range of female students is double the rate of male students. Reasons could be tradition, few women within the area creates few roll models for female students and besides they have to adapt to a very male-dominated study environment dominated by soccer and computer game discussions.

In the light of this, the Faculty of Engineering and Science at Aalborg University decided to make a special contribution to the female students. This decision caused the establishment of a mentoring program. The aim of the project described in here was not to attract female students for an education in which they weren't interested, but to help the girls already enrolled at university to get a better study environment implying a higher retention rate.

As the above described tendency is seen in many western countries, it has been an obvious idea to look for solutions internationally. In the USA e-mentoring programs are introduced as part of a solution. Within the program an engineer from the industry is mentor for a student/mentee from the university. The mentee can via e-mail consult the mentor questions concerning the study program or her future career and in that way get advises and become a roll model in industry.

It was found that the e-mentoring program idea could be useful in creating roll models for the female engineering students. Consequently a pilot-mentoring program for these students was established. To meet the need of a better study environment by creating a network between the female students, an extended version of the American program has been developed and at the same time an adaptation to Danish culture has been carried out.

This paper is based on the experiences and results obtained during the mentor program at Aalborg University.

### **Organization of the program.**

In Denmark the use of mentor programs for engineering students is something quite new and the idea of basing a program on e-mail communication only seemed to be insecure. To introduce the idea and to evaluate the results it was decided to arrange an introduction meeting and some evaluating meetings during the first year of the mentoring program.

The first step was to invite all faculty female students to a meeting, where the mentor idea was presented. Within the same period an introduction meeting for the mentors was arranged. After the introduction meeting the students could sign up as mentees. At the notification the students handed in an individual profile descriptions to be used for mentor/mentee matching.

The organizing committee matched mentors and mentees before a launching mentor program meeting where all participants were invited. At this meeting the program ideas were discussed and the mentees were introduced to their mentors. During the next period the correspondence between mentors and mentees was supposed to be e-mails.

A midterm evaluation meeting was established after about four months. Here again it was possible for the mentees to meet their mentors in person and additionally an evaluation of the first month was carried out. Finally, after one year an evaluation meeting was established.

The program only asked people to make a commitment for one year, of course all mentors and students were free to continue the program after the first year if they liked. A new program with new students and mentors has been launched every year in continuation of the existing program. In the newer programs there have been made changes based on the response received through discussions at the evaluations, through e-mails and other conversations with mentors and students. The meetings within the program were emphasized as very important, as the participants found it much easier to communicate by e-mail after actually having met each other. In the light of this, by the three program meetings are decided to be part of all launched programs.

Traditionally the organization of mentor programs is one mentor supervising one mentee. This concept is e.g. used in the American Mentor Net program. We found that this concept made a high probability of mentor/mentee mismatch e.g. within engineering disciplines, type of career or inter personal communication. To overcome this problem an alternative organization inspired by the organization of the education at Aalborg University was developed.

At Aalborg University the engineering educational program is based on a special pedagogical model with focus on group-organized problem-based learning. Within the mentor program established here, the organization of the mentors and mentees is partially based on the same model. Consequently the organization of students into groups is transferred into the organization of the mentor program. In the pilot program one mentor is matched with two mentees within the same area of engineering- if possible a fresher and a graduate. After the evaluation of the pilot-mentoring program

the groups were expanded as the participants suggested that it would be easier to fulfil all the ideas in the program. Each mentor/mentee constellation is now matched with another mentor/mentee constellation, preferable within the same area of engineering, forming a group of two mentors and four to six mentees. The group members can then exchange experiences, the mentors can assist each other and if one mentor is extremely busy for a period of time, the other mentor can take over prime responsibility. Likewise the mentees is invited to exchange their experiences - our aim is that the older students in this way can do a kind of mentoring for the fresher, as some of the problems related to studying at university are more present to older students than to graduated engineers.

In the later evaluations the mentees have pointed out that they are happy about the organization, groups including a fresher, someone in the middle of her study and a graduate facilitates a good exchange of experiences. Additionally it was stressed that using this organization the mentors get the opportunity to get in touch with engineers from other parts of the industry and it is a help to have another mentor to exchange ideas with.

### **Organizing the groups.**

A major problem within the program is a good matching of mentors and mentees as this is supposed to be the main condition for a well functioning program.

The group organization within the program makes the matching of mentors and mentees rather difficult. The ideal constellation is supposed to be fresher and older students and mentors all within the same engineering disciplines. A typical program includes about 12 -18 mentors and 35 students representing four or five different disciplines. Mostly it does not exactly match. A combination has been too many electronic engineers and few electronic students and likewise many civil engineering students and only few mentors. This is partly due to the fact that the main mobile communication industry is situated in and around Aalborg and consequently many electronic engineers joined the program, at the same time there is only about 5% female students joining this program.

In the late programs a new problem arose namely to get fresher and older students in the same program. Usually the students sign up the first year at university implying that the older students who want to attend a program already are participating in existing programs.

One solution is to drop the demand on older students in the group. In those cases the program will be without important elements. The impact to the study environment and the networking aspect are lost, as the three or four newcomers within a discipline usually know each other in advance, additionally the mentor/mentee relation between fresher and older students is disappearing.

An alternative way to compromise in composing the groups is to neglect the demand on the same engineering discipline. In such cases questions concerning problems related to special study disciplines can not be answered within the group. This is a very important aspect for students wanting to join the program, and this lack will be a problem in motivating the students to participate. Through the evaluation of existing programs other items have been stressed. It has been said that the most important benefit in participating in a group is to get information on the working environment at

engineering companies. An other important item is how to handle the combination of family life with children and a carrier as engineer, and last but not least to get a network of female engineers. All these issues do not relate to specific engineering disciplines. Problems related to the study curriculum can be solved by direction to the study board or the student guide office. The evaluation concludes that equality in engineering disciplines is of less importance.

A third solution to this problem could be to add fresher students to the existing groups; this concept has been working in some situations. Problems to this solution are that some of the groups only are working for a year, and some groups already consist of 6 students in which case an extension will imply very large groups.

Furthermore an issue has been the static aspect of this type of organization. Suggestions have been that mentees should be able to circulate in a wider group of mentors. Depending on the project the mentee is working on or the problems she is engaged in, she should be able to temporarily to adopt another mentor who could help her with the specific question in mind. This would mean a better use of the mentors' skills and abilities, give the students better and varying opportunities for help and advice, but would also mean a lot of extra work for the mentors. This increased flexibility might limit the difficulties involved with matching students and mentors; many students have been critical of their match with a mentor of different disciplinary background than their own which it is difficult to avoid unless many more mentors join the program.

Within the program the specific matching of mentors and mentees are made by the project committee, the above mentioned demands are taking into account at the highest possible degree.

#### **Means of communication within the program.**

Initially the communication of mentors and students was intended to be only through e-mail apart from the meetings, which are part of the program. In that way participating in the program would mean that the time consumption and the personal engagement would be on limited scale. This model did not suite the participants in our program. Many mentors have invited their students on company visits, even those mentors who work in companies that are situated far away from Aalborg. Furthermore some of those mentors who work and live in Aalborg also invite their students out for lunches and dinners. This means that the communication in many ways has been more personal and direct than the originally intended e-mail communication.

The need for physical meetings has been stressed at all evaluations. Both mentors and mentees find it a lot easier to communicate through e-mail if they have met their counterpart and also these meetings add another dimension to just writing through e-mail. Most mentors and mentees conclude that actual meetings are necessary in order to establish a good relationship. Compared with the American Mentor Net, which is based solely on e-mail contact, the response in Denmark has been that e-mail does not work on its own. Mentors and mentees both have to find out how to establish a mentor relationship via e-mail and at the same time they have to figure out what the specific content of such a mentor relationship is.

At the evaluations, a suggestion was to make a small guide introducing various activities that mentors and mentees could do together. This could also be activities such as company visits where e.g. also the male students from the mentees' project group or class could be invited. A Danish handbook is now written, primarily on the basis of the experiences from the pilot program. A group of mentors and mentees have been involved in part of this, e.g. sketching a mentor contract and presenting various activities for mentors and mentees. A selected group of mentors and mentees has read and commented on the handbook, before it was printed for use in the programs.

### **Recruiting Mentors**

As in many other countries Denmark is today facing a severe shortage of engineers and scientists - and the number of female students within this field is very low compared to the fact that more women than men are engaged in higher education in general.

This dilemma is a growing headache of politicians, the industry as well as lower and higher educational institutions. Initiatives that can stimulate the interest of primary school children into science and technical areas are discussed as well as initiatives more directly aimed at primary and secondary school girls.

Concerning this it was decided that it was important to hold on companies as responsible partners within the program, implying that recruiting mentors was done by direction to companies instead of by direct direction to female engineers. In addition it was chosen not to use female engineers employed at university, as they already were visible and could be roll models to the students.

Letters were sent to a number of companies asking them for female engineers who might be interested in participating in this program. These letters were sent to the Human Resource Departments, because we wanted the companies' official support and acceptance since the participating mentors would have to spend some of their working hours participating in the program. Engineers from a wide range of companies signed up and the response from female students was overwhelming and some even had to be put on a waiting list.

Within the program the mentors were chosen based on their engineering disciplines. In the evaluations other qualifications and characteristics have been pointed out as at least as important from the mentees. Recent graduated engineers are very relevant in questions concerning the master thesis and application for the first job and in general, mentors with seniority have experiences related to carrier planning in combination with family and kids. The ideal combination would be a mentor representing each of the above mentioned categories. This makes it even more difficult to form ideal mentor groups.

### **Summary and evaluation**

The mentor program has been working for four periods and in the general the impression is that the participants are satisfied with the program.

Everyone agrees that the group organization of participants is great. The mentors have pointed out that they get the opportunity to get in touch with engineers from other parts of the industry and that it is a help to have another mentor to exchange ideas with. However most of them see the general meetings as an opportunity to get together and establish an informal network among these female engineers. In the project committee we will try to establish special activities for these engineers in the new program and thus substantiate and support the basis of the network.

The students likewise are happy about the organization, but for those groups including only fresher and graduating students the gap in maturity and experience is simply too big. The graduates are already focussed on getting a job whereas the fresher is slowly getting to know the world of university. Consequently the best groups are formed by mentees consisting of fresher, someone in the middle of their studies and graduating students. Unfortunately in the later programs it has been hard to form such groups as many of the attending students are fresher.

A complete examination on the drop out range for the participating students has not been carried out, but within the first two programs only one student from each program dropped out which is much lower than the average drop out rate for female students. Obviously the reason could be a well functioning mentor program, but the fact that well functioning students most likely are the most motivated to attend such programs, may also influence the result. In addition it should be taken into account that the above mentioned result is based on a very small number of students.

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