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Enabling Multidisciplinary Learning: A Descriptive Study

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INTRODUCTION

There are many reports about Finland and the challenges Finland is facing. Many of these reports pose requirements towards education in order to be able to answer future challenges. One challenge is for example the aim to get different disciplines working together (Technology Industries of Finland 2003). Students should be able to acquire knowledge and skills from many disciplines during their education (Ruokanen 2004). Future education should offer chances for multidisciplinary learning. The reports also write that teachning should be organizated in larger modules that are based on real-life competence requirements. (TT 2003)

Another major challenge is to enhance knowledge in business operations and entrepreneurship (Ruokanen 2004; SITRA 2005). Internationalization is also a big challenge and it should be strengthened (Technology Industries of Finland 2003; Ruokanen 2004). Polytechnics should encourage student exchange (Ministry of Education Finland 2005). Degree Programs should provide possibilities for individual curriculums ie. individual study plans (Ministry of Education Finland 2003). Another challenge is to have such a tutoring organization that supports and guides students in their studies and decreases number of drop-out students (SITRA 2005). Development actions should focus primarly on speeding graduation and making quality of teachning better (Ministry of Education Finland 2005).

This paper describes the curriculum development process carried out in 2003 to 2005. The description shows, how curriculums but also internal processes were developed to promote multidisciplinary learning and to answer challanges presented in many of the above mentioned reports. The paper continues describing the research setting, the development steps, current situation and finally concluding remarks.

RESEARCH SETTING

The Finnish higher education system is made up of two parallel sectors: universities and polytechnics. The basic purpose of universities is to perform scientific research and to provide higher education connected with it. The polytechnics (Universities of Applied Sciences) are usually regional higher education institutions which emphasize a connection with working life.

This research uses qualitative approarch and presents a decsriptive case study of a curriculum development process in the faculty of Telecommunication and e-Business in Turku University of Applied Sciences. The process changed curriculums of five degree programs that all operate in one campus (Table 1). These degree programs are all quite small: the number of incoming students is only 120 yearly ranging from 17 to 30 students per degree program.

The curriculum development process was started for many reasons: financial pressures, staff workload, industry viewpoints and curriculum constraints. However, one of the main reasons was our will to enable multidisciplinary learning.

The financing of the small degree programmes was not enough to offer anything else other than a basic setting of courses. In the curriculum only

Table 1. Degree programs and specializations

Degree Programme	Specialization	Credits ECTS	Discipline
Business and Administration	e-Commerce and Marketing	210	Business
International Business (in english)	Technology Marketing	210	Business
Business Information Technology	Database Systems	210	Information Systems
Business Information Technology (in english)	Business Information Systems Management	210	Information Systems
Information Technology	Embedded Systems	240	Information Technology

15 ECTS (optional studies) was not predefined and fixed rather student could include here for example additional foreign language courses. Students were allowed to take courses from other disciplines, but because time schedules were not syncronized and pre-requisite rules of the courses were not clearly defined this did not operate in practise. More coordination was also needed because there were similar topics in every degree program, but typically under different course names that also had slightly different content and credits.

The curriculums were filled with a large number of small (3 ECTS) courses, which made the management of these degree programs challenging. It was also quite impossible for students to keep up about their records and know which courses they should still enroll. Maybe, the biggest problem relating to these small courses was that the professional competence students were aiming at was hided or was at least a little fuzzy. This was also a question of teachers' resources: instead of concentrating on couple of large courses, every teacher had a mixture of small courses. This meant that a teacher had to master many subject areas without actually being a master in all of them. Constant changing from topic to topic also reduced the time to really develop the courses.

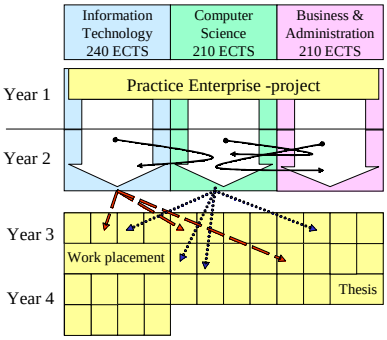
DESCRIPTION OF STEPS

Our first task in every degree programme was to define the core competence and core studies. As a supportative material we used reports:

- IS 2002 (ACM, AIS et al. 2002)
- Computing Curricula (ACM and IEEE 2005)
- Computing Curricula 2005 (ACM, AIS et al. 2005).

These reports describe for example the exit characteristics of graduates that are easily applied in all our degree programmes. At the beginning of the process we had one orientation day and after that we have had several afternoons for curriculum development purposes. Meanwhile several groups of teachers have worked and processed our curriculum definitions. Afternoon meetings were mainly used for cross-checking and for general curriculum topics. The final results were presented and discussed in our advisory board that consists of industry and business representatives from the region.

Figure 1. Structure of curriculums



Our basic idea was to find the core competences that a student must achieve in order to receive a bachelor degree in certain degree program. The result was a curriculum where first two years were almost fixed (Figure 1). Basically we defined core learning outcomes and elective learning outcomes like proposed by ACM and IEEE (2005). Last two years consisted of optional modules either from your own discipline or from the other disciplines.

We identified also common core courses for every degree program like first course on e-Business and Practice enterprise –project where all first-year students work in a multidiscipline group and study basics of business operations in virtual practice enterprise network.

The curriculum is based on competences and study paths are defined around these competences. A study path consists of restructured courses (now 6 to 9 ECTS credits) and ranges from 20 to 80 ECTS credits. The study paths also described the relationships between the courses. At the beginning there were around 20 different competence areas and study paths.

Next step was to concentrate on pragmatic questions:

- How we inform students about the new curriculum structure?
- How students know which modules are available?
- How to syncronize the time schedules of the five degree programs?

The time schedule syncronization problem was solved by dividing weekly schedule into 4 to 8 hour blocks (Table 2). A course will be placed in one block and it will not disturb any other courses. Basically a student could select one course from one block and build his/her time schedule this way.

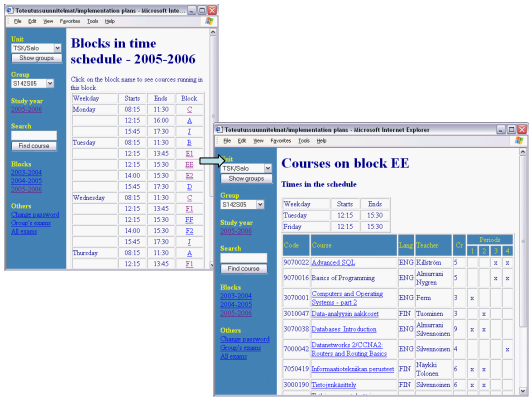
Also one of our information systems was modified to contain this information about time schedule blocks. The new features give students a chance to list all the blocks, to select a block and get a list of courses in this selected block and to view the implementation plan of an interesting course (Figure 2). This information system became a very crusial part of the study process.

At the beginning of a new semester all these changes had to be informed to students but also to teachers. The degree programme managers were key actors in this process. The understanding of this new way of learning was especially important for tearchers acting as tutors, because they have to be able to answer all students' questions.

Table 2. Time schedule blocks

	Monday	Tuesday	Wednesday	Thursday	Friday
8-10	C	B	C	A	B
10-12	C	B	C	A	B
12-14	A	E1/EE	F1/FF	F1/FF	E1/EE
14-16	A	E2/EE	F2/FF	F2/FF	E2/EE
16-18	J	D	J	D	
Open learning = O					

Figure 2. A snapshot from the information system



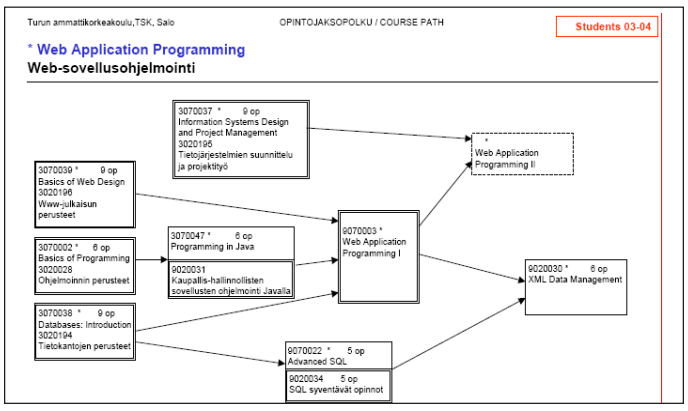
This semester 2005-2006 is the third one after the big changes and now those students that started two years ago at the same time we introduced these changes are entering into their third year and are truly making selections among the study paths. The previous two have been a good time to test study paths and all our processes, but still our chances to restructure those earlier curriculums were more limited.

During these years the core of the degree programs has shaped into a better format. Many of the core courses are starting points of different study paths (14 different; see example in Figure 3). In addition, we have four different study paths for languages. The study paths are published on the Web: http://ixos.turkuamk.fi/englanti/studying/coursepaths.htm.

During the process we encouraged and expected our tutors to have discussions with the students to receive feedback from these new arrangements. The feedback from the student has been quite promising and inspiring. Now students have real choices and they can define what kind of experts they want to become. This new system has also improved study possibilities of exchange students, because teaching offered in English is easier to find and you don't have to worry that the course will conflict with some other course later.

One major challenge during these three years has been integrity of the information shown in different information systems. There are basically four separete information systems that must integrate information between each other: study guide database, student register, implementation plans and time schedules. At the moment these systems do not have any automatic integration solution available rather the work is done manually. This semester a lot of attention is paid in the integrity of the information and now the information presented in different information systems is solid.

Figure 3. An example of a course path



CONCLUDING REMARKS

We have answered many of the challenges that have been presented towards higher education. We have now more motivated students than before because of our curriculum developments. All degree programs have many times more elective courses than before. We have developed a system that truly support individual study plans and enables learning that crosses discipline boundaries as required. At the same time our curriculums have become well-defined and easier to understand. This new system has also improved our planning. We have to know when different parts of the course paths will be and must be offered in order to support students moving along the course paths. We have to have our plans ready earlier. Otherwise we can not provide necessary information for students when they are planning their selections and building their individual study plans.

Now the curriculums describe the competences rather than just a list of courses whose relationships you only could quess. The course paths guide students in their studies and provide a very helpful tool for a tutor. The role of our information systems is emphasized. However, we still need to improve the integration of the information systems. Therefore we have started a development project which should solve many of the current integration problems.

Our results in Salo campus are so promising that same kind of arrangements will be done in our Turku campus as well during this and next year.

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