

Changing Teaching Concept

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Key words: syllabus, thematic term, project teaching, problem based learning, interdisciplinary courses, examination method.

SUMMARY

The survey education programme at Lund Institute of Technology, Sweden, in 2001 introduced a new, thematic syllabus. After an introduction follow one term each of natural science, GIS, LIS, real property economics and property law. The teaching is mainly problem based. The last year the students specialise. A total changeover like that takes lot of resources but can inspire the lecturers concerned to new teaching methods. During the first thematic term a questionnaire was carried out. The students were on the whole very positive to the concept, though they found it more laborious. They also believe that they have learnt more by the project than by traditional lecturing. Since the new syllabus lead to three important alterations: - no parallel courses; project based teaching and thematically arranged subjects – it is not possible to draw any conclusions about the thematic concept. Does the result depend on the combination of factors or are any of them of greater importance?

ZUSAMMENFASSUNG

Die Landvermessungsausbildung in Lund, Schweden, führte im Herbst 2001 einen ganz neuen Studienplan ein, der beinhaltet, dass der Unterricht die drei ersten Jahre in Themen vereinigt wird; ein Thema pro Semester. Nach dem Einführungssemester folgt Grundlagen der Naturwissenschaften, Geomatik, Landinformationstechnik, Grundstückswirtschaft und Grundstücksrecht. Die Studenten führen außerdem jedes Semester ein größeres Projekt vom Thema des Semesters ausgehend durch.

Im Frühjahr 2002 wurde eine Umfrage unter den Studenten durchgeführt. Dort geht hervor, die Mehrzahl der Studenten sei mit der neuen Unterrichtsmethode sehr zufrieden. Die Projektarbeit sei mit viel Arbeit verbunden, gleichzeitig aber lerne man besser. Die Lehrer erleben, dass die Studenten mehr Verantwortung für die eigenen Studien tragen und mehr engagiert sind. Gewisse Zweifel bestehen doch, den ganzen Unterricht in dieser Weise durchzuführen. Vor allem wird in Frage gestellt, die Note zum größten Teil auf der Gruppenarbeit basieren zu lassen.

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1. BACKGROUND

Young people's interest in natural science and especially in technique has decreased lately. This lack of interest has also affected the survey education programme at Lund Institute of Technology, a faculty within Lund University. When there are few applicants to the places available many of the admitted students have low marks. More students have difficulties to proceed their education, especially the technical courses.

So far the programme has had about 30 students yearly. From 2001 there are 40 and an ambition to increase up to 60. The survey programme extends over four and a half years; four years of studies and half a year to write a degree thesis. Academic studies in Sweden are organized according to a credit system. One Swedish credit is equivalent to one week of full-time studying. In the course of a normal academic year students are supposed to obtain 40 Swedish credits (equivalent to 60 ECTS credits).

Surveyors in Sweden usually have one of the following professions, though the education is in much the same: The oldest profession is the geomatic engineer, with mathematics, computer science, geodesy and GIS as the main items; cadastral surveyors also have a long tradition with land use planning, real property law and cadastral science as the core; Valuation surveyors or real property managers are late apparitions where economy, property valuation and management plays the main role.

So far, there has been five terms of compulsory courses, three terms of specialisation and one term of thesis writing. 50 % of the students are female. The students are free to choose specialisation. Most of them chose real estate management, while geomatics only attracts approximately 20 %. Less than 40 % of them have got a degree even ten years after the introduction.

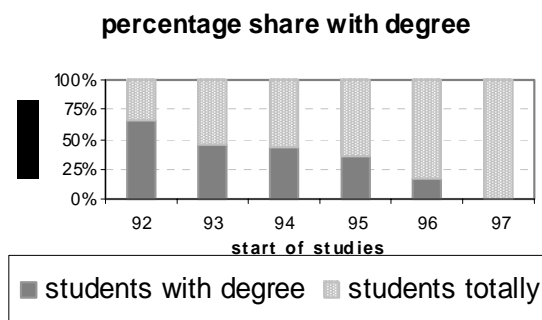


Table 1: students who take a degree are a small portion of applied students.

Roughly you can discern three reasons for this poor result:

- Some students find early another education programme or interrupt their studies.

- Many students get an adequate employment at the end of their education without the degree and lose the motivation to complete the education programme.
- Some students try to get their degree but not are able to.

Before the syllabus alteration a student had to attend different courses, often three or even four paralleled. A typical course was 7.5 ECTS. There were about twenty lectures every week and on top of that reports, essays or seminars. The teaching method was the “main thread” - later courses were built upon earlier. The students’ knowledge was gradually built up to a more complex level. There was little connection between subjects studied paralleled.

	Autumn term Sept - Dec	Spring term Jan - June
First year	Introduction, mathematics, basic law, geology	Mathematics, property law, political economy, construction technology
Second year	Programming, statistics, environmental science, environmental law, building construction and basic GIS	Mathematics, building economy, geodesy, traffic and physical detailed planning
Third year	LIS and cadastre science, property valuation, advanced GIS	Specialization: the students can chose one of three main programmes 30 ECTS
Forth year	Specialization: the students can choose one of three main programmes. 30 ECTS Free choice within limits. Student often choice a second specialization 30 ECTS	
Fifth year	Degree thesis	

Table 2: syllabus 2000. The specialisation part embraces 60-90 ECTS, thesis excluded.

2. NEW SYLLABUS

Inspired by the sister University of Aalborg in Denmark the survey programme decided to introduce a totally different syllabus. At University of Aalborg all tuition is project based. The LTH survey programme board, with representatives from the staff, practising surveyors and students, decided to introduce a new syllabus. The different subjects should be arranged strictly disciplinary: one term – one discipline. Once the term is ended there should be no more lecturing on the subject, unless the student doesn’t choose to specialise on that specific subject.

The new syllabus started in the autumn 2001. There has been a slightly increased interest in the survey programme. However this trend started some years before the new educational order. In our questionnaire most students claimed ignorance of the “new syllabus”. It is too early to state that the syllabus has enlarged interest in the programme.

The new syllabus was called “thematic terms” and was built on five themes, see table 2. Mathematics, statistics and programming are courses given to the all students at LTH, and were not included into the themes.

	Autumn term Sept - Dec	Spring term Jan - June
First year	Basic mathematic and law studies	Environment and land use mathematics
Second year	Geomatics (GIS) , mathematics, statistics	land information systems (LIS) programming
Third year	Property economics	Land legislation
Fourth year	30 ECTS optional courses in geomatics, land information or land use; 30 ECTS optional courses within LTH (LU) with limitations	
Fifth year	Degree thesis, 30 ECTS	

Table 3: syllabus 2001. Themes are typed **extra bold**. Specialisation embraces 30-60 ECTS, thesis excluded.

The first six terms all courses are compulsory. During the fourth year the students specialize depending on interest. The degree thesis should deal with a subject within the chosen specialization. One has also opened a possibility for students who want to specialize in technical geomatics to choose more adequate courses during the third year.

3 IMPLEMENTATION

3.1 Lecturers - Preparations

Experiences from this first term urge reflections. A totally new syllabus, team building and new teaching approach demand great efforts. The survey programme board adapted the new syllabus in autumn 2000. Lecturers concerned (herein after called the team) were informed some weeks later and were ordered to produce a draft to the first thematic term. The programme board allocated ~10.000 €. This sum was meant to cover the costs for four lecturers and one teaching consultant. The money was however allocated to the department, not to the lecturers, who were supposed to lecture as usual.

The programme board gave initially very vague directive. The team did know neither how their term fitted into the whole education programme nor the content of the course nor even the relations between the different course units. Initially the overwhelming problem was to decide whether we should try to work parallel or serial. Despite this uncertainty and the vague directives the team worked with lots of enthusiasm during spring term.

The team discussed course content, course units, order of course units, possible integration, balance between group and individual work and examination method. Supported by a pedagogic consultant the team decided to examine the students on the project report. Much energy was used to find an appropriate project. Finally a road project was selected as the most suitable application example.

Initially the team intended to integrate the former four courses into one single interdisciplinary course with the project as a comprehensive part. However the legal aspects concerning surveyor problems were problematic to integrate in geology or road building techniques. When the programme board disapproved the examination method and directed a written, individual traditional examination, the integration idea vanished and with it the team

commitment. At the same time it was decided that there would be no teaching assistant to assist the students during all units. A course administrator was appointed.

Left were rudimentary attempts to integrate around some themes where the connection was obvious like “ground water” or “the concept of road”. On the whole the result was four rather clearly delimited course units. Each unit ended with a written group-essay, and an individual test. The term ended with an all-embracing written test. Each group-report and individual test was marked in a very sophisticated way. The discussion concerning these marks was unhappily not quite finished when the first course unit started. Each lecturer prepared his own unit separately. It was obvious that the term would consist of four separate units, each of them ended with a test and an essay.

The team had a late start concerning the project. Looking in the rear-view mirror we realized that we should have introduced the project early in the process. Many discussions concerning integration probably never had appeared. To our defence we can only say that even lectures are human and need time to form a working group. A road seemed to be a good example, since its geographic extension and technical demands create interesting conflicts well suited for analysis. But we were too ambitious. The section was too long, the alternatives too many and, worst of all, there were too many study reports to copy. We also found it a bit difficult to formulate the task distinctly. As every unit was very concentrated we were uncertain of what criteria we should use for the task. How much knowledge can a student acquire, understand and analyse within the period of four weeks? Theoretically the course should be the same, but in practise we had to recreate our material a lot, partly because the project stole half of time.

3.2 Students

The team was eager to know how the students reacted on the new syllabus. Most of all we needed guidance about our continued work. Should we try to integrate our units into one whole or should we keep the units separated – even more clearly? Did the students see the over all picture or did they just see four sequential units? If they didn’t see the coherence: why not?

The study was carried out at three different occasions during the spring term 2002. All students were asked to answer a questionnaire at the end of the first, second and third unit. An oral symposium was planned at the end of the term, but was postponed till the beginning of the autumn term. On the other hand the students then had some distance to the first term.

The questionnaire had ten questions, distributed on the following subjects:

- thematic syllabus
- group work
- project work
- examination
- general information.
-

Some questions were of the type “describe shortly...”, others asked the students to mark the level of agreement on a line not at all _____ completely.

The line was 50 mm long which made it easy to rank and operate the answers.

3.2.1 Thematic syllabus

Joining similar courses to one huge term unit got unqualified approval from about 30% of the students. These students hoped to get a better understanding of how the different knowledge is part of a puzzle. The rest of the students were a bit pending. The concept, they said, is good, *but* common objection was that the studies were more demanding. Our modest attempt to integrate course units was very unpopular. The students just were confused.

In next questionnaire most students more decidedly were pro or against. To our satisfaction many of the former ambivalent students now were positive. Negative remarks usually had one of two reasons: the person concerned didn't like our attempt to integration or he/she was dissatisfied with the administration and the information. I will come back to that.

Opinions like "very good, one understands how to apply the knowledge", "good to get an increased understanding of how the different units completes each other". Some of the students are now much more negative to the whole concept: "it might be good to integrate different units but the work load is constantly very heavy and it is rather muddled what we are doing." – "I had learned more with traditional tests." – "Poor! I can't see the whole; all revolve around the road."

In the third questionnaire we could notice certain tiredness. Now the students began to worry about the comprehensive test. Few regarded the four units as parts of a whole. "A good idea to create connections but each unit should end with a separate test" is a typical opinion. Concerning the connections between the course units most students meant that the project worked as connection. "One understands how the knowledge can be used in working life." "Weakest connections to the project have the legal aspects."

3.2.2 Group work

Most work was performed in groups. Four students - usually two male and two female - formed a group. The students had little influence over the group assembly.

Group work was the most controversial part of the project method. Initially two problems were pointed out: the risk that a group member turns out as a "free-rider" not doing his part of the work, and the risk that the task is divided between the group members so the overall picture is lost to them.

In the first questionnaire the judgements are overwhelming positive. Most students point out the risks but at the same time state that *their* group works excellent. In working they start to discuss the structure of the essay, divide the job – sometimes by two – discuss and exchange opinions and experiences. They have fun! A few are displeased and find the workload unfairly divided or state that "one person decides".

The second questionnaire gives the same picture. 70 % still regard the group work as successful or very successful. The working method initially formed has been polished. A typical answer is "The group works very good. Come together, discuss the problems and decide a structure. Divide the work among ourselves, work individually. Intense and

demanding composition.” Many of the students stressed pleasure, discussion and mutual listening.

Groups working less efficient usually directly divided the work among them selves and then joined the parts with little or no discussion. Typical answers from these students were “it is rather tough sometimes but I guess that’s inevitable. We work separately and then we join the essay together.” In these groups we found anxiety that someone just would slide through. Two groups of totally nine had such problems that we had to interfere. Three students from these groups chose another education programme the following term or made an interruption of studies.

Asked for the essential part of group work the students pointed out fellowship. The possibility to discuss with others, openness, respect and learning were other important key words.

3.2.3 Project Work

A fundamental part of the syllabus was the project, which was supposed to get coherence between the units. The team had selected a five kilometres long road section where the National Road Administration had investigated four alternative localisations completely, with environmental impact assessments included. Each group should analyse one alternative. The students had access to the whole study. They had to write four different essays concerning geological, legal, environmental and construction aspects on the road localisation. Every essay should have two parts: the first part theoretical and the second an application of theory on the project.

As mentioned before, the team found it problematic to give a final shape to a project task that covered all four aspects of the term. As you can see from the diagram 3 below, our first attempt was not very successful. We were not capable to improve this during the term.

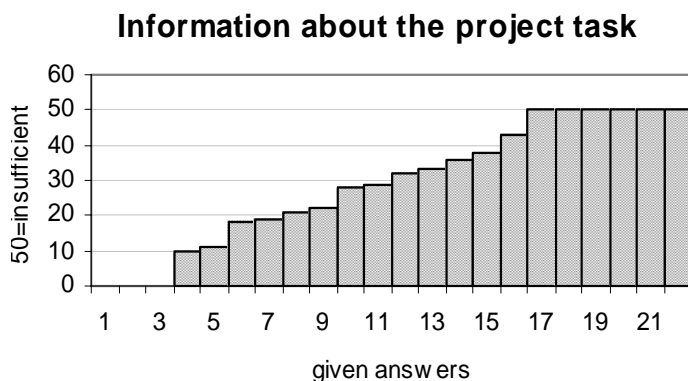


Table 4 .still in the third questionnaire 27% of the student consider the information very insufficient.

One reason was that the team was poorly prepared. Another that the students were not prepared for independent, academic studies. They were used to detailed instructions. “Just tell us exactly what you want us to do and we will do it” was a common comment. From the questionnaire I cut some typical opinions: “one should have informed more about everything”; “all that has been said is very fuzzy”. They got a problem, heaps of facts,

literature and reports and were forced to decide structure, extent and content of essays themselves. They more or less copied material from consultant reports or prescribed texts without discussion or analysis. This was especially obvious when they should apply theory on the road project. Their ability to use their own knowledge was very limited. They could not understand why they got bad marks despite an extensive essay. The communication problem was widespread.

It was not until the end of the term they realized that our demands required an ability to work independently. But some realized early that there was a pedagogic point behind the poor information. "Perhaps everything should not be served, but it is difficult to know what the demands and the expectations are." Others have understood that lecturers can be a resource: "it was bad in the beginning, but when we began to ask we got answers."

Group work suits students very unlike. Teaching methods varies and suits lecturers and subjects more or less good. For the moment problem based learning is very popular. Similar concepts are case-methods or other project based methods. All of them are time consuming. Typical is that the students have to work in groups. It takes time to listen to everybody and formulate a joint conclusion. The positive side is learning. You have to understand to be able to write a good essay on a subject.

There was neither time nor money enough to adapted lecturing to the project. To be kind you can say that the project was adapted to the lectures. In spite of this the students found the lecture series interesting and a good help to carry out the project. Some of them stated however that lectures discussing subject not treated in the project were quite unnecessary.

3.2.4 Examination

The team initially sketched an examination based on written group essays, oral seminars and poster presentations summarized in a final report. The demand from the programme board mention above changed the conditions totally. The result was almost a catastrophe. There was excess in examination occasions. Since 50% of the credits should relate to the project all essays must be evaluated. On the other hand the board had demanded individual tests. A natural consequence was that each lecturer ended a unit with an individual test, evaluated and marked. Finally there was a comprehensive test, covering all four units. The poor students thus were tested at nine occasions, each evaluated and marked in a very sophisticated system. I will immediately stress that the lecturers too were very dissatisfied with the system. The discussion continued during the term, which led to further confusion.

Initially the students didn't complain. Discussions concerned the marking system and especially the possibilities to get a high grade when many results are added. In the last questionnaire we asked the students if individual examination is an essential part of learning. The result is a bit astonishing: more than 30% declare that tests have none or little importance.

individual test is an important part of the learning process

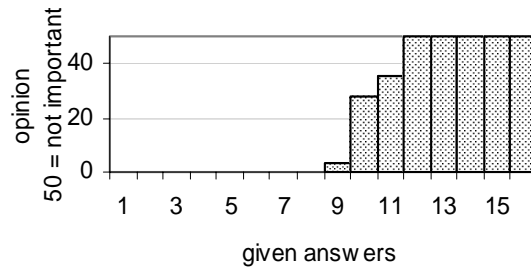


Table 5: opinion about the importance of tests divided the students.

Similar partition was found when we the questioned if good grades hint good knowledge. As the end of the term came closer the students complained over the final comprehensive test, which they found quite unnecessary. The general opinion was that too hard work was needed to recover knowledge which had been tested once before.

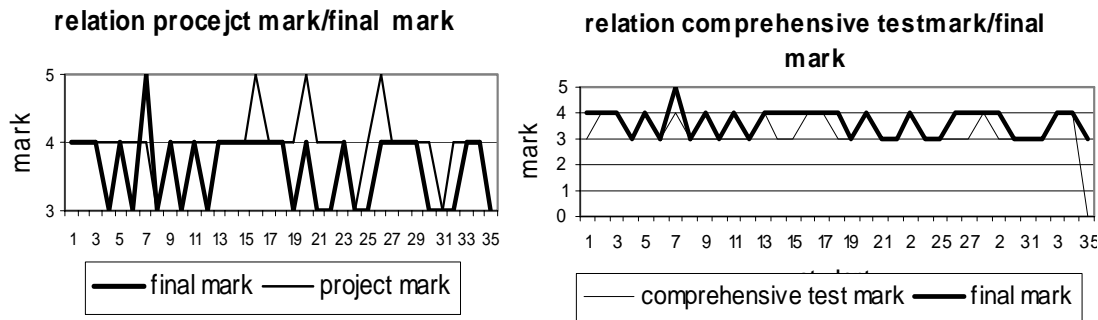


Table 6: There is good co-variation between the project marks, the comprehensive test marks and the final marks. 26% of the students got better mark as a result of the comprehensive test and 31% got a lower mark.

3.2.5 General information

Information is a very important part of alterations. Most students were not aware of the new syllabus before the term began. Only one student stated that this had affected his choice of education programme. The majority said that the new syllabus had no affection *but* they would have had much more information at the start, se diagram below.

sufficient information

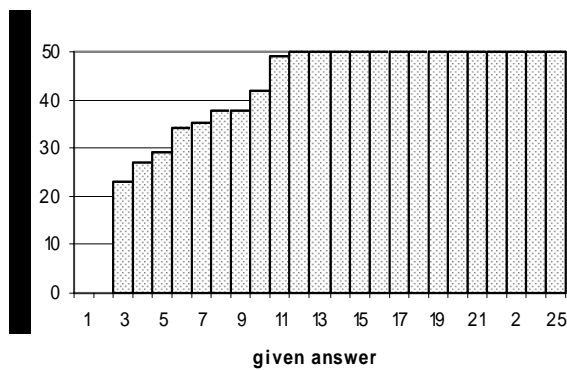


Table 7: information about the theme principle, examination demands and method etc. were poor.

Demand for information was most commented after the second course unit. The first and the second units had rather different structure and content, one was technical the other legal. The essays were supposed to be different. One should describe the rock and soil in question and its characteristics from maps and literature. The other should have an academic approach and describe how Swedish law has its roots in international declarations, conventions and EU-directives and how these legal rules are interpreted.

The students could not use the same methods. Their confusion increased. The third task was to present an environmental impact assessment and the fourth to present a poster on road construction; both represented new teaching - and report methods and were of little help in clarifying what the university demands from its students. Our ambition to get them to know different methods rather increased than decreased their confusion.

3.3 Lecturers – Considerations.

What did the team feel about the new pedagogic method? Compressing a course from fourteen to four weeks raises problems. Four weeks is a rather short time for a student to learn basic knowledge, to structure the knowledge, identify the core, apply the adequate part on the project and describe that in an essay. On top of this a written test to prove that they had acquired all theoretic knowledge required. This was a challenge!

The result of the lecturers' ambition to weave the course units together was that there were no pauses between the different units. Lecturing was going on uninterruptedly from New Year to summer with breaks only on calendar "red days". From the questionnaire we know that the students found this very laborious.

There are however many positive things to say. The student now could devote themselves by all their heart to our course, as there was no concurrent. The lecturer could dispose time wholly to his own mind. If a need arise to complement some issues it was possible to give an extra lesson. The project opened up for a practical application of the theory.

The project based learning and the group work promoted a more mature attitude to the learning process. The students developed a “how can I learn” perspective instead of a “teach me” perspective. The solidarity within the student group increased and the studies were pleasurable. The students were more engaged which passed on to the lectures that became more enthusiastic. To the lecturers the team work resulted in a feeling of togetherness and insight in the other course subjects in a way that is rather unusual at university.

At the oral assessment the lasting impression was the student’s opinion that they had learned more by this educational method than by a tradition one. However the feeling of guinea pig was very obvious as was the feeling that the administration had been poor.

4 IMPROVEMENTS

The second version of this course is running just now. The team is unchanged and still enthusiastic. There have been several improvements – or what is supposed to be improvements. The programme board realized its mistakes and has apologized for their interference. The unit tests have been abolished and each unit now ends with a group essay. The written individual comprehensive test is still there – it’s our opinion that many students need some kind of whip to learn basic facts – but the design is different. The students will have access to their own essays and the course literature. The intention is that the students must demonstrate understanding and analysing skill combined with knowledge.

This time we have an imagined project. This gives the team freedom to construct interesting problems. There are no studies, no analysis and no reports. The students have to start from scratch. The project concerns a limited area.

All integration ambitions are put aside and the four units are clearly separated by one or two free days. No lecturer appears in “wrong” unit. On the other hand, the project has been adapted to all four units and we believe that the project task as coherent core has been strengthened. As a complement to every essay the students produce a transparent map. The final conclusions should be based on a these maps, analysed with a simple overlay technique. The requirement remains that 50% of the mark shall relate to an individual test. We hope that a test grounded on the student’s own report shall be regarded as a part of the course.

5 CONCLUSIONS

Finally I will try to summarize our experiences and stress some points of interest:

- Implementing a totally new syllabus is an extensive work, which demands much time and money. Lecturers concerned must be informed from start. The goal and content of the term must be clearly defined before the preparation work starts. The courses’ place in the education programme must be clearly defined.
- Teaching methods must be clear and approved by the lecture team. In our case the programme board was inspired by project teaching at University of Aalborg, but could not produce the necessary economic or personal recourses. The team was never consulted and had little influence over the design.
- It is a big step to make one interdisciplinary course from three or four specialized courses. In my opinion this is not necessary, perhaps not even desirable. Such a course

would be very extensive. The students prefer to learn by separate, smaller units. On the other hand: what is interdisciplinary? Who can say that today's definition of disciplines is appropriate?

- Is the theme syllabus a good idea? Lecturers with similar competence can collaborate or even replace each other. Students can devote themselves totally at one subject at the time and penetrate a subject thoroughly. On the other hand they can get totally distasted when uninterested in a specific topic.
- Thematic terms are specifically design to one programme. There is little possibility to cooperation between different programmes. This makes education more expensive and delimits the students.
- Will the new syllabus increase the part of students who degree as intended? Mathematics was a problem but is not included in the theme system. There is no new concept concerning the degree thesis, which was and is the other big problem. Theme system might have an affect on the mathematics as the theme studies are pursued within groups, but there is no obvious reason why the change should solve the problems.
- Is it rational to use the new teaching method during a whole education programme? What alternatives are there? In the former method were different subjects arranged in a logic consequence in order to support each other. The new syllabus has strengthened the bonds between similar subjects, but weakened the bonds between different subjects. It is too early to judge if one method is better than the other one. However the system makes it impossible to insert a bachelor degree.
- The concentrated lecturing pave the way for difficulties to a student who gets ill, as the work is very intense. It is more difficult to re-examine students who fail in the tests. There is little time for reflections. The same goes for the lecturers, who have to work very hard for a short period, but who may be under-employed part of the term, if they are not scientists.
- The very positive effect is that the students give evidence to a better learning even if they have to work harder. It is also positive that most of theme prefers the new syllabus to more traditional methods. The study can not answer the question why. The thematic term caused three alterations: there are no parallel courses (except 7 weeks of mathematics); the teaching method is project based and the subjects are arranged by theme. Does the result depend on the combination of factors or is any of them of greater importance? Personally I guess that the project based method is the determining factor. Pedagogic research proves that students remember more of the matter since the have to understand it to pass the exam. They also get practice in methods to learn by themselves.

Finally, I will state that the alteration has brought lots of work and taken lots of time. The lecturers concerned have formed a team that has had much fun in formulating the term schedule. We have been stimulated to discuss and refresh our teaching methods and the content of our courses. Perhaps that is our best contribution to the students.

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LTH Course Prospectus

BIOGRAPHICAL NOTES

Åsa Knutson lectures at Lund technical Institute, Lund University, Sweden since 1995. Before that she was employed at the National Survey Board as Chief County Surveyor.

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