

THE FIRST YEAR AS ENGINEERING STUDENT

The Experiences of Four Cohorts of Engineering Students in Applied Physics and Electrical Engineering in Linköping University

Elinor Edvardsson Stiwne

Department of Behavioural Sciences. Linköping University. S-581 83 LINKÖPING.

ABSTRACT

In this paper comparative data from four cohorts of engineering students' expectations and experiences during their first study year are presented and discussed. Four main issues are highlighted:

- The entering students' previous study experiences, expectations and aims for the future.
- The students' experiences of their first year in the study program.
- Commonalities and differences between the cohorts.

The study is one part of an ongoing longitudinal study. The data from the first cohorts, 1998 and 1999, are base-line data against which data from the latter cohorts, 2000 and 2002, are compared. Comparisons are made in relation to the planning and implementation of a CDIO curriculum from 1999 and on.

The results show a changing approach to studying between the first and the latter cohorts, from an achievement and future oriented approach to a gratifying and here- and-now oriented approach. This is enacted in the relation between their earlier study experiences, what they expected to learn, their aims for the future and the teachers approaches to teaching (Entwistle, 2003). The conclusion from this study of the first year in a longitudinal study of the students passage through the whole study program and with a follow up one year after graduation, is that well intended and well planned changes in a study program can give unintended results, as a consequence of this relationship. In future presentations we will see if the commonalities and differences between the cohorts during the first year will remain.

NOMENCLATURE

A **cohort** is one batch of students.

Drop-outs are students who quits a study program.

Stop-outs are students who take a shorter or longer study leave with a plan to return.

Working hours are the actual time the student spend studying, in lectures, class, group/project work and individual studying.

Work load is a subjective assessment of how much work/study related issues affects a persons whole life situation.

Free rider effect: a group motivation loss arising from the perception that ones' efforts are dispensable for group performance

Sucker effect: a group motivation loss arising from the perception that other capable group members are free riding on ones' own efforts, resulting from attempts to achieve a fairer, more equitable ratio of individual effort to payoff.

INTRODUCTION

The first year in a study program is crucial for the students' approaches to studying and learning as well as for the socialisation into a future professional life (Entwistle, 2003; Weidman et.al., 2001) Several studies show that approaches to studying and learning is constructed in an interplay between individual students' and the institutions' aims and expectations (Biggs, 1999; Entwistle et.al., 2002; Hounshell & McCune, 2002; Marton & Säljö, 1997).

Student learning is based on the relation between their earlier study experiences, what they expect to learn, their aims for the future and the teachers approaches to teaching (Entwistle, 2003). This relation is domain specific, i.e. the relations are constructed within a specific context. The results from studies of the first year in study programs with large study groups show that the organising and management of classes and programs are of vital importance for the students perceptions of the relevance and quality of a course (Entwistle, *ibid.*). Other studies show a correlation between students' adjustment to their study environment and their motivation and achievement (Drew, 2001; Halamandaris & Power, 1996; Struthers et.al, 2000).

In 1998 the study board of the Y-program (Applied Physics and Electrical Engineering) initiated a study with the aim of inquire into the students self reported experiences during the first year. The program was marketed as "the toughest" Graduate Engineering program in Sweden and the attrition rate was high but so was the drop out rate. The study was initiated in order to give the study board some idea of what the problem was. Both students and lecturers were dissatisfied and the drop out rate was *one* indicator of this dissatisfaction.

The results of the study were considered to be of interest and value for further development of the curriculum, as well as for the improvement of the program. The time span of the project was expanded to include the whole study program of 4 ½ years with a follow up one year after graduation. In 1999 plans were made to transform the study program from an elite program to a project- based learning environment, where engineering skills would be in focus. These changes were in line with the goal of an international development project, CDIO (Conceive, Design, Implement, Operate) that the study program was enrolled in from 1999. In order to monitor the implementation of planned changes it was decided that the study would encompass four cohorts, those who started in 1998; 1999; 2000 and 2002. In 2000 Linköping University and the Y- program were involved in the CDIO project in collaboration with KTH and Chalmers in Sweden in cooperation with MIT in Boston. Data from the first cohorts (1998 and 1999) were defined as base line data in the study against which the results from the latter cohorts (2000 and 2002) could be compared to, with respect to the rolling assessments of the implementation of a CDIO curriculum.

Three main issues guided the design of the study:

- a) The students experiences from college and their expectations when they start the Y-program
- b) The students experiences of the curriculum and study environment in different phases of the program
- c) The students evaluations of how the program have prepared them for their professional lives as graduate students.

In this paper I will present comparative data from the first year of the four cohorts. Four main issues will be highlighted:

- The entering students' previous study experiences, expectations and aims for the future.
- The students' experiences of their first year in the study program.
- Commonalities and differences between the cohorts.

- Conclusions.

THE CONTEXT – A GRADUATE ENGINEERING PROGRAM IN SWEDEN

In Sweden about 48% of an age group are entering into Higher Education before the age of 25 (Annual report of the Council for Higher Education, 2004). There is a diversity in the social background of the entering students, 70% come from upper- and middle class backgrounds compared to 23% from working class. This uneven recruitment is most evident in long, high status programmes like Graduate Engineering, Medicine, Psychology and Law, as well as in Music and Arts. There are some structural features in the Swedish Higher Education system that differentiates the Swedish model from some other European countries’.

In Sweden there is a long tradition of Adult Education and Lifelong learning. Students can get complementary or supplementary grades after Upper Secondary School, with state grants and student loans. As a consequence of that the age span can be quite big in some classes at the University. There are no student fees in Higher Education and all students are qualified to student grants and student loans for twelve semesters. In Sweden most students leave home and start a life of their own, maybe for the first time, when they go to University.

The Y-program is a 4½ year graduate study program. It is considered to be one of the toughest and most demanding graduate programs in Engineering. The students have a reputation of being ambitious and clever, but also a bit square and dull, (Edvardsson Stiwne et.al 2002). The program is managed by a study board within the Deans office. The board has an elected chair and the members are

- Teachers from the departments running the specific classes
- Students from different cohorts
- Administrators from the Deans office.

A study program does not belong to a department but "buys" courses from different departments. Every August about 180 students are admitted. They are enrolled to 5-7 classes with about 30 students. Female students are in minority and they are allocated to some of the classes, which means that there always are some all-male classes. Senior students are appointed as form masters/mistresses, teacher assistants, mentors etc. for first year students.

The curriculum the first year consists of a foundation course in mathematics, linear algebra and perspectives on mathematics and physics. From 2002 there is an engineering project (a CDIO-class) the first semester. The work is organised in lectures (the whole cohort); classes (lessons with one class); laboratory lessons (the students work in pairs or small groups) and projects (small groups). Lectures are given by professors, who also tutor and supervise projects. Teaching assistants are supervising in classes and laboratory lessons. Course evaluations are made on the internet and the results are communicated to the chair of the study board, where the evaluations are followed up and attended to. Each course is evaluated according to a scoring system. An examiner can get an honourable mention or a request to make some improvements.

In 1999 the CDIO-project was initiated. This was rendered possible with a financial support by the Knut and Alice Wallenberg foundation. The main purpose of the project was to make graduate engineering education more applicable and to give more attention to the students’ employability. In order to meet the critique from the 1998 cohort of a tough start in mathematics, a foundation course in mathematics was launched this study year.

In 2000 a new class was launched, Yi (Y international). The students were offered classes in a foreign language and to spend one semester in a foreign country. These students were not supposed to participate in the CDIO project course during the first semester. The implementation of the CDIO curriculum started in 2000, with structured interviews with all teachers involved in the Y-program in 2000/2001. The purpose of the interviews was to make the teachers familiar with the core concepts in the project, Conceive, Design, Implement and Operate. Another intervention in line with the CDIO-curriculum was that all new students filled in a "Beginners survey". The results were followed-up by the study counsellors. They identified what the main obstacles and problems were, and offered individual counselling to the students.

During the study year of 2001/2002 the implementation of the CDIO curriculum continued. The student reception was improved and the first CDIO project course was planned. Potential project managers were taught a project model, LIPS, and there was a request to different departments for interesting projects. The "Beginners survey" was launched to all students in the Faculty of Technology, in order to make it possible to compare the different study programmes.

In the study year of 2002/2003 the first CDIO-project course was implemented during the first semester. Besides the follow up of the "Beginners survey" the study counsellors launched the idea of "Student mentors". The aim was to facilitate the students' adjustment to university studies with the help of a counselling method "Supplemental instructions".

The implementation of the CDIO curriculum has continued from 2003, but this is beyond the scope of this paper. From the description above it is concluded that due to planned changes, the study contexts of the students are changing and this will be considered in the interpretation of our data.

METHOD

The design of the study is based on

- a) Questionnaires distributed to all students in each cohort twice the first year (Q 1 & Q 2) and once a year during their study year 2-5 (Q 3-5) and finally one questionnaire one year after graduation (Q6).
- b) Interviews with 10 students, 5 male and 5 female, in each cohort. The same students are interviewed twice the first year (I1 & I2) and once a year during their study year 2-5 (I3-5). A telephone interview is made with them one year after graduation (I6).
- c) In the 1998 and 1999 cohorts those students who dropped out during the first semester were interviewed on telephone.

All three questionnaires were distributed, filled in and collected during a break in a lecture or lesson. Within the first two weeks the students filled in one questionnaire (Q1; N=702) about their previous study experiences, their expectations of the study program and of their future. After the first semester a second questionnaire (Q2; N=596) was filled in. The focus was on their experiences of the first semester. They were asked questions about their study results, experienced workload, thoughts of dropping out, experiences of cooperation with lecturers and peers, perceived study related health and well being and their identification with the study program. At the beginning of their second year the third questionnaire (Q3; N=486) was filled in, where they were asked to report their experiences of the first year, in the same areas as in Q2.

Ten students, five male and five female, were interviewed twice during the first study year. An interview guide was used, based on the questionnaire.

Results from the study have continuously been fed back to the program and reports and conference papers have been published (Edvardsson Stiwne et.al. 2002; Edvardsson Stiwne et.al. 2003; Edvardsson Stiwne, 2004).

Response Rates

The response rate is based on the number of filled in questionnaires related to the number of students in each cohort who registered for the first time. Table 1 shows a high response rate on Q1. In Q2 and Q3 it is declining. Based on these data we have anticipated drop-stop out rates during the first year of about 35% (1998); 36% (1999); 27% (2000) and 23% (2002). The cohort 1999 has the lowest response rates. One explanation is that these students did not attend lectures and lessons to the same extent as the others.

Table 1: Response rate Q1-3. Within brackets are the number of students who register for the first time.

	Questionnaire 1	Questionnaire 2	Questionnaire 3
Cohort 1998	185 (187) 99 %	137 (174) 79 %	120 (160) 75 %
Cohort 1999	170 (204) 83 %	155 (191) 81 %	107 (166) 64 %
Cohort 2000	173 (178) 97 %	159 (162) 98 %	125 (151) 83 %
Cohort 2002	174 (160) 100 %*	145 (148) 98 %	134 (138) 97 %
Total	702 (729) 96 %	596 (675) 88 %	486 (615) 79 %

* The number of questionnaires exceeds the number of registered students. One explanation is that some of the admitted students never registered.

Of the 10 interviewed students in each cohort there were three stop- outs in the 2000 cohort. They were not interviewed the second time. In the other cohorts all students are interviewed twice during the first year. In total there are 78 interviews of 30-60 minutes.

The Entering Students

In each cohort there are about 13-18% women and the average age is about 20 years. They go to the University about one year after their A-levels. Some students have spent one year completing their military service, working and/or travelling. Only about 8% do not have an A-level from a natural science/technology program.

Previous Study Experiences

All students have been successful in Upper Secondary School, some of them at the price of hard work, others without to much efforts, which indicates a great variation in perceived work-load. The cohorts of 2000 and 2002 describe an accelerating rush and competition for the highest grades. About 30-40% have experienced some kind of study-related stress (sleeping problems, stomach problems, feelings of self doubt and insufficiency; problems of concentrating and depressions). These experiences are gender related, as we can see from table 2.

Table 2: Percentage of students who have experienced study related stress symptoms in Upper Secondary School

	Perception of study related stress symptoms		
	Total	Men	Women
Cohort 1998	34 %	27 %	64 %
Cohort 1999	29 %	26 %	62 %
Cohort 2000	46 %	40 %	75 %
Cohort 2002	42 %	38 %	58 %
Total	38 %	33 %	66 %

The increase in students' experiences of study related stress is considered in an overall cultural context. Studies of psychological well-being in the Swedish population show that it is in the age group of 19-29 (young adults) the increase of psychological ill-health is accelerating (Hallsten et.al, 2002; Wenemark et.al. 2003).

The students' motives for choosing the Y-program as their first choice has changed. *In 1998 and 1999* a special interest in mathematics and physics guided the students choice. The students had a clear goal of a future as a Graduate Engineer on an anticipated promising job market. By the end of the 1990ies the IT-boom was declining and *in 2000 and 2002* the students' were more ambivalent to their future. The job market was more insecure and the breadth of the program was more in focus. Arguments for this was that it enabled the students to postpone their career choices. The choice of study program was more informed by life style and an image of the study context. There was a difference in the approach to the study environment between the first and the latter cohorts. In 1998 and 1999 the first year was "a test" of the students' capacity to live up to the standards of the program, while it for the latter cohorts was "a test" if the program could live up to the students' expectations. In all four cohorts the students expected long working hours (about 50h/week) and a challenging and stimulating co-operation with faculty and peers.

What They Expected to Learn

Interviewed students expected to learn to solve problems, to analyse complex problems and to get in touch with research based knowledge in physics, communication, electrical engineering etc. They also expected that knowledge, as well as work methods, to a high degree should be related to their future jobs as graduate engineers. In the cohorts of 2000 and 2002 the students had a more instrumental and pragmatic attitude to their learning. They wanted to learn how to study in order to get an exam. "Without an academic grade you are nobody on the job market today".

Aims for the Future

In 1998 and 1999 the students were aiming at a bright future as Graduate Engineers, with good wages and good career opportunities. There were not many who considered an academic, research based career. In 2000 and 2002 the students were aiming at a *University grade* in order just to get into the job market. These students said that they just focussed on the next year and avoided to think about the future. Rather than taking a low-skill work after graduation they anticipated to take study leaves or take more classes. They did not worry too much about the future, "it will sort itself out somehow".

THE STUDENTS' EXPERIENCES OF THE FIRST YEAR IN THE STUDY PROGRAM

Their First Impressions of the Study Context

In 1998 and 1999 the students' described their first impressions of the academic study context as "chocking", "chaotic" and "overwhelming". Managing a high tempo and tough classes in mathematics evoke much agony and self doubt. The perceived harsh attitude of the lecturers intensified their feelings of panic. In 2000 and 2002 the students reported different experiences. They praised the activities related to the reception of the students and they felt "taken care of and lavished". The lecturers' attitudes were perceived as "helpful". The students commented that the high proportion of teacher-led lectures and lessons was unexpected but very positive. The interviewed students commented that they were aware that the image of "The Y-student" was that of a bore and a nerd with no social interest or competence. In the interviews they commented that this was true for some of their peers, but that it did not correspond to their own self-image. Some students solved this dilemma by not telling people outside the class that they were a "Y-student". They believed that when you got to know these "other" people they were much the same as them selves, ambitious and clever students who also liked to party and participate in student activities.

Study Results and Study Achievements

In questionnaires and interviews the students were asked to comment on their average study results. Within all cohorts three categories of students were identified:

- a) Those who were satisfied of being in phase with lectures and laboratory lessons. They had not failed any major examinations or tests. They had no aspirations above passing.
- b) Those who had failed tests and examinations from the start and lagged behind. They experienced a vicious circle, they did not have the capacity or energy to work with new courses and manage retests at the same time.
- c) Those who were surprised that their results were better than they had anticipated. These students had raised their aspirations and were aiming at the highest grades.

There were students from all three categories in every cohort, but the proportions were different. In *the first category* a majority of students are in the first cohorts. They experienced a tough start and their strategy to "survive" was to persuade themselves that in order to reach their goal of becoming a graduate engineer, they had to make some sacrifices and to modify their achievement goals. The students from the latter cohorts had another motivation for their low aspirations. They did not want to sacrifice their social life and their well-being, so they gave priority to other things than studying and therefore they were satisfied by just passing. The students in *the second category* had panicked and in the interviews they responded very emotionally to these issues. The reason for panicking differed among the students. One category was those students who panicked, but soon realised that they had to change their study strategy and who were confident about their capacity to do so. They were accustomed to achieving good results without great efforts and they had began with the same attitude at the University. Another category was the students who had realised that they had to reconsider their motivation to study and/or their capacity to fulfil the requirements of the program. In the cohort of 2002 there were no students in this category. Together with the cohort of 2000 they were in majority in *the third category*, where the students were more successful than they had expected. They were surprised themselves, as they had expected a much tougher assessment from what they had heard from senior students and from the marketing of the programme. The students attributed their success to luck, hard work or "it obviously suits me".

Study Satisfaction

In all interviews the students commented on their overall study context. Although they belonged to a cohort of about 180 students, on a Campus with about 26.000 students, their study life was very much limited to the life of their class or their campus corridor (Edvardsson

Stiwne, 2004). During the first weeks they participated in a lot of Y-program activities. During these first weeks people grouped together in smaller units as peer groups, study groups, commuting groups, student union groups etc..

For commuting students it was considered a strength to have a “normal” life outside the University. They had friends and family with non-academic lives and interests, which helped them to continue “to be themselves”, but also contributed to a feeling of being an outsider in the overall study context. The student union students, who very soon engaged in student union activities, were proud to represent their study program and they enjoyed the opportunities to make interesting and valuable contacts and connections within the whole University. These students were described as “an exclusive clique who are electing each other”, by those who not were engaged in these activities.

When the Y-students compared themselves to other students they characterised themselves as more ambitious, more self demanding, smarter and more hard working than other students. When they compared themselves to non-students of the same age they described themselves as living a good and comfortable life, in spite of hard study work, and they could not think of “an ordinary job” as an alternative. “I enjoy studying, much more freedom than an ordinary job, I like this life”.

In all cohorts the students had the opinion that peer groups were very important, but for very different purposes. In study groups they could help, and get help from one another when they got stuck or did not understand. Peer groups were important for social well being, for keeping up healthy daily routines and for feed back and encouragement when things are tough and not easy (Edvardsson Stiwne et.al, 2001). Peer groups also become self referential in the evaluation of their own learning and achievements.

In the first cohorts it was entirely up to the students to arrange their own group work, with the result that some students became very isolated. In 1998 the students perceptions were that the lecturers norms of what was desirable student characteristics also sat the standards for their own groupings, i.e. “the smart ones” and “the serious ones” grouped together and as an opposition to that “ the not so smart ones” and “the not so serious ones”.

In 1999 the students perception of “grouping criteria” was based on attendance at “school”, i.e. “those who are at the University”, “those commuting” and “those who study on their own”.

In 2000 and 2002 said that “they” had encouraged the students to work more in groups and that “they” had tried to create a class spirit. “They” was referring to faculty, lecturers and study counsellors. The feeling was that “they” also had heavy expectations on the students to live up to be some sort of an “elite”, and there were some critical voices from the interviewed students, arguing that they felt “pushed” into an Y-identity. The well intended interventions by faculty, to encourage the students to work in groups (from 2000) and to organise their group work in projects (2002) were obviously met with some resistance.

Due to the planning of a CDIO project course in 2002, the cohorts of 2000 and 2002 were asked to estimate how they allocated their study time. Table 3 show that the cohort of 2002 increased their work group time, in comparison with the earlier cohorts, but also that they increased their individual working time *after the first semester* (after the project work).

Table 3: Allocation of working time, scheduled, group work, individual work, during the first semester (Q2) and during the second semester (Q3).

%	Scheduled		Group work		Individual work	
	Q2	Q3	Q2	Q3	Q2	Q3
Cohort 2000	68 %	75 %	12 %	12 %	20 %	13 %
Cohort 2002	67 %	63 %	15 %	16 %	19 %	21 %

The students' experiences of their teachers' competencies were unified. They were considered to be highly competent and professional within their specific fields of knowledge, but lacking in pedagogical competence. In the first cohorts many students were upset by the lecturers attitudes towards the students. This was exemplified by their comments that *some* lecturers seemed to be fed up with students and seemed to enjoy tormenting the students. Another impression was that some lecturers did not bother to explain issues that were considered too simple and too evident. The students' strategies to cope with this were to try to interpret and understand the lecturers' communication style. The students in 2002 had a much more positive attitude towards their lecturers, who were considered helpful and considerate but still lacking pedagogical competence.

Work Load, Health and Well-Being

In all cohorts the average working hours/week were 40-50. Lectures, classes and laboratory lessons were highly attended to and as the students also expected to work long hours these circumstances also were considered fair. What was creating stress and ambivalence was a conflict between tough working conditions and the status of the program. "It is supposed to be a tough education, you are becoming a graduate engineer, and then it has to be demanding an tough". The student added that otherwise it (the study program) might loose its' reputation and image. Students also pointed to the fact that they did not see any alternative to studying. Leaving home, fixing accommodation, economy, household duties and creating new social networks, were also considered very stressful activities during the first semester and in conflict with a demanding study situation. About 40% of the students had some time during the first year considered taking study leaves (stop-out) or to drop out. The reason for that was not primarily the work load or failing tests but the experience of a lack of meaning and relevance. The students hoped that the first year was the worse and that it would be more interesting later.

The students' ambivalence to their study work, their perception of lack of meaning and lack of alternatives is closely related to the kind of psychological stress that is accelerating among young adults in Sweden. Hallsten et.al (2002) define a burning out process as "*an individual crisis, characterised by an individuals perceptions that her alternatives to take action are insufficient in relation to a life situation that is at hand*".

Compared to the first cohorts, the cohorts of 2000 and 2002 had more experiences of study related stress from Upper Secondary School. Even though these cohorts were more successful in their studies than the first cohorts, felt more welcomed and taken care and enjoyed their study context, they also articulated more signs of psychological stress during the first year. Sleeping-problems, states of low spirit or depression, feelings of insufficiency and social isolation are symptoms related to psychological ill-health in general.

During the first semester 35-55% of all students had some sleeping problems and periods of low spirit or depression. After the first semester the sleeping problems were declining in the first three cohorts but increasing in the 2002 cohort (from 37% to 46%). The periods of low spirit or depression increased in all cohorts after the first semester, most evident in the cohort of 2002. About 55% of all students had experienced periods when they doubted their capacity to manage their study situation. There is no significant difference between the

cohorts. This could be regarded as “normal” in a tough program. The cohort of 2002 breaks the pattern by expressing more confidence. This could indicate that the efforts of the study board and the study counsellors to facilitate the students working conditions and learning have had some success.

Another surprising result is that in spite of the CDIO project the first semester and the encouragement of faculty to create social engagement and commitment to a study group, the percentage of students who felt socially isolated increased in the cohort of 2002, from 26% to 36%, *after* the first semester. This could be explained as a reaction on the experiences of the group work in the project. In the interviews the students commented that in many groups they did not co-operate in the project work and that the free-rider and sucker effects were prevalent.

Students Approaches to Studying and Learning during their First Study Year

In spite of different prerequisites and different aims, the students’ main learning outcomes during the first year is that they learned how to learn in order to get their credit points and manage their tasks. The problems and obstacles they identified were related to individual goals and approaches to studying.

Individual main goals in the cohort of 1998 was to manage a prestigious and tough study programme with the aim of getting a good job and good career opportunities. Their main study strategy was to make immediate personal and social sacrifices for a future goal. Failures were ascribed to their own lack of knowledge and competence and too small sacrifices. The students in the cohort of 1999 had very much the same main goals as 1998. As the study board had changed the curriculum, a foundation course in mathematics had been inflicted, the study context had changed and they could not rely on the experiences of previous cohorts. As the foundation course was to be taken in parallel with other classes, the main study strategies of this cohort were to make priorities. They did not attend all lectures and classes. They dropped classes that were considered “irrelevant or incomprehensible”. The female students in this cohort argued that they gave priority to group discussions or classes where they not were presented ready made solutions but were encouraged to think for themselves. They actively created learning situations themselves.

The cohort of 2000 were “taught” the value of learning how to learn, of finding a balance between work- and leisure time and they were encouraged to work in groups. They expressed more open critique to a teaching model based on fact-feeding and copying. These students focussed on self-discipline and structure and created individual strategies in their active choices of lectures, lessons and group sessions. In doing so, the focus was as much on *who the lecturer was* as on the content. The cohort of 2002 expressed the same strategies, but as they were the first cohort who had worked in a project group, their strategies were influenced by an element of comparison and self evaluation in relation to their peers. “You get stressed when you see how far the others have come”. The study results were not considered important per se, they were important in relation to the comparisons made.

In reflecting back on their first year, the students were astonished that they knew so much and were able to solve complex problems. In order to keep up the motivation for another 3 ½ years the students’ strategies were to think about and imagine the interesting and relevant courses that they anticipated would come *after the first year*. They hoped to realise the necessity and relevance of enduring “the necessary evil” of the first year.

COMMONALITIES AND DIFFERENCES BETWEEN THE COHORTS

Weidman et al. (2001) argue that students are socialised into the academic context in different stages. The stages are not linear or passed step wise. Depending on the social and cultural background of the students the stages are enacted individually in a study context that is designed for an anticipated homogenous cohort, especially the first year.

The anticipatory stage: The students' first impressions of the study context are guided by their *individual* backgrounds and expectations. This is further emphasised with the governmental goal of 50% of an age group going into Higher Education before the age of 25. The students' professional expectations are often guided by stereotypical images, the way the profession is presented in media, family, friends and life style magazines. During this stage the students listens to and observes what is going on and they are occupied of "learning the ropes". They comply with information "from above" or "from outside".

In this study this is evident in the way the students describe their first impressions of "the academy". The differences between the first and the latter cohorts can be interpreted as an evidence of the theory that student learning is based on the relation between their earlier study experiences, what they expect to learn, their aims for the future and the teachers approaches to teaching (Entwistle, 2003). The students' experiences further indicates that this relation is domain specific, i.e. the relations are constructed within a specific context, a study program or a class. The differences between the first and the latter cohorts can also be related to other studies of the first year in study programs with large study groups. These results show that the organising and management of classes and programs are of vital importance for the students perceptions of the relevance and quality of a course (Entwistle, *ibid.*). Our results show that the interventions by faculty and study board, to facilitate the study work and make the study context more welcoming, was met by some ambivalence by the students. They appreciated the support and to be "taken care of", but at the same time they anticipated that the status and image of the study program would be deteriorating. They also had a feeling that the liberality had a hidden agenda, that they were expected to pay a price.

The formal stage: The students actively look for formal instructions about study technique, study guide lines and assessment criteria. Faculty and peers become important role-models, especially for students with a non-academic background. The students monitor course alignment, the consistency between what is said and done, and this guides their approach to learning (Biggs, 2003; Marton & Säljö, 1997).

In this study this is evident in the students' descriptions of what they have learned the first year. Learning the ropes through monitoring the actions and attitudes of faculty and senior students becomes difficult when the curriculum is changing. This is most evident in the cohort of 1999 and 2002, when two new courses are implemented, the foundation course in mathematics (1999) and the CDIO project course (2002). In these new elements the students had to rely on themselves and on their peers and therefore the experiences of working together in a group became vital for their approach to learning.

The informal stage: During the first stages the main goal for the student is to "learn the ropes" of the academic context in general, and of the specific study context of a program and a class in particular. In parallel to this learning the students are creating a personal, informal platform. Small groupings are created where the students have (or have not) a belonging. In the way these groupings are classified, implicit cultural values are enacted, and the status and ambitions of individual students are confirmed or challenged (Twale & Kochran, 2000).

In this study this is evident in the students' perceptions of the norms and criteria that guided the sub groupings of the classes. In 1998 it was a norm of excellence and in 1999 a norm of attendance that were the guide lines and the students were either complying or resisting this, defining themselves as "excellent" or "not excellent", as "attendants" or "non attendants". In 2000 it was a norm of normality and balance and in 2002 a norm of structure and self-discipline that were the guiding lines defining the social identities of the students. In the first cohorts the study group and the peer group were support groups, but became more referential to the individual student, a point of reference for her/his self-assessment in the latter cohorts.

The personal stage: Every student creates their social identity as a student and/ or as a professional. How this is enacted depends on what the student identifies with, as well as her/his self-image and prospects for the future.

In this study this is evident in the influence of an overall social and economic context on the students' approaches to their studies and to their future. The students who strongly identified themselves with a non academic context were most prone to make all the necessary sacrifices in order to become a Graduate Engineer and to secure a different or better future for themselves and their family. The students who strongly identified themselves with an academic context were prone to work hard in order to secure a position as a student, for the time being, and they were very confident that "things would sort themselves out" in the future.

During the 4-5 years that it takes for a student to graduate from a study program, most students develop a distancing approach to their study context and to their student roles, in favour to an identification to a professional context and professional roles. Students tend to be more critical and negative to their study context at the end of a program (Rautopuro & Vaisanen, 2000; Pancer & Hunsberger, 2000; House, 1999). If a study program shall contribute to the students' identification with a future professional role, Weidman et.al (2001) argues that the curriculum must be of such *relevance* for the students so he/she is prepared to invest time, money and commitment. It is also important that students are actively involved in the study context and in professional activities.

It is the students' aims and goals that guide their perceptions of *relevance*. Progression, application and an increasing specialisation contribute to the students' confidence that they can meet the professional requirements of potential employers after graduation. Identification with a professional role contributes to the students' willingness to invest time, money and commitment to reach their goal of becoming a graduate engineer. A strong identification with a student role can make a transition from student life to working life more difficult. Their willingness to invest time, money and commitment is based on their goal to remain students and belong to the study context.

In this study the somewhat surprising and also contradicting results from a comparison between the first and the latter cohorts could be interpreted as an enactment of the students' perception of relevance in relation to their personal aims and goals, but also to the situation on the job market. The first year was perceived as "a necessary evil", a preparation for the interesting classes. The first year was also perceived as "a test", a self-referential test. For the students in the first cohorts this was experienced with a reference to their perceptions of what they could have to offer the program and a future profession, and for the latter cohorts with reference to their perception of what the program had to offer them in their professional development.

CONCLUSIONS

In this paper I have presented comparative data from the first year of four student cohorts in a Graduate Engineering program in Applied Physics and Electrical Engineering in Linköping. The purpose has been to relate the results to an ongoing implementation of a CDIO curriculum. Data from the first two cohorts are regarded as “base line data”, from the period before the planning and implementation of the CDIO curriculum. Four main issues have been highlighted:

- The entering students’ previous study experiences, expectations and aims for the future.
- The students’ experiences of their first year in the study program.
- Commonalities and differences between the cohorts.

There is a difference between the study experiences, the expectations and the aims for the future between the first and the latter cohorts. The students in the first cohorts were goal- and future oriented and they were expecting to work hard in order to fulfil the requirements of the study program and to deserve becoming a Graduate Engineer. They began their studies at a time when the job market was bright. The students in the latter cohorts had experienced more study related stress in Upper Secondary School than the students in the first cohorts, due to increasing competition and rush for the highest grades. The situation on the job market had got tougher and the goal for many students was “to get a grade” rather than “to become an engineer”. These differences were enacted in the socialisation of the students into a study context that was changing due to the planning and implementation of a CDIO curriculum (Weidman et.al. 2001).

The results from this study show a changing approach to studying between the first and the latter cohorts, from an achievement and future oriented approach to a gratifying and here-and-now oriented approach. This is enacted in the relation between their earlier study experiences, what they expected to learn, their aims for the future and the teachers approaches to teaching (Entwistle, 2003).

The conclusion from this study of the first year in a longitudinal study of the students passage through the whole study program and with a follow up one year after graduation, is that well intended and well planned changes in a study program can give unintended results, as a consequence of this relationship. In future presentations we will see if the commonalities and differences between the cohorts during the first year will remain.

ACKNOWLEDGEMENTS

The CDIO Initiative has been sponsored by The Knut and Alice Wallenberg Foundation. The longitudinal study is sponsored by the Study Bord of the Y-program.

REFERENCES

- 1) Annual report of the Council for Higher Education in Sweden (2004)
- 2) Biggs, J. B. *Teaching for quality at University* (2nd ed.). (2003). Buckingham: SRHE & Open University Press.
- 3) Drew, S. Student perceptions of what helps them learn and develop in higher education. *Teaching in higher education, Volume 6, pp.* 309-331, 2001.

- 4) Edvardsson Stiwne, E. *We live in our own small world. The first year in a Study program in Engineering*. Paper presented at the ECER conference in Crete 20-24 September 2004. Network 22 "Research into Higher Education".
- 5) Edvardsson Stiwne, E., Rosander, M., Stiwne, D., & Karlsson, A. *Critical success factors in higher education- the first year*. Paper presented at the ECER conference in Lisbon September 11-14, 2002 in the network "Research in higher education".
- 6) Edvardsson Stiwne, E.; Brännström, L; Hempel, A & Granström, K. *Peer-teaching and co-operation within and between different study programmes*. Linköping: Linköping University. Department of Behavioural Sciences, 2001.
- 7) Edvardsson Stiwne, E.; Stiwne, D. & Rosander, M. *Expectancies and realities- Presentation of a longitudinal study in progress at the CDIO review meeting in Gothenburg* June 18-19 2003.
- 8) Entwistle, N. J. Concepts and conceptual frameworks underpinning the ETL project. Occasional Report 3, 2003. ETL project. <http://www.ed.ac.uk/etl>
- 9) Entwistle, N. J.; McCune, V. S. & Hounsell, J. Conceptions, styles and approaches within higher education. I R. J. Sternberg & L-F Zhang (Eds.). *Perspectives on thinking, learning and cognitive styles*. Mahwah, NJ: Lawrence Erlbaum, 2002.
- 10) Halamandaris, K., & Power, K. G. Individual differences, social support and coping with the examination stress: A study of the psychosocial and academic adjustment of first year home students. *Personality and individual differences, Volume 26*, 665-685, 1996.
- 11) Hallsten, L.; Bellagh, K. & Gustafsson, K. *Utbränning i Sverige – en populationsstudie*. Arbetslivsinstitutets skriftserie Arbete och Hälsa 2002:6.
- 12) Hounsell, D. J. & McCune, V. S. *Teaching-learning environments in undergraduate biology: initial perspectives and findings*. Occasional Report 2, 2002. ETL project. <http://www.ed.ac.uk/etl>
- 13) House, J.D. The effects of entering characteristics and instructional experiences on student satisfaction and degree completion. *International Journal of Instructional media* Volume 26, pp. 423-435, 1999.
- 14) Marton, F. & Säljö, R. Approaches to learning. I F. Marton; D. J. Hounsell & N. J. Entwistle (Eds.), *The experience of learning* (2nd ed.). Edinburgh: Scottish Academic Press, 1997.
- 15) Pancer, S.M. & Hunsberger, B. Cognitive complexity of expectations and Adjustment to University in the first year. *Journal of Adolescent Research* Volume 15, pp. 38-57, 2000.
- 16) Rautopuro, J. & Vaisanen, P. *Keep the Customer Satisfied. A longitudinal Study of Students' Emotions, Experiences and Achievements at the University of Joensuu*. Paper presented at the ECER 2000 Conference.

- 17) Struthers, W., Perry, R. P., & Menec, V. An examination of the relationship among academic stress, coping, motivation and performance in college. *Research in higher education, Volume 41, pp. 581-592, 2000.*
- 18) Twale, D. & Kochan, F. Assessment of an alternative cohort model for part-time students in an educational leadership program. *Journal of School Leadership, Volume 10, pp. 188-208, 2000.*
- 19) Weidman, J. C.; Twale, D. J. & Stein, E. L. (2001). *Socialization of Graduate and Professional Students in Higher Education – a perilous passage?* San Fransisco: Jossey-Bass, 2001.
- 20) Wenemark, M., Borgstedt-Risberg, M., Holmberg, T., Nettelblatt, P., Noorlind Brage, H., & Åkerlind, I. *Östgötens psykiska hälsa. En kartläggning av självskattad psykisk hälsa i Östergötland hösten 2002.* Linköping: Folkhälsovetenskapligt Centrum. Rapport 2003:1.