INTERNATIONAL CONFERENCE ON ENGINEERING AND PRODUCT DESIGN EDUCATION
2 & 3 SEPTEMBER 2010, NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, TRONDHEIM, NORWAY

TOY DESIGN AS A TOOL

Yvonne ERIKSSON and Helena JERREGÅRD
Mälardalen University, School of Innovation, Design and Technology

ABSTRACT
The aim of this paper is to report the results of the undergraduate project course Toy Design for Creative Play (Mälardalen University, Sweden) based on human-centred design. It can be described as a design course where different academic disciplines and, consequently, different scholarly traditions meet. From an explicitly expressed gender perspective, the students were assigned the task of creating toy models that will stimulate non-gender-coded play. They worked in project groups, where the students' specific competences are applied, e.g. engineering technology, pedagogy and information design. This means that the students are confronted with issues related to technology, problem solving, gender and play. The course also aimed to build knowledge about how gender is constructed by means of play, and how this is supported by toys. The course deals with various theoretical as well as practical attributes of toys. The results of the course show that this course design can function as a successful tool for dealing with such issues as gender technology, creativity and learning processes.

Keywords: Gender, toy, learning process, course design

1 INTRODUCTION

One way to achieve a change in the long run concerning the negative attitude towards engineering is to inspire young children's interest in technology and problem solving, girls and boys alike. Play is one of the areas where children develop their creativity. In order to stimulate play that is creative and non-gender-coded, it is necessary to influence producers of toys, since contemporary toys are to a high degree gender stereotypical. In this paper we will discuss the results from the undergraduate project course that we initiated, *Toy Design for Creative Play* (Mälardalen University, Sweden), based on human-centred design. It can be described as a design course where different academic disciplines and, consequently, different scholarly traditions meet. From an explicitly expressed gender perspective, the students are assigned the task of creating toy models that will stimulate non-gender-coded play. The toy models were expected to be developed into prototypes for mass production. We have followed the students throughout the course, focusing mainly on the process per se while including changes in the students' attitudes to gender. We will here focus on how the students solved the task of creating toy models that can be mass-produced, and how they may be expected to function in practice. We have also studied whether, and if so in what ways, the students developed an awareness of gender issues during the course, and how they managed to implement that in their work. The results will also be discussed in relation to contemporary theories about creativity and learning processes, and the potential for further development.

2 THEORIES AND METHODS

The change of attitudes with respect to traditional and stereotypical gender expectations is multileveled. This is to be noticed especially in relation to play and education, though many categories of adults are involved, and equipment such as toys, computer games, books and teaching materials. Since girls and boys are raised in an environment that consists of gender-labelled toys [1,2,3], and this labelling knowledge influences preferences later in life by affecting the individual learning processes [4], we argue that it is very relevant to start designing non-gender-coded toys.
Research questions that we initially raised were: Will a multidisciplinary course based on human-centred design principles suit gender consciousness among students? Is it possible for undergraduate students to put gender theories into practice? Can undergraduate students challenge the established toy

industry with new suggestions for non-gender-coded toys? The expected result was to find a model for how to work with gender and engineering education in the future.
The course *Toy Design for Creative Play – a project course* is a human-centred design course inspired by IDEO in Palo Alto and Design Research Methodology (DRM) [5, 6]. The course has been an opportunity for us to study to what extent multidisciplinary studies can facilitate inclusion of gender studies in engineering design education, and thereby stimulate an interest and awareness among the students for the issue. To find these answers we followed the students by writing process diaries in which we recorded some of the students' comments. Moreover, we designed the course evaluation form in such a way so that we could sum up to what extent the course fulfilled the expectations of the students and whether they had changed attitudes during the course. In addition to the course evaluation form, we also designed a questionnaire concerning attitudes about gender.

2.1 Course design — "Toy Design for Creative Play – a project course"

The course *Toy Design for Creative Play* was announced for students in Information Design, Engineering Design, Innovation Engineering and Pedagogy. The students work in project groups, where the students' specific competences, e.g. engineering innovation, engineering design, pedagogy and information design, are applied. This means that the students are confronted with issues related to technology, problem solving, gender and play.
The project course runs for one semester. It was given for the first time in the autumn semester 2009, and will continue in 2010. We met once a week, the meetings included lectures, seminars and workshops.
Early in the process the students were asked to collect data from interviews with children, adults and teachers; to observe toys stores, children playing, children in society and the waiting room at a child welfare centre; and in media following discussions concerning TV broadcasting for children, advertisements for toys, Google scholars, literature, YouTube etc. In addition they were asked to describe play from their own childhood. The students were inspired by the workshops; this resulted in the following question: What is play? They also decided to find a common favourite toy for the group, and to find out who the commercial giants among the toy companies are, as well as whether there are non-gender-coded toys and if so of what kind. After the first two workshops, the processes in the three groups had begun. In the following workshop the process leaders presented an overall project plan for the group, involving inspiration and identification.

3 RESULTS

The three groups created one model each, shown in Figure 1, and in a final paper they described their processes. We will here show the results from the three groups and their processes separately. One group created a note-wall. It is a board that should be put on the wall on which notes can be placed in nine different positions. After the child put the notes in elective positions, he or she presses "PLAY", and a melody is heard. It is possible for the children to record different kind of sounds that could be combined into a melody or sound-image. The students gave the notes different characters in order to stimulate the children to create melodies and sound without feeling the pressure of not having knowledge about notes. In the process the group analyzed the expected functions of the toy. They combined three of the ten concepts into one project idea.

Figure 1. Results from the three student groups, shown from left to right: the Notewall, the KubIQ and the Cleo.

The second group produced a game with the name KubIQ, which alludes to Rubik's cube from the 1970s. The KubIQ consists of 24 cubes (70x70x70 mm), playing cards divided into different categories concerning subjects and level of questions, cards for making original questions, two die, cards and three-dimensional pieces. The objectives for the rules of the game are to stimulate the player to build the game differently. Since the construction of the cubes is solid, they suit young children, who can use them as building blocks. If the counter player answers the question incorrectly, the rules for the KubIQ make it possible to help each other and continue the game instead of kicking each other out.

The third group made a very simple toy, a peg or stick named Creo. They got the idea from the first lecturer who maintains that a peg found outdoors is the most frequent toy among children. The group created soft pegs in different colours. It is possible to shape the pegs differently and to make figures and animals. The group also discussed potential development of their concept.

The group process is described differently by the various groups. The students with the note wall started with project definition, project planning followed by information research, idea generation and function analysis. The second group started with brainstorming, mood board, interviews, and development of different concepts and selections of concepts. The third group started by visiting toy stores to get an overview of contemporary toys.

At the very end of the course we asked the students to answer 11 questions individually from the course evaluation form. The first question: *What was your expectation of the course?* The answers on the first question can be summarized as following: to have fun, to create discussion about gender, to practice multidisciplinary work, to build a prototype, to be creative, and that the course should be innovative. The student's expectations on contacts or seminars with toy producers were fulfilled. As the second question we asked *if the course was better or worse than expected*. Two of the students found the course less satisfactory than expected. However, one of them considers the course better during the last part. The majority of the students thought that the course fulfilled their expectations, but they required a better structure of the course. They also commented on the fact that the course was given for the first time. As the third question we asked: *What was most fruitful?* The students answered: brainstorming, their course mates' ideas, the process, working interdisciplinarily, human-centred design and the lectures. We asked a specific question about the relevance of the lectures and about their quality. In general the students were satisfied with the lectures, especially one that focused on gender and engineering, and the introductory lecture about toys.

Key for the course was the work in the three project groups. The students had different experiences from the group processes. Some of them found the initial phase complicated, and testified that the process was turbulent since the group members had different opinions. But all students were very satisfied with the final result and the work during the second part of the course. However, all the students apprehend that they got support in the working process. The students commented that they lacked continuous information while the course ran.

The groups presented the results, models of three different toys, at a public event. This event was announced in a press release, and media showed great interest. Three students and a teacher appeared on morning TV news for 14 minutes and also two news broadcasts. The students found that stressful but exciting.

In order to investigate whether the course had any effects on the students' attitudes, we also asked them to fill in a questionnaire concerning attitudes about gender. The median age of the 13 out of 14 who answered the questions was 26, including 11 female and 2 male students. The education programs the students came from were Information Design (3 students), Innovation and Product Design (8 students), Pedagogy (2 students); One student worked as an environmental engineer, and one did not answer.

9 students had experience from project courses. 8 had earlier experience concerning gender matters, and 3 had no experience. 6 of the students had thought about the relation between design and gender before they started the course, 2 had not and 3 answered both yes and no. 6 of the students had experience of discussions on gender theories or had applied gender theories in other courses within the education program, while 4 of them had no experience.

We asked the students if they had any knowledge about gender theories before it was introduced in the course. 2 answered no, 9 considered they had understanding from practice but not theoretical, and 1student mentioned that he or she had great consciousness from upper secondary school about gender. We followed up that question by asking if the learning processes in this field had been stimulated by

the course. The majority of the students did not answer this question affirmatively. But they thought that they would have greater consciousness about gender in the future in general and in product design in particular, especially concerning toys. The last two questions had reference to future working life and the engineering education. In connection to future work, the students responded that they will be conscious about gender issues, both in relation to colleagues and the products they will design. The teacher students intimate that they will observe children's play and bring up gender issues in their teaching. The students concluded that gender theories and gender issues are important in engineering education.

4 DISCUSSION

In this research project we used the multidisciplinary course as object to study and answer three specific research questions. Our first question was *Will a multidisciplinary course based on human-centred design principles enhance gender consciousness among students?* and we found that this perspective very much fulfilled the aim of creating gender consciousness. This was shown in the results of the questionnaires as well as changes in attitudes as shown in the students' final papers. On the other hand, it is hard to masseur attitude changes especially on a long run. The target for the course was to make non-gender coded toy prototypes and the literature for the course and the lectures emphasized the gender issue. As a consequence of that it could be the students fulfilled our expectations.

Our second question was *Is it possible for undergraduate students to put gender theories into practice?* The course design turned out to be a useful tool when approaching issues like gender, technology, design and learning processes. The attitudes towards gender issues were markedly affected; all students indicated that the course made them become more conscious of gender-coded phenomena in the society, and the majority of the students also found that awareness useful in their future occupations. The results concerning the toy prototypes show that the students did not have the mature to implement gender theories in their work. But they use their consciousness about gender when they created the prototypes. Innovation demands a lot of insight and experience from a field and at the same time it requires non-conventional thinking. The students did not have the mature and experience form toy design or gender theories to be able to create something ground-breaking but as mentioned before they used their awareness.

In Figure 2 we show possible effects of this kind of course. The direct effects are seen when introducing the toys to children and within the awareness of the students themselves. A more long lasting effect may be seen when the students enter their future occupations: those who will work as teachers may affect the children by choosing a gender perspective in their pedagogy, and those who become engineers may consider gender perspectives in designing new products as well as in their relation to colleagues (which also counts for teachers).

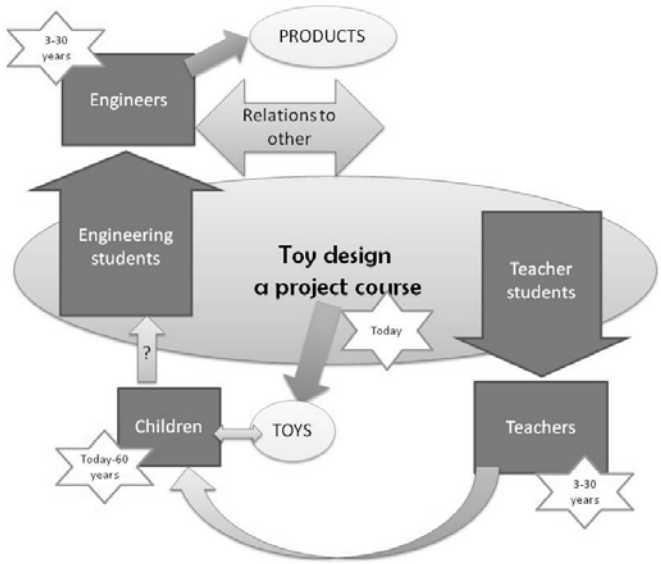

Figure 2. The results of the course can be described in the picture. The direct results are changes in attitudes among the students and the actual toy prototypes that may be mass produced. Thereby the toys may influence children of today and the forthcoming teachers will continue to influence the children of the future. These children may grow up and show interest in science and technology, leading to more students choosing engineering as an occupation (as well as teachers in this area). The engineering students may bring their knowledge and attitudes into new products and in relations to other engineers (as well as the whole society). The expected time ranges of the effects are shown as rough estimations in the star figures.

Our third research question was *Could undergraduate students challenge the established toy industry with new suggestion of non-gender-coded toys?* and we argue that the three toy prototypes presented all have a commercial potential, and that they are based on well-founded arguments as being non-gender-coded toys. At MIT, the Toy Design course has run for several semesters, and Kudrowitz [7] has introduced a classification system for toys in order to communicate and ideate new concepts. This system is called the Play Pyramid, and is based on Piaget´s four stages of cognitive development, thereby suggesting Construction, Fantasy, Sensory and Challenge as the four counter stones in the pyramid. This is a very valuable tool, and we suggest that if it were used with a gender perspective it would be even more valuable. The toys developed in this course could easily benefit from this tool; especially in connection to toys for specified age groups. The Play Pyramid could work as a challenger for the student and stimulate to specific problem solving concerning toys that challenge gender stereotype play and learning process in different cognitive development stages. The needs of gender-neutral or moderately gender-typed toys are identified as crucial to optimal development in a recent study by Blakemore and Centres [8].

The expected result was to find a model for how to work with gender and engineering education in the future, and we suggest that the model presented in this article is well suited for the purpose. However, the course is not yet perfect, as we could show areas that have to be improved. The need of gender perspective in design education has been discussed since the end of the 20th century, and the efforts to solve or study this problem have probably been numerous; however, rather few have been reported on in the literature [9,10,11].

5 CONCLUSION

To sum up, we here demonstrate that the pilot project model for a course in toy design is a successful tool for linking together such central concepts as gender, technology, learning processes and creativity. The consciousness of the importance of gender awareness concerning design will probably have some effects in the students' future professions, especially in relation to attitudes. Because of time constrictions, and thus the learning processes, the students did not gain a deeper understanding of the relation between gender, creativity and design that could be altered in contexts other than toys and

play. That is in engineering design and industrial design in general. Therefore we suggest that multidisciplinary courses within engineering design education might be fruitful to stimulate alternative pedagogy that offers new aspects of the education and the profession as such. By the project course *Toy Design for Creative Play*, we have demonstrated that students in engineering design are interested in ethical values, and that students from social science are willing to get into engineering subjects.

REFERENCES

[1] van de Beek C, van Goozen S. H. M., Buitelaar J. K., Cohen-Kettnsi P. T. Prenatal Sex Hormones (Maternal and Amniotic Fluid) and Gender-related Play Behaviour in 13-months –old Infants *Arch Sex Behav* 2009; 38:6-15

[2] Williams C. L., Pleil K. E., Toy story: Why do monkey and human males prefer trucks? Comment on "Sex differences in rhesus monkey toy preferences parallel those of children" by Hassett, Siebert and Wallen *Hormones and Behaviour* 2008: 55. 355-358

[3] Martin C. l., Eisenbud L, Rose H. Children's Gender-Based Reasoning about Toys. *Child Development* 1995: 66. 1453-1471

[4] Eriksson, Yvonne & Jerregård, Helena, "Creative Environment for Innovative Learning Processes", International Conference on Engineering Design, ICED´09, Stanford University, Stanford, 2009.

[5] Wikström, A., *idPeo a Multidisciplinary Approach to Innovative Product Realization* in *UPA Europe 2008*. 2008, UPA Europe: Turin Italy.

[6] Blessing, L. & Chakrabarti A. (2009). *DRM, a Design Research Methodology*. New York: Springer.

[7] Kudrowitz B., Wallace D. The Play Pyramid: A play Classification and Ideation Tool for Toy Design http://web.mit.edu/2.00b/www/2009/lecture2/PlayPyramid.pdf

[8] Blakemore J. E. O., Centres R., E. Characteristics of Boys' and Girls' Toys. *Sex Roles* 2005: 53, 9/10.

[9] Mayer-Smith J., Pedretti E., Woodrow J. Closing the gender gap in technology enriched science education: a case study. Computers & Education 2000: 35. 51-63

[10] Akpinar E., Yildix E., Tatar. Ergin Ö. Student's attitudes toward science and technology: an investigation of gender, grade level, and academic achievement. *Procedia Social and Behavioural Sciences* 2009: 1. 2804-2808

[11] Kinnear A., Treagust D., Rennie L. *Gender-inclusive technology materials for the primary school: a case study in curriculum development*. Research in Science Education, 1991, 21, 224-233.