An Interdisciplinary Course: Interaction Design – Communication and Users In IT-environments

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ABSTRACT

This paper presents the undergraduate course "Interaction Design - User and Communication in IT Environments" (ID-course). We have combined students from different backgrounds let them run innovative projects related to IT with emphasis on methods from the field of interaction design. Students identified and selected any interaction design problem to work with as a project during the course. We have studied three cases during the course. Subcultural differences among the students should be regarded as an effective variable for the outcome of each project. Student more successfully and more enthusiastically approaches their ideas when they collaborate interdisciplinary with different background and competencies.

INTRODUCTION

There are many learning styles and individual approaches to learning. For instance, according to Marton et. al. learning runs on a scale from holistic to atomic [1]. Those who learn with a holistic approach learn the big picture before going into details and vice versa. This is analogous to Edward de Bono's view of lateral versus vertical thinking [2]. The cognitive style of creative people is, according to De Bono, that of lateral thinking. The characteristic feature of lateral thinking is the ability to recognize patters for solutions across vastly different domains. For example, a surgeon envisions the solution of how to use radiation to kill a cancer tumor without damaging the surrounding tissue from watching a movie scene displaying a U.S. air raid during the Korean War. The carnal let the plain approach the target from different angles, the surgeon realises that multiple beam with low energy combined at the location of tumor would generate energy enough to kill the tumor. De Bono advocates that lateral thinking is vital for the survival of an organisation.

Riding et. al. adds one dimension to Marton's view of learning cognition. First the holistic – analytic (Marton: atomic) to which a textual – visual dimension is added [3]. By textual means that persons more easily understand and learn from textual content, whereas person with visual learning style find images more easily to comprehend. Figure 1. displays these dimensions and their relations.

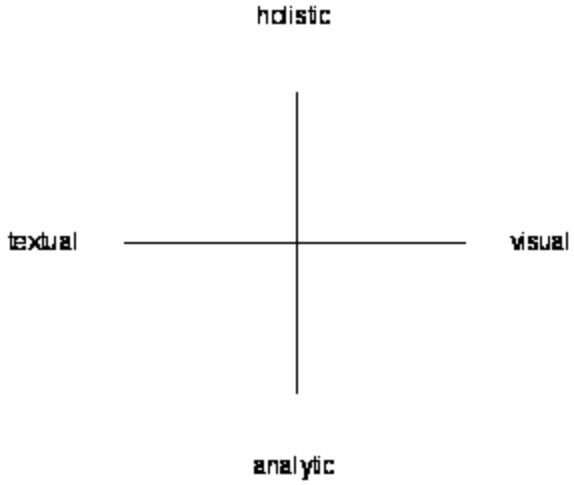

Figure 1. Learning style dimensions, the horisontal ax displays the textual to visual dimension. The vertical ax displays the analytic holistic dimension.

The classical pedagogical approach is analytic, most courses given by the Department of Computer Science (Idt) falls into this category. Learning start from analytic details, reaching new levels of knowledge until the student eventually reaches the ability to synthesise new knowledge. Figure 2. shows the learning style dimensions of our course in relation to a classic course. Approximate positions of the learning style of the student that took our course is also displayed. Evaluation in depth interviews revealed that students from the Department of Innovation, Design and Products (IDP) have more of a holistic learning style, whereas IDt students are more analytic. It is harder, thou, to be specific about the textual – visual dimension, there were only indications that IDP student had a more visual based learning style compared to IDt students. Even though we had as few cases as five (5) we claim that the differences in the analytic – holistic learning style dimension are true in the general case since each student have spent at least three years in the respective environment of each department, hence they are under strong influence of the over all environment of the department.

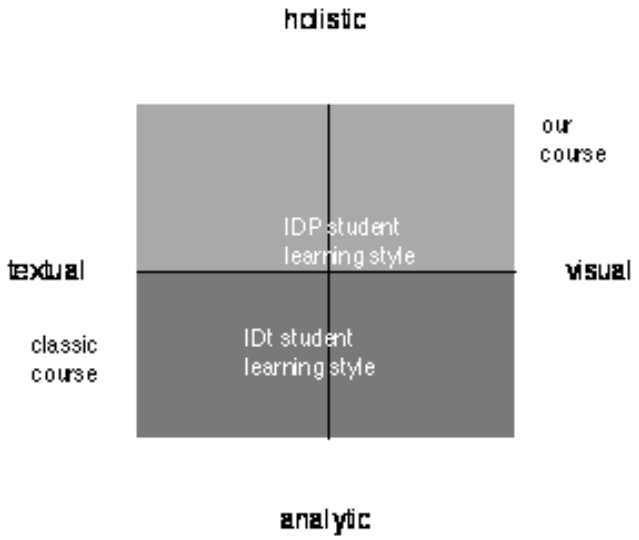

Figure 1. The top light gray region represents the learning style for our course. The bottom dark gray region represents learning style of classic pedagogical approach. The white labels' position represents the learning style for student from each department.

Disscusion

The conclusion from the theory of cognitive styles and learning stagiest is that a Problem Based Learning [4] (PBL) pedagogical approach would move away the focus from analytical learning to holistic. The basic idea is to let the students take responsibility for their own education. Control is displaced from the teacher to the students. There are number of advantages from the PBL approach, among them training in social competence, training in critical thinking, and training in the ability to analyse a realistic problem or case.

A framework for students how to approach a case are Anne Algers' 12 steps [5]

1. **The staring point, the case**. What is the team's view of the case? Explain all the case's terms and concepts that are nontrivial and not easily understood.
2. **Associate freely around the staring point/case.** Note all the team's suggestions, ideas and associations without rejections, criticism, or explanations.
3. **Catalog the problem space.** Evaluate, sort, and catalog the ideas. Reject those that are irrelevant.
4. **Evaluate the team's knowledge of the problem space.** What does the team already know?
5. **Focus on what need to be learned.**
6. **Precise what needs to be learned in the problem space.** Put concrete questions for all members of the team to answer. What is the team's strategy to answer these questions?
7. **Learn with learning goals in mind.** Study literature. Make sure the every member of the team knows the answer to the questions.
8. **Process the problem space with the new knowledge.** Discuss within the team theory and facts on a general level.
9. **Apply the knowledge to the staring point/case.** Discuss theory and facts on a specific level.
10. **Evaluate the team's new knowledge of the problem space and the teams learning strategy.**
11. **Evaluate the strategy for the team to produce a memo of the case.**
12. **Produce a memo.**

Now this framework was specifically developed for the food industry engineer education at Skövde University. However, they can serve as inspiration for PBL courses in other domains such as for instance computer science, usability engineering, and interaction design. It is a good example how theory can be applied in practice.

INTERACTION DESIGN COURSE

The idea for the undergraduate course "Interaction Design - User and Communication in IT Environments" (ID-course) was to combine students with different backgrounds let them run innovative projects related to IT with emphasis on methods from the field of interaction design. The course was administrated from two departments: The Department of Innovation, Design and Product Development (IDP) and The Department of Computer Science and Engineering (IDt). David S Ebert's and Dan Bailey's multidisciplinary and collaborative course in computer graphics and animation inspired us [6]. The first course occasion took place during a calendar period of 20 weeks in the fall of 2002. The scope of the course was 10 points (measured as 10 weeks full time work).

Goals for the course

1. Problem Based Learning approach. Students learn and understand from what they do. Even better so, if they are not given detailed instructions or goals. Hence, they should plan what should be the goal for their project themselves and how to handle the problems.
2. Students should be highly motivated by creating something of their own from their initiative.
3. The assumption that multidisciplinary work would stimulate lateral thinking and teamwork.
4. Collaborative learning, where students learn from each other in terms of learning strategies as well as knowledge and awareness of problems and methods from each other's disciplines.
5. Emphasize on behavioral science methods and qualitative methods in the interaction design process.

Our approach

We recruited a small number of students from each of IDP and IDt departments, as well as industry. We let the first

occasion of the course be a pilot study of our approach. Our assumption was that project teams with combined students from different backgrounds would have better output and result due to combinations of skills and competences [7]. We also thought that the environmental diversities, derived from each department's pedagogical approach and role models, could cause tension and conflicts within the multidisciplinary teams [7].

Projects

Students identified and selected any interaction design problem from either industry, research or from their own ideas to work with as project during the course. The students had to write an initial project plan. They got more aquatinted to the problem domain by literature studies and by conducting interviews with users. The students posed a solution design rationale for the selected problem at hand. They implemented and evaluated concept prototypes and product prototypes for this design rationale. All user centred evaluation took place in a controlled usability laboratory environment at the Digital Lab at IDP. Finally the student wrote and presented a paper on their project and results.

Seminars

In parallel with these projects we ran a series of seminars. We discussed theory of interaction design as well as research methodology and computer science theory. For some of the seminars the students had to present a literature study, both in-group and individually. For this study the students selected a topic from an appointed field. For instance the field could be: memory, stress and motivation; cognition/perception; interface design, media, shape and colour.

Guest Lecturers

Guest lecturers were also invited; Annika Wearn from Swedish Institute of Computer Science (SICS), talked about interaction design in games. Camilla Rastas from Rehabolaget, talked about physical ergonomics in computer use. SICS is an industry research institute for computer science, where two laboratories are committed interaction design. Rehabolaget does investigations in site working ergonomic environments, and sell retail tools for physical ergonomics.

STUDENTS

We aimed to recruit total 16 students, mostly from IDP and IDt and a few from industry. We wanted to run the course as a test run, before recruiting some 40 students. Even though we got a fair amount of applicants, many never showed up due to the lack of information the students received from the departments. Our question is: why did not those students that were interested in taking the course contact us? The students from industry as well as some of the others dropped at an early stage, due to the economic decline. Only 5 of the 9 that started completed the course.

Students' Environment

IDt is a small department, around 450 students; with main focus on educate students in computer science and engineering for corporate industry. The students are trained to become skilled software developers. Computer programming languages, algorithms and real-time systems are in the core curriculum. The pedagogical approach is mainly based analytic/atomic learning and vertical thinking, however many lecturers are experimenting with approaches to PBL. Students' environment is fairy homogenic, and is characterised by working with well-defined small problems. Also most teachers are men.

IDP is a department with around 1000 students, and with a broad variety of curriculum programs mainly the program for Innovation, Human, Technology, and organization (IMTO); The Illustration Program, The Text Design Program; Information Search Program; and Engineering Programs. However, there are also programs for art management and scenography. Thus, the students' environment of the department is divided into several subcultures. A common denominator is striving towards innovative design and lateral thinking. Without going further into each subculture the overall environment is a creative one, characterised by methodological approaches to design from viewers' perspective or users' perspective.

THE PROJECTS

Multidisciplinary

Three projects were run during the course. One of these projects had two participating students from each department. This project sought alternative ways for quick launching the users favourite applications and files. They went about their task in an impeccable way. They based their idea on theory, made thorough literature studies in the problem domain, stayed true to their evaluation results, and eventually made well-founded conclusions. They also implemented a working prototype for Windows XP. During their process they had several different ideas. They evaluated ideas and threw them away without hesitation if it turned out to be a major flaw in the concept.

IDt Students Project

Another project had two students from only IDt. They wanted to create a tool for making blueprints for house renovation. This group was determined to create their favourite application, based on their ideas. They used interaction design methods for sure, however their attitude gave us the impression that they felt themselves forced to use these methods but did not rely on them. For instants, they never showed their design concept to users, and only made a summative user evaluation. Even so, they deferred from taking the users point of view and listen to critique. On the positive side they showed admirable determination to get the code running. But the prototype, although with a fresh approach to 3D modelling, was full of simple user interface flaws. Many of those errors could have been avoided if they had made user evaluations along the way, which eventually would have rendered a more useable product prototype. For example one of the flaws in the application was multiple ways of doing one thing, this mean that the students had to write redundant code, thus making the prototype more complex and time consuming to develop. Also for instance the help system could have

easily been evaluated in advance by showing users the design at concept level. It is our suspicion that their determination comes from IDt pedagogical environment, where running code base rewards rather than innovations.

IDP Student Project

The third was a solo project by a student from information design at IDP. This student's idea was to look at use of computers in home environments. The assumption was that people's homes had become employers' affiliations in which the presents of personal computers and other IT-artifacts generate stress. Combination of cumbersome furniture and smaller home space make the problem, according to the student, even worse. The students proposed solution was to design a desk, which could hide screen, CPU, keyboard, and modem etc. The original approach was to develop and build this desk as a prototype, fulfilling ergonomic requirements of TCO[1]. What happened was that during the process the students change the plant to only make a blueprint design since the antropometrics theory as well as physical ergonomics and even carpeting was outside the students scope of competence. Most method of interaction design and those we advocates for are all based on building prototypes, therefore we could not let this student escape this demand. But what could be escaped is to fulfill the entire ergonomic requirement; it is after all only a prototype.

STUDENTS' COMMENTS

Instead of evaluating the course with summative form, we chose to discuss the course in focus group. The first comments were that the students felt themselves left in limbo; "To do what you want makes one confused!" The students requested more control of their projects and clearer demands from us. They wanted to know in detail what we expected of them. This came as no surprise to us, teaching often disregard creativity, innovation and critical thinking.

The students would have wanted us to force them to choose a topic much earlier with clear examples of what one might do. It is our experience that such examples make it too easy for the students, when presented a set of projects it almost never happens that they choose to work with something outside this set. Safety is a factor; hence, this is sound behaviour.

The IDt students said that it was difficult to work in a course that did not have the traditional form of lecturers, laborations and examination. They asked for more seminars and more practical exercises, but with time devided in 2 weeks for seminars and eight weeks for the project we will never squeeze in more that takes time from the project, the foundation is learning by doing.

The students would like to have discussed what a model is, what is a problem formulation and how can research methodology be adapted to prototype creation. We fell that these are typical topics for future seminars; also these questions are driven out of the need from their projects. It is somewhat surprising that no one raised these questions in the seminars during the course. It is again so that, for PBL, the learning is the students responsibility, whereas, the teachers are merely guides to this knowledge.

The students felt that interaction design literature never posed any questions, only solutions and methods. This made it cumbersome to turn to this kind of literature for inspiration. However we encouraged lateral thinking, guiding that inspiration could be sought in movies, literature or by using provocative questions.

When the students eventually got their project running they felt it was very motivating being able to work with their own ideas. One comment was: "I got to do what I planed to do in my spare time!" They felt like the activities were for real, that what they did was something they could be expected to do after graduation. When asked if the course was worth the effort, we got an unhesitant yes for answer. One of the students summed the course in few words: "We have learned!"

DISCUSSION

From the three cases, followed during the course, the conclusion is that subcultural differences among the students should be regarded as an effective variable for the outcome of each project. Both individual characteristics and organisation environment can be traced in these projects. The students' organisational environment and background along with individual objectives controlled what were in focus, a proper report or a fully working software application. Combination of competence and culture were key element for the most successful project. Their ambition to reach their goal: to construct a functioning prototype, relayed on methodology and innovation. They did not make any tradeoffs.

We aim to improve the course. For instance, the IDt students felt lost when they had to find a project on their own. However they deferred to communicate this, hence several weeks were lost in the beginning of the course, since they waited for us to tell them what to do. To one end to increase student creativity and sense of responsibility the IDt curriculum should be redesign, make it more innovative, interdisciplinary, and collaborative. To the other end we should more thoroughly stress that the students must come up with an idea and a plan more quickly in the beginning of the course. We should also more carefully monitoring students whom show tendency to stall, especially when it comes to the creation of prototypes. But, very important, the responsibility should remain the student's.

Eventually, we believe that our approach to give a course at undergraduate level is a successful one. That the students become more successful and more enthusiastic when approaching their ideas while interdisciplinary collaborate with different background, competencies, cognitive reference system, cognitive style, and learning strategy.

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[1] TCO99 established by Tjänstemännens Central Organisation (Swedish Clark Union)

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