PLASTICS DESIGN TEAMWORK ON A SHARED VIRTUAL DESKTOP

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ABSTRACT

This is a description of a e-teaching experiment in industrial design education. The aim of the BA level industrial designers' plastic education course was to achieve knowledge of plastics and their processing methods and also the ability to apply this knowledge to a plastic product design. This goal was attained by giving students an exercise that led them through the plastic product design process. The students were provided with an assignment (research problem) and to solve it they had to seek and also build up information in design groups.

The course challenged students to design a complex plastic product and to adopt all essential knowledge concerning it. Teams were formed out of students from four different schools meaning that the team members worked at various locations. The task of the team was to select a product to develop with at least three individual parts in it and re-design it.

Each student made a detailed design and 3D modelling of one of the parts. Parts were produced by rapid prototyping and finalized to ultimate prototypes of the products.

Central issues were lectured either locally in each school or over the internet as a video lecture. The nature of the task demanded a lot of independent work in order to deepen the knowledge. That was done by internet learning material and other sources relevant to the design task.

Keywords: design education, problem based learning, e-learning, plastics education

1 RESEARCH TOPICS

The aim of this paper is to talk about experiences in plastics education using e-teamwork. Hereby at first we will introduce the structure of the project, then we will describe the exercise students worked with during the project and in the end we will discuss some of the findings. Points of interest in this paper are:

- Is it possible to solve design problems and produce a design by e-teamwork?
- Is multi method education and teamwork a better way to learn about plastics than by lecturing and using individual effort?
- Does e-learning enable / support a more personal way of tutoring?

2 BACKGROUND

2.1 Pedagogical approach

The pedagogical model of the course is based on problem based learning (PBL). Students do the design task in small collaborative groups. The task can be too large for

one student to handle, therefore sharing the knowledge and helping each other are the keys for success on this assignment. Students have more responsibility in their own learning and they must act independently and evaluate their own actions.
PBL can give better results with active students and interesting subjects, but it can also bring out weaknesses with students with low motivation. Also if the structure of the course/content is disordered or the tasks are too complex, the outcome can be low.
The skill of working in a group is valuable or even necessary in working life today.

2.2 Learning the product design process

To master the product design process it is necessary to experience it. In an average school exercise it is difficult to teach the process from start to end. The lack of time usually forces to concentrate in E.G. conceptualizing. The detailed design phase is frequently left for less interest. Utilized design process was adapted from Ulrich and Eppinger [1].
Some of the earlier reported studies of virtual design studios were realized locally by using learning environments. The students were asked to do their design by writing in to conversations though they could meet physically and talk of their designs. [2]

2.3 Plastics and Industrial design

Plastics knowledge is a central part of an industrial designer's professional skills. Plastics give great potential to produce functional and appealing solutions in often profitable costs and they are used in almost all designed products.
The task of Industrial design is often an open problem. Functionality of the product, user needs, limitations and possibilities of materials and production methods form out a puzzle of countless numbers of solutions. The designer has to define the area where he or she tries to find the resolution. [3]

2.4 Co-operation between universities

Need for better plastics education and curiosity for e-learning, added with funding, motivated the universities to co-operate. The participants of the this collaboration experiment were the University of Art and Design Helsinki, the Tampere University of Technology, the University of Lapland and the Lahti Institute of Design.
There has not been co-operation in plastics teaching between these different universities before this plastic course discussed in this paper. On the contrary, it was more about competing. This novel co-operation enabled utilizing the best professionalism of designing and plastics technology in Finland.
Plastics course 07 was based on experiences on earlier plastics studies structured alike locally at the University of Art and Design Helsinki. These courses were arranged three times. The role of a learning environment was small. It was used mainly for returning the design tasks.

3 CASE- PLASTIC- COURSE 2007

3.1 Virtual desktop and communications tools

The teams were provided with an online sketching desktop. Students were able to draw, write text, import pictures and other documents on this shared virtual paper. This was accomplished by the eBeam Scrapbook –software. This program shares a set of pages or a digital presentation for members of a virtual meeting and all the changes made on any object in the presentation are instantly visible for all the members. Students can, for example, bring a screen capture of a 3D-model into the presentation and draw or highlight the details he or she wants others to focus on. [4]

Teams were also given their own channel on TeamSpeak, a web based audio conferencing software. Students could join and together discuss their assignment day or night. Both the eBeam Scrapbook sketching desktop and the TeamSpeak audio channel were available 24 hours a day, 7 days a week. [5] The online learning environment was used mainly for sharing information to everyone on the course.

3.2 Teaching

Teaching and tutoring activities included lectures, verbal tutoring on TeamSpeak and local tutoring in the classroom. Teachers wrote comments to the subtask deliverables in the learning environment. Students were to join the teachers' TeamSpeak channel when they had questions.

Integrating the education was a central part of motivating the course. Plastics materials and production methods, design exercises and CAD- modelling were combined to one teaching unit to serve this exercise. Due to the different teaching and study entities of each separate university, students had slightly different times and credits allocated to the course. The average was one day a week for four months in the autumn.

Students were guided to use the learning environment and communication tools in each school by support people. At these sessions they practiced using Moodle and filled in their personal information. Asked information was, for example, CAD skills, special interests, e-learning skills, attitudes and expectations. Also age and the students favourable starting angle to a design problem was asked to choose between product structure, styling and usability.

3.3 The teams

The 54 second year bachelor students of the course came from four different universities. Industrial design students were from the University of Art and Design Helsinki (18), the University of Lapland (18) and the Lahti Institute of Design (16) and four master level engineer students from the Tampere University of Technology. Three of the University of Art and Design students were minor subject students from technical universities and one was a clothing and textile master student.

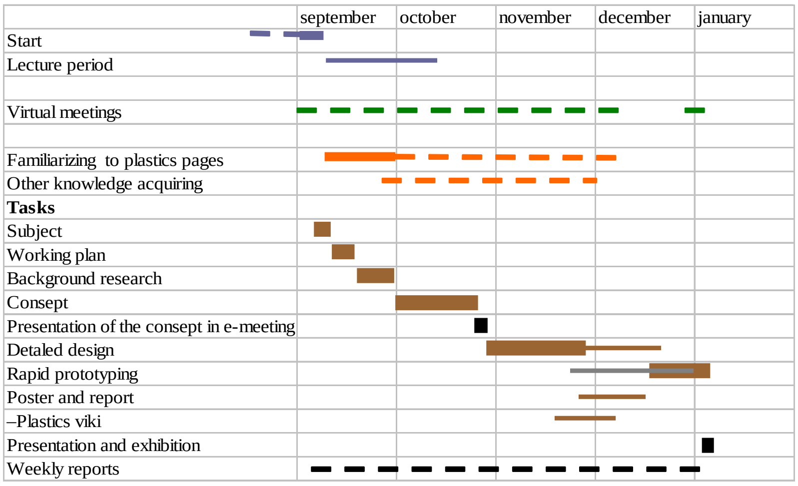
A team design exercise was done during the course. Teams of three were formed out of students of the diverse schools, meaning that the team members practiced on various locations using different internet tools for communication. The teams were built to be multidisciplinary and equally competent by, for example, interests and 3d modelling experience. Also pure male or female teams were avoided.

3.4 Task

There was a guiding assignment from the Design Forum Shop to design a gift shop product. Design Forum is an organisation that promotes design and has a showroom and a shop in the centre of Helsinki.

The task for the team was to select a product to develop with at least three individual parts in it and design then design it. The design task was divided in to strictly scheduled parts. Thus it was possible to carry out a demanding task and large amount of work in a relatively short period of time. The slow start, which is typical for design exercises, was also avoided.

Table 1 Schedule of the exercise



3.5 Subtasks

Subtasks had strict deadlines and each team had to return a subtask document to the Moodle learning environment.

The first subtask was to choose the subject and justify their choices. Chosen topics varied significantly. There were, for example, spice crunchers, mobile loudspeakers and LED lamps using empty PET bottles. Second subtask was a working plan. Teams divided their tasks and responsibilities to weekly actions and predictable results. The next step was a background research for needs of conceptual design phase.

Based on the collected information teams started to design a concept. The results of this task were presented in the commentary meeting half way through the course. At this stage teams had designed the function and structure of the product and chosen preliminary material options, manufacturing methods, joining methods and product graphic as well as done a mock-up and an exploded view of the product construction.

In the detailed design phase students individually designed and 3D computer modelled a part to the common product. The goal of the detailed design was to produce 3D models that were ready for moulding.

Parts were produced by a rapid prototyping machine and finalized in to ultimate prototypes by sandpapering and painting. The fact that there was only one rapid prototyping unit available stretched the timetable in the end.

Teams had to also make weekly reports concerning their common discussion sessions and issues and tasks that had been done each week.

Each team produced an A1- size poster of their design for the Design Forum exhibition.

The team members met each other at the final presentation, where each team had five minutes to sell the design to the Design Forum Shop manager and also to the teachers and other teams. Students were also asked for feedback after the presentation by using a questionnaire.

4 RESULTS OF PILOTING

4.1 Distributed plastics teamwork is possible

Students seemed to be able to adopt the network tools quickly and start the design work. All the students who started the course continued to the end and produced a plan and a prototype of a product which they presented at the final presentations at the end of the course. Prior doubts of severe difficulties in teamwork interrupting the course did not happen. This teaching experiment shows that it is possible to teach second year industrial design students to design a product on the internet. Also most designs were realistic in a way they were intended.

4.2 Teachers working

Lack of division of duties and responsibilities led to inefficient conversation on Teamspeak on afternoons when the teachers were waiting for the students to have questions. According to the student feedback it seemed that part of the students had not understood that the teachers were there to help, if they asked. It also seems that the students found it uneasy to contact the teachers.

For the teacher, it felt like an intrusion to go in to the students' team TeamSpeak conversation and on the other hand when the students were having a meeting with their headsets on, it made no sense to talk to the ones that were in the classroom.

The University of Art and Design Helsinki had used a similar method locally to teach industrial design students and there was not enough common planning and conversation to transfer the knowledge prior to the actual action

4.3 Technology

According to the students feedback, the Moodle learning environment was not easy to use and intuitive to find instructions and information or to use as a conversation platform and material storage though they gave better response to that than to earlier used FLE learning environment. The Reason for this is partly the way the opening page is constructed as a series of lectures and partly how the folders and subfolders were organized. What also caused problems was that the eBeam servers stopped almost every week and there were also TeamSpeak connection problems. Due to these problems groups also used Skype, MS Messenger, email and telephones when communicating to each others.

Also, a more rapid prototyping capacity is needed. Because there was only one rapid prototyping machine available, including Christmas holidays, it took 30 days to produce the models.

4.4 Studying

The exploratory learning method did not seem to work as intended. The division of research topics students made did not lead to sharing the knowledge in all groups. For example, the design students were using more experienced plastics engineering students to study the material and production technology and they did not bother learning these things themselves. This meant that the essential lessons were not learnt in the groups where an engineering student was.

The students in distributed groups seemed to care less of the common goal than the local groups in earlier years. Difficulties in communication and lack of facial contact seemed to make it easier to ignore the common goal.

4.5 Students feedback

Students appreciated the possibility of networking with students from other universities. They also liked the general structure of the course. Students would have hoped for more lectures about plastics design. About half of them did not study the plastics web pages that they had been told contained most of the information needed. Some of the students thought that four months was too long a time for one exercise whereas others felt that there was too much to do.

5 CONCLUSION

Answers to the research questions:

- It is possible to solve design problems and produce a design by e-teamwork, though you need some extra effort.
- It is very difficult to measure whether multi method education and teamwork is a better way to learn about plastics. Still we believe that these students are more competent in handling a real plastics design task.
- E-learning did not enable or support a more personal way of tutoring. Written comments or talking over Teamspeak are a strained situation.

Planning a design exercise for a learning environment requires significantly more work than a traditional exercise. Co-operation must be scheduled and a learning environment built and tasks must be written out in more details than in a traditional exercise.

There is serious doubt whether it does make sense to have such a large quantity of design students educated in one group. Design is usually taught in small groups partly because of the possibility of very personal tutoring. That was somewhat lost in this experiment. Teamwork itself is difficult and the students had tasks that were too complicated and which were not communicated clearly. Still there will most likely be continuum of co-operation, however with a few changes, for example, the groups could be local and they would have opponent groups in other schools.

A learning environment, that combines the functions of the separate programs used this time, would make it easier to design in distributed teams. Drag and drop picture handling and the ability to draw directly in an e-learning environment document, would make it excellent.

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