FOSTERING CREATIVITY AND EFFECTIVE COMMUNICATION WITH INTERACTION DESIGN STUDENTS

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ABSTRACT:

This paper presents our experiences introducing, developing, and teaching master and bachelor level design courses at a Danish computer science faculty with the central aims of fostering creativity and maturing the students' abilities to engage in professional discussions about design and design choices. Reflections on our efforts in previous courses provide examples of didactic choices we have made to facilitate the meeting of these goals including iterative experimentation, experience prototyping, and a host of sketching techniques. In the second part of the paper, we reflect on a new seven-week master's course focused on the design of shape changing interfaces in the form of a chronological journey description focused on the progress and challenges for teachers and students. Conclusions in the form of lessons learned and future refinements are provided, which may be of interest to others who develop and teach courses in creative topics.

1. INTRODUCTION

Interaction design (IxD) involves the shaping of behavior and the design of experiences supported by interactive products (Sharp, Rogers, and Preece, 2007) where the designer strives to bring about favorable or pleasurable experiences for the user while minimizing unfavorable outcomes. Although IxD involves the shaping of behavior through interactive, electronic, and/or digital

technologies, the challenge stands somewhat in contrast to engineering pursuits, which aim primarily to satisfy technical or performance objectives, business goals, etc. Teaching IxD therefore requires classes that expose the students to a wide range of methods, tools, materials, and examples, including problem solving not unlike traditional engineering classes. However, teaching IxD also requires developing skills of involving users appropriately in the design process, exploring experience qualities besides efficiency, and design critique.

This paper reviews our experiences attempting to get students enrolled in a computer science faculty to appreciate the value of hedonic design qualities from a user centered perspective and avoiding the narrow focus of reliability and control issues, which are central to a traditional engineering approach. As summarized in (Keinonen 2008), user centered design is fundamental to cooperative prototyping (Bødker and Grønbæk 1991), cooperative design (Bødker and Grønbæk 1992), ergonomics, usability, and experience design among others. In consequence, the process of becoming a proficient technology designer and learning when to use the appropriate methods and skills involves building up technical proficiency, techniques for user involvement, problem solving and an eye for and language to describe hedonic design qualities. Working with concrete design briefs, conducting experiments and getting feedback and guidance (Sas 2006, Wroblewski 1991) is perhaps where students learn some of the most critical skills including working within deadlines, carefully focusing resources and efforts most effectively, refining communication skills with users and interested publics.

This paper is organized as follows: first, we present our experiences introducing, developing, and teaching master and bachelor level design courses at a Danish computer science faculty. We then present a chronological journey description of a new course on shape-changing interfaces, and discuss our own lessons, which may be helpful for other IxD educators and teachers of creative design classes outside the Fine Arts. Lastly, we provide concluding remarks about how we intend to refine future courses.

2. BROADENING THE VIEW ON DESIGN

In the following we present our previous experiences with teaching and supervising interaction design classes to students enrolled at a computer science faculty. We focus on sharing our insights related to how we might foster creativity and mature students' abilities to engage in professional discussions about design and design choices, and how me might broaden their

understanding of what design is and how to articulate and discuss design qualities.

Our experiences are based on the following classes, which are all related to IxD and train iterative experimentation, experience prototyping, critique, and a host of sketching techniques.

SAINT – SOCIAL AND AESTHETIC INTERACTION, 14 WEEKS

During the course groups of students create a design aimed at facilitating social interaction between users of a near-by forest park. Students present their design concept with various physical sketches and prototypes, and a report on the design process. Individually students choose an aspect of their design to explore in detail through a series of sketches in order to discuss and articulate the consequences for the aesthetic qualities of the interaction. They submit a series of five sketches and a short report discussing their implications for aesthetic interaction.

The teaching consists of weekly inspirational/theory-focused lectures and exercises. In the individual part of the course, exercises take form as weekly critique sessions between the individual student and teacher.

URBAN INTERVENTIONS, 7 WEEKS

The course introduces interventionist thinking and design as a tool for intervention in an urban space. In groups students choose and analyze a public space, create a concept for an intervention and place their concept in this setting using cross-media mock-ups, such as props, websites, posters etc. Students submit a group report on the concept and attend an individual oral exam discussing design interventions as a field.

The teaching consists of lectures on theory and examples, student presentations and plenum discussions of research articles, and practical work where students get supervision in groups.

PHYSICAL DESIGN, 7 WEEKS

The course builds upon electronics and programming skills and introduces the students to designing a new musical instrument that involves large movements of the body. In groups students brainstorm and create a concept for an instrument, build

prototypes and explore giving form to interactive systems. The musical instruments are then built and demonstrated in a final critique. Students submit a group report on the concept and attend an individual oral exam, which explores the topics they discussed in the group report and the design decisions made in the development of the instrument.

The teaching consists of lectures on theory and examples of interactive and digital musical interfaces, student presentations and practical work where students get supervision in groups.

IT PRODUCT DESIGN PROJECT, 7 WEEKS

The course builds upon all of the courses that the students have taken including electronics, programming, physical design, business models, etc. and requires them to find a problem in the field of health and welfare and design a technology-based solution. The course is intensive, counts for 3 classes worth of credit, and during which, the students are expected to work every day in the lab or in the field as needed. Lectures are given once a week covering topics such as the design of form, mapping and affordances, conducting user studies, etc. Students work in groups and develop a functional prototype complete with a business model for bringing the product into the market. Students submit a group report on the concept and attend an individual oral exam, in which each student is given one small section of the group report and are expected to present and answer questions about their concept.

These four classes focus on design in different ways. IT Product Design Project and Physical Design are mainly focused on the production of physical functional prototypes involving electronics such as Arduino boards, various sensors and actuators, web technologies and software-based interfaces. As a result, they introduce and train electronic construction, prototyping materials and tools, and the solving of practical 'making things work'-problems. Social and Aesthetic Interaction and Urban Interventions, on the other hand, have no requirements to use electronics, and focus on hedonic design qualities, experience and ideological design, much closer to art than engineering. As a result, those courses are expected to introduce and train the exploration and articulation of aesthetic design qualities. All the courses, however, require that the students practice and refine their abilities to articulate design decisions and communicate their design process and results clearly.

3. FROM 0 TO 4 PAGE RESEARCH PAPER IN 7 WEEKS

In the following, we reflect on a new seven-week master's course on shape changing interfaces in the form of a chronological journey description focused on the progress and challenges for teachers and students. Among our main lessons learned are considerations about the design case, the use of critique and feedback, and the balancing between the very open and explorative content and the strict deadline and curriculum-oriented content. In the duration of the course, we have used weekly submissions of sketchnotes to facilitate students' training of a core design competence, namely sketching, and their processing and understanding of course literature. These experiences will be reported separately as they are part of a larger experiment.

THE PLANNING PHASE

Shape Changing Interfaces is a 7 week course (7 whole days, distributed over 7 weeks), aimed at exploring design qualities with 8 different types of shape change identified and discussed by (Rasmussen, M., Pedersen, E., Petersen, M. and Hornbæk, K. 2012). The field has only recently been described as such, and the definition of the different types of shape change is therefore still highly debatable. As a result, we planned to conduct the course as an exploration of the 8 types of shape change in order to contribute to the articulation of the field. Our goal for the outcome is 8 designs that each experiment with a type of shape change and an individual short research paper per student discussing the design qualities of the explored type of shape change.

To create an interesting design case and a realistic frame around the course, we approached the Danish design company bObles, which produces a series of popular foam products used as furniture and play objects for children (bObles ® 2012). The CEO immediately showed interest in collaborating on the course, but insisted on protecting the company brand against misuse of their products with a contract on IP rights between bObles and each student. In some aspects this – from a business perspective understandable wish - was a great threat against using a business collaborator, since art schools and universities have their own rules about IP rights to designs produced in class by students. In collaboration with bObles we wrote a contract that secured both company and students' interests. Agreeing to this contract then became a prerequisite for joining the course.

Additional activities in the planning phase included agreeing on and getting a number of product samples, identifying and ordering electronic equipment which could be used during the

prototyping, and – of course – making a description of how we imagined the teaching to progress from students knowing nothing about shape changing interfaces in week 1 and students being able to write a short research paper discussing design qualities related to shape change, and contributing to articulating the field after week 7.

At this point formulating a design brief that balanced between being sufficiently open and still directing students to explore shape change in a way that did not compromise bObles' design philosophy was a major issue.

1ST WEEK – ZERO KNOWLEDGE BUT A LOT OF CURIOSITY

During the first week students were introduced to the concept of shape change and the requirements for participating in the course in lecture format. Emphasis was put on the production of experimental prototypes as a way to understand and discuss aspects of designs that use shape change as a means for communication. Two older students presented their own shape changing design (Alrøe, Grann, Grönvall, Petersen & Rasmussen 2012) and shared technical insights as to how to work with shape memory alloys and other prototyping materials. Then the design brief was presented together with some insights into bObles' products and design philosophy, students formed groups according to their interests, and brainstorming based on the design brief started. We chose to let students pick a type of shape change they would like to explore, formed the work groups accordingly, and constrained each group with the challenge that they should experiment with their type of shape change to facilitate imagination and movement in children in accordance with bObles' design philosophy.

At the end of the first day, students had presented two rough concept ideas for the class and received feedback on the design qualities and how they might proceed.

Concerns

As teachers, we paid special attention to a few groups with few members or with weak design ideas. We also struggled with how to facilitate the groups in advancing quickly from brainstorm mode to production/experimentation mode since most groups seemed prone to stay in the comfortable brainstorm mode.

At this early point, students seemed eager to start working. Some had fairly weak ideas about what they wanted to do, but rejected further help arguing that they wanted to figure the challenge out for themselves.

2ND WEEK – PRESENTING A SOLID IDEA

Students were introduced to examples of various types of shape changing interfaces from the literature and worked on their paper or foam prototypes and design experiments. Feedback and inspiration in groups was provided after the groups had presented their current state in plenum.

Concerns

At this point the teachers were mostly focused on making sure each group was progressing with their explorations. The fact that not all the electronic equipment had arrived was a concern, and potential problems with construction materials and students' ability to use various materials for their exploration start to appear.

Some groups have still not chosen a concept to work with and seem to fear taking a plunge into what might just be simple experiments with materials or interaction qualities. Other groups are skillfully making series of experiments, for example with how our perception of texture changes according to minor adjustments with the material.

3RD WEEK – FITTING OUR WORK INTO CURRENT TERMINOLOGY

A research paper describing a framework for understanding shape changing interfaces by (Fishkin 2004) was presented in lecture format and groups were asked to discuss and place their designs within this framework in front of the class. Practical work continued supervised by teachers who provided help, inspiration etc. in groups.

Concerns

Teachers note that some groups are struggling with how to understand their type of shape change. The more they work with it and think about it the less tangible it seems. Another group reports on the frustration of discovering that minor changes in the length of strands or hairs on a surface they changes how the

texture is perceived. At some point texture seems to stop being texture and becomes something they cannot describe what is. Several groups have similar concerns and are uncertain as to how this might be a 'correct' or 'valid' observation, and how and why one might pursue such observations.

4TH WEEK – MIDWAY CRITIQUE

A short lecture covering more examples of shape changing designs and how to report on and discuss these in a research paper format was followed by a detailed critique by teachers and one of the authors of the survey paper on the topic of shape chaning interfaces (Rasmussen, M., Pedersen, E., Petersen, M. and Hornbæk, K. 2012).

Concerns

Previously, teachers had been encouraging the groups to explore their concepts and refine the designs while withholding critical feedback and encouraging freedom of expression. At this point we faced the challenge that several groups had been focused on creating a physical prototype that could 'do something' and paid less attention to the experiential qualities of what it could do. Some groups had digressed a great deal from the design brief by adding more and more irrelevant elements to their design, such as blinking LED lights and music, rather than refining subtle design experiments such as introducing a bump on the side of a cylinder to make it roll in a new way or experimenting with how to make the material move elegantly when pulled by a motorized arm. Students seemed to understand these parts of the critique but seemed unable or unwilling to follow them in their work. Somehow we did not succeed in explaining what 'small experiments' meant.

5TH WEEK – PRESENTING INTERACTION QUALITIES IN VIDEO FORMAT

A short lecture was given on how to making compelling videos of interaction designs. Examples from successful videos featured in international conferences were provided together with examples from the instructor, including self-critique on how these videos could be improved.

Concerns

During the course teachers have stressed the importance of making a good and convincing video showcasing how the design together with good high resolution pictures presenting the design as a whole and important parts hereof. We wondered whether the students' have the motivation to and the skills to produce such documentation since they seem stuck in the understanding that the physical prototype is the vehicle for exploring and presenting their concept for shape change, and not, for example, a video demonstrating key interaction qualities. Accordingly, the groups struggle between spending more time developing a refined prototype to include in their video and creating a video involving mocked up interactions, virtual objects, etc.

6TH WEEK – MORE CRITIQUE AND WORK IN PROGRESS

A lecture was given by one of the authors of (Rasmussen, M., Pedersen, E., Petersen, M. and Hornbæk, K. 2012) who based on her work in progress discussed what goes beyond shape change, for example, actuated interfaces. Following this, another critical review of each project was provided, which in some cases simply repeated the critique from the week before since the groups had not taken any of the critique and advice to heart.

The template for the research paper was discussed in detail.

Concerns

Teachers feel pressured to move the deadline for the submission of the videos and photos of their designs since students complain that the workload is too much. As teachers we are torn between on the one hand, fearing that moving a deadline one whole week might compromise our integrity – since students try to buy more time in all our classes - and also signaling that the products are not that important, while on the other hand wanting the best possible video and photo documentation of the projects possible.

At the same time, students start voicing concerns about how to write the research paper presenting and discussing their design and its aesthetic interaction qualities, which they find is a very fuzzy challenge. They call for a clear problem/solution format and seem uncertain as to how to present the unique insights they have gained during their experiments.

7TH WEEK – THE FINAL CRITIQUE

For the final critique each group presented and demonstrated their work before two three-year-old visitors in 10-minute sessions. Following this, a panel of six experts in design and interaction design critiqued each product in front of the class. At the end of the day teachers held an open Q&A-session where students could ask additional questions about the exam research paper and provide feedback as to how teachers might develop the course, the design challenge, the teaching and the critique style.

Concerns

During the presentation and critique teachers and panel experts noticed how most students still struggle with presenting their design as a consequence of a series of mature design decisions. When probed about why a design moved in a certain way or the quality of one interaction mode compared to another, almost all groups responded with some kind of technical explanation that placed the responsibility for the design on the technology or the material chosen. Most design choices came across as almost accidental, and in about half of the cases the physical prototypes left very little to be explored or experienced by the expert panel. The other half had succeeded in creating physical prototypes that convincingly presented a type of shape change and inspired debate about shape change qualities.

4. LESSONS LEARNED / CONCLUSIONS

We have provided accounts of our efforts teaching IxD in a computer science faculty with the focus on improving the students' abilities to go beyond engineering to become designers of pleasurable and inspiring products. While there are many lessons to share, for this paper, we wanted to focus on the concerns related to how students respond to the design task and process feedback from peers and instructors. In order to address these challenges, we propose to refine future courses to include more clear guidance for students to align their development of their work processes, the final design product, and their individual growth needs.

RESPONDING TO THE DESIGN TASK

Our students, who come from a computer science background have a hard time understanding that design for human interaction is not an exacting science. Furthermore, at the masters level, at which the course was held, the topic focused on an area of

interaction design that is still being explored and defined. Some students found the design task as being too free and open, while others felt that the constraints were too restrictive. The takeaway from these concerns is that the students need to be aware that in designing for humans, they have to explore the design task and actively refine their design intention throughout the process.

PROCESSING FEEDBACK

Students were generally looking for approval and support for their efforts and large changes to their designs were difficult to accept. Knowing when to push back and how to argue for their design choices is difficult during a live demonstration/critique session. Students often acted upon low quality feedback from their peers resulting in adding more features instead of strengthening the concept.

As teachers, we have encouraged our students to explore and refine their concepts while often withholding critical feedback. Striking a balance between giving poignant critical feedback and fostering freedom and exploration is necessary. In fine art studios, the critique process is well established and could be helpful for IxD instruction, however this may be challenging to bring into an existing creative domain as discussed in (Graham 2003) which examined challenges of its use as a pedagogical tool for teaching architecture.

How to give appropriate assessment in design and art education is highly debated. However, a promising approach could be the holistic assessment as proposed in (Harpe and Peterson 2008) in which the core focus is on the process, the final product and the student's well-being. Developing and maturing this process represents important future work for teaching IxD. In the next section we discuss techniques we propose as initial steps in this development.

REFINING FUTURE COURSES

We propose that for future courses, students be provided more clear guidance in three key areas in an approach similar to the art school critique style summarized in (Harpe and Peterson 2008), focusing on development of work processes, the final designed product, and their individual growth needs. Two tools that will assist this include a written plan developed by each team and an assessment template that can be used to self assess one's own

work, and to facilitate intergroup critique, while enabling the instructor to provide appropriate feedback.

While students in fine art studios learn very quickly how to present their work and carefully consider the feedback given by peers and teachers, computer science students could perhaps benefit from building and maintaining a written plan. This could bring awareness to and serve as a constant reminder of the design objectives along their journey. The plan should match the weekly schedule published for the course with clearly defined activities. This would help the instructors take a more active role upfront to encourage effective use of time and appropriate selection of design activities.

In terms of improving the students' final designed object, more clear examples of the range of acceptable outcomes will be provided. Students will update their group design plan to include specifics on design experiments, functional, and aesthetic prototypes. While typically this can change from the beginning of the course to the final deliverable, discrete decision points along the way should be identified in which the students adjust and refine their goals for the designed objects. Currently, under development is a critique template that can be used by the students to self-assess and for other students to provide structured feedback to other groups. The discreet elements in the template will force the careful review of all major aspects of the design work—our current focus is to develop the template and begin evaluating it in upcoming classes.

In order to address individual growth needs, it is important to aim at developing each individual student as a whole, recognizing their existing strengths, and at the same time, identifying and nurturing their process of overcoming weaknesses in skills. Assessing and nurturing the needs of each individual in the design groups is an ongoing challenge. The planning tools should provide help in this regard by reducing the amount of time the instructor would need to ask the same standard questions to each student, but instead, use the outcomes from the group and self-assessments to facilitate each discussion.

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