# Active learning in the education of human computer interaction

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*Abstract:* Software engineering students are trained to perform structured analysis and development. These activities have rigid structure therefore usually teaching methods expect them to master development life cycles and apply them in assignments. In engineering studies active methods are often employed in team projects where students acquire important professional development skills and learn to act in a project group. The multidisciplinary engineering, science and social underpinnings of human computer interaction challenge the educators because social aspects are new for mostly technical-oriented software engineering students. In our opinion, these aspects are better assimilated by technically-oriented engineering students when teaching social aspects the methods established in social science education are employed. In this paper we explore these methods that we employ in traditional lecture-based teaching format and big student classes. The aim is to incorporate the active learning that enhance creativity and heighten student appreciation of non technical aspects of human computer interaction.

*Key-Words:* - HCI education, teaching methods, active learning, creativity.

## 1 Introduction

The education of human computer interaction (HCI) provided in software engineering (SE) study programmes differs significantly from the teaching of traditional engineering subjects. HCI is multidisciplinary subject that deals with engineering, science and social aspects. It is evident that significant part of HCI courses in SE curriculum is dedicated to usability engineering. Students mostly positively accept also science aspects such as HCI principles, models and theories that accumulate the experience of the development of user interfaces. But social context of use is often a formidable part of the course for technically-oriented SE students. SE students are trained to work in teams and to act in certainly roles that are defined in particular life cycle. They are not trained to invent creative solutions like art students.

Reacting to versatility challenges the teaching is constantly modified. Our study aims to analyse which teaching methods established in social sciences could be employed in teaching HCI, especially in topics related to social sciences. We faced a big variety of teaching methods used in teaching social domains [1]. This experience motivated us to explore these methods because they are unusual for SE educators.

This paper discusses the reasons for modifying the way of teaching HCI courses after first experience with a new curriculum SE is gained. The goals of modifications were twofold. Firstly, we aimed at enhancing creativity in the teaching of HCI on the undergraduate level. Secondly, our intention was development of higher-order thinking skills, analytical and decision-making skills in teaching human computer interaction design (HCID) on the graduate level.

The paper is organised as follows. Further we summarize our experience with HCI teaching and motivation for SE curriculum enhancements. Next we deal with active learning methods that motivate students' creativity and could be used in traditional for engineering lecture-based big class format. Then we present our approach in the teaching of undergraduate HCI and graduate HCID courses followed by conclusions.

## 2 Motivation

In this section we identify the need for SE curriculum improvements that related to HCI teaching. We argue the importance of training creativity skills for interface designers. Next we deal with the issues of teaching social aspects in a graduate HCID course.

### 2.1 HCI in SE curriculum

Currently we gained experience with three crops of SE undergraduates and two crops of graduates. Further we discuss the reasons for modifying the way of teaching after first experience with a new curriculum is gained.

Before the implementation of the new SE study programme, several HCI topics, related to interface design, were taught in SE course, paying too little attention to usability education. After completing these SE courses, students tended to approach design and analysis from system developer perspective, rather than from user's perspective [2]. They also valued tools and implementation, and tended to bypass paper prototypes. Students lacked both communication and collaborating skills that needed to be improved because they are asserted as essential professional attributes [3]. Graduates possessed strong development skills, e.g. programming, data structures and databases. However, such approach to education of software professionals was not satisfactory: graduates did not receive the knowledge and skills needed for industrial software development. It resulted in low quality and unusable software systems. Students were weak in both visual design and understanding of user-centred design process [4].

A lack of vertical and horizontal integration of the individual courses throughout the old CS curriculum was realized [5], because:

- the courses were poorly coordinated;
- some material repeated in the different courses;
- students lacked the confidence how to apply skills learned in a course to new situations;
- practical exercises were poorly coordinated and integrated with theoretical material.

Introduced separate HCI course for undergraduates only partially solved above mentioned issues. After the first internship, industry partners pointed out the real problem with the organisation of team work in student projects. They indicated the lack of practical experiences in communication and collaboration both inside the team and with people in industry. Industry partners stressed that our graduates lacked skills of teamwork, communication with customers, application area analysis, and project management. The need to improve both the practical skills of working in software development group and the user-centred education was recognised [2, 3, 6, 7, 8].

Despite of the introduced HCI course, team project outcomes have not improved because many students limited the use of acquired knowledge only to HCI assignments [9]. We understood that separate HCI course should be integrated with SE team projects. This allowed balancing student workload and gaining experience to perform user-centred design activities in SE projects. Furthermore, when students perform SE team project with industry partner as a user and customer, they do realize that real users have quite different needs and perceptions [10].

Industry expectations helped defining the main curriculum outcomes and the emphasized aspects. In order to solve these shortcomings project-based approach was introduced [5]. Because of danger of possible opportunist behaviour that can be manifested in teamwork by some part of the students, we evaluated both parts of the teamwork: developed software as well as development process [11].

## 2.2 Creativity in HCI education

For several years computers have gone from office desks. They found their way into our cars, flats or mobile phones. Users expect to enjoy using these things. That means that engineering students have to understand people with their cognitive limitations and social needs when they learn new technologies as they emerge. Changing technology environment requires adapting syllabus to stimulate generating creative and innovative solutions.

Creative solutions do not mean only aesthetically pleasing user interfaces. We understand this concept as innovative ideas that implement various solutions for users' needs and simplify the complexities in tasks that people engage in.

It is important to stress that HCI courses should aim not only at usable solutions but at solutions that enhance quality of interaction. Although creativity is individual ability, but we maintain that this ability can be trained, too.

Significant part of HCI courses covers usability concept and usability evaluations. They aim not only at usable solutions but at solutions that enhance quality of interaction. The narrow orientation to prototyping and usability evaluations does not motivate students to be creative. Such an approach often lacks for methods that invent better solutions and designs [12]. In the undergraduate course we deal with the whole range of HCI topics in overview; while the user-centred design techniques incorporated into the existing software design methodologies are treated deeper, like in T-model [13]. Students mastered user-centred design activities in this course but created mostly standard solutions in their assignments. The last challenge was syllabus modifications that should stimulate generating creative solutions.

Teaching modifications that promoted creative solutions in student assignments were introduced to HCI lectures and assignments in 2007 [14].

## 2.3 A need for active learning in HCID course

HCI lectures overviews wide range HCI topics while assignments emphasise usability engineering. HCID

emphasises the analysis phase, while the undergraduate course highlighted the user-centred design processes in software engineering lifecycle. The most difficult part for students is the creation of alternative low fidelity prototypes in the beginning of the course. A brainstorming sessions is involved to this assignment.
HCID course is devoted to deepen analysis phase. This phase involves understanding of users, conceptualising the interaction, creating personas, choosing appropriate interaction paradigms and then formulating user needs and requirements. Most of topics are non-technical in their nature and software engineering students run into difficulties dealing with them.
Currently we have gained experience with two crops of SE graduates. After the first course implementation we noticed that students tended to treat interaction design with a focus to interface building. They tried to build first prototypes early and then improved them using usability evaluations. It was difficult for students to argument their choices of interaction styles.
The master courses in the Faculty of Mathematics and Informatics of Vilnius University are taught in traditional lectures and seminars format. Human computer interaction design course is multidisciplinary. Though its engineering nature it deals with social aspects that need different teaching approach as we realised. In the first year seminars students analysed the examples and applied facts and principles in small assignments. Some part of the seminars was devoted to explore the research papers from scientific journals that dealt with innovative designs and interesting cases. After the course many students expressed an opinion that it would be better to make seminars more interactive.
Next year we tried to add some variety to monotonic seminars by involving the methods that are usual for social sciences but not traditional for engineering education. For the undergraduate course we employed the brainstorming sessions while in the graduate HCID course we introduced the debates.

## 3 Active learning in social disciplines

Business, law and medicine educations have a long tradition of using techniques that involve learning by doing, develop analytical and decision-making skills and improve oral communication as well as team work skills [1]:

- discussions,
- debates,
- public hearings,
- trials,
- problem-based learning,
- scientific research team,
- team learning.

Discussion technique ranges from strong questioning to nondirective class discussion. In the first case instructor asks probing questions and students analyse the problem and try to answer. In nondirective discussion instructor starts with minimal introduction and then acts more as a facilitator than dominant questioner. Practitioners mostly use a middle approach with proper introduction, case materials, directive but not dominating questioning. The essential issues are highlighted in the blackboard. The class ends with an appropriate summary.
Debates are well suited for cases where two opposed views are evident. Two teams of students prepare written briefs on both sides of the issue and are prepared to argue both sides. In the beginning the instructor assigns the side for student teams. After the pro and con teams present their arguments, each team have rebuttal right. Then audience can question both sides and evaluate the content and presentation of both teams.
In public hearings format a student panel acts as a hearing board. It listens to presentations of students teams that present a prepared solution with an argumentation. Any student panel member can ask questions. After all presentations the panel makes decision or recommendation.
Trials involve two opposing sides. Each is represented by an attorney. Each side involves witnesses with different views that are cross-examinated. In the end the attorneys summarise their positions. Preparing for the court two student teams prepare position papers that favour extreme sides. These materials are used during the trial. The compromise position has to be achieved. At the end, other students write which position convinced them.
Problem based learning format is used in medical schools. It is faculty-intensive technique with one tutor for every four or five students. Students perform a team work with case series that are lined by common area or progress in complexity. In the first phase students determine which information they need, divide up responsibilities to search the needed information. During the next class students discuss their findings, share opinions and determine which new information they need to reach the solution. In the third class students share collected data and their understanding and try to reach closure on the diagnosis and treatment.
Scientific research involves data collection and analysis. Student teams write research papers with standard sections: introduction, methods, results, discussion, references. The papers are exchanged and evaluated using peer-review. Students criticize the whole paper, evaluate the design and the methods used, presentation of results and their interpretation. Then groups can revise their papers and submit them to the instructor for grading.

In team learning technique class is divided into small groups of students. The course content is divided into learning units. Each unit group reads the reading assignments followed by individual tests, and then groups do the same test together. Both tests are scored. Groups discuss their answers using textbooks. Finally groups apply the learned facts and principles to a problem or a case.

# 4 Fostering creativity in HCI courses

A brief analysis of existing HCI courses reveals different teaching trends motivating creativity. The techniques of creativity are abundantly used in the industrial, commercial and publicity domains. They make it possible to bring the new ideas and concepts in minimum time and with the best performance. According to Dondon [15], creativity could be introduced through appropriate management in educational projects by facilitating individual creativity and using Herrman Human behaviour modelling [16] in creativity seminars.

## 4.1 Stimulating creativeness in lectures

According to Altshuller et el. [17], creativeness ranges from minor improvements to new concepts and true discoveries. Creativeness needs time interval for social interaction because "creativity is an individual characteristic whereas innovation is a social activity" [18].

Computer science students are trained to use structured methods in analysis and development. The rigid methodologies contradict to fuzzy creativity processes. The challenge is integration of highly organised engineering processes with fuzzy activities that facilitate creative invention [12].

Creativity can be summarised as partly talent but also solid skills, planning, understanding the requirements, implementation, theory and testing, that apply to the problem and the solution [19].

Wong [9] provided practical suggestions how inventiveness could be incorporated into HCI which among other stated the following:

- students should be expected to generate ideas, present them in sketches and explain how these ideas influenced the final result;
- the more realistic settings are needed which replicate real-world cases with enough low-level details in order to develop sound understanding of the domain;
- before entering HCI courses students should be aware of tools and frameworks for creativity that assist them in discovering, generating and refining new ideas;
- create opportunities for 'eureka moments';
- expose students to design solutions from different domains;
- learning environment should be shaped to collaboration and sharing of ideas within a student groups.

According to Lars Oestreicher, successful teaching should shake student minds by making them aware of a constructive curiosity [20]. It is not sufficient to provide just good or bad design examples. These examples should make the students reflect on the further consequences emanating from the more general problems illustrated through the examples. Our experience and the introduced course modifications are very near with above mentioned findings.

## 4.2 Tools and methods for inventiveness

In this section we outline some tools that could help students to generate ideas. On conference in Limerick the following methods were suggested:

- on-line lab-diaries allow the public brainstorming of ideas about the problem and design concept [18];
- the contextual interviews, the affinity diagrams and the development of personas and scenarios help students to understand the context and nature of the problem [21];
- the record of cooperative evaluation in which partners think aloud provides a source of reflection and insight to designers and could be used to focus on creative thinking [22];
- project-based approach is a suite of methods and techniques which incorporates design journal, the morphological box with different combinations of all possible solutions, sketching and representation techniques, project-planning, scenario-based design and other user-centred methods [23];
- Bad Ideas Toolkit suggests using systematic methods to critically review bad ideas from different perspectives, it creates new opportunities by making them good ideas that helps avoid design fixation and trains students to explore and understand the extent and constraints of the design space [24].

Fonseca, Jorde et al. [25] point out that a significant obstacle that restricts creativity occurs when students are forced to go from the initial task analysis directly to prototyping. In their opinion, it is a very brusque step in the interface development methodology because students start thinking in interaction styles and screen

layout before thinking about the solution for users' needs. The authors suggest including the conceptual modelling phase between the task analysis and low-fidelity prototypes.

Creativity can be encouraged by introducing special courses e.g. visual literacy course to engineering curriculum [26]. Such courses prepare engineering students to be effective visual communicators.

Students are encouraged to brainstorm thoroughly and not settle with the first idea that comes to mind. During the lectures the different ways to think creatively, such us divergent thinking, are introduced to them. In our observation, brainstorm session involves students with different attitudes and motivation.

According to the approach recommended in [27], two types of classes are arranged for the students with similar attitudes and motivation. In our settings, we use the team work as a way to involve less motivated students to achieve common results. In our observation, in the process of developing the alternative solutions, the bright ideas are developed by the students with not very strong technical background.

Brainstorming sessions are also for gifted students because they can take the initiative and actively participate in learning. According to Kim et al. [28], it is a proper environment for these students can interact through group activities.

# 5 Teaching approach

This section presents our teaching approach and experience gained. We deal with recent modifications that concern stimulation of creativity in student projects. We deal with it from both theoretical (on lectures) and practical points of view (in the projects). To illustrate our approach we present some examples of students' prototypes.

Currently, two courses of human computer interaction are delivered at Vilnius University: human computer interaction (HCI) for undergraduates and human computer interactions design (HCID) for graduates. HCI is multidisciplinary field in which engineering, science and social aspects are interlaced. In the undergraduate course we aimed to foster creativity and inventiveness. In the graduate course we aimed to improve higher-level thinking and analytical abilities.

HCI course has been taught in the undergraduate study programme since 2003 [4], whereas human computer interactions design (HCID) course – since 2007. HCID course is developed for students that are completed HCI on the undergraduate level.

## 5.1 Teaching HCI

HCI course was introduced as a stand-alone course with its own assignments in 2003.

After the first student internship in industry we realised that despite the introduced HCI course, subsequent team project outcomes have not improved: many students limited the use of acquired HCI knowledge only to HCI assignments [29]. These results induced the first modifications: HCI course was integrated with SE team projects combining separate lectures with joint practical classes [4]:

- HCI and Team Software Process (TSP) courses have separate lectures;
- assignments are performed in the frame of Team Project I (TP1): TSP course covers general project activities, HCI exercises incorporate the user-centred techniques into the team activities;
- a task is provided by industry partner that participates in team projects activities as the user and the customer.

Integrating the HCI assignments with TP1 motivates students to apply acquired knowledge into software engineering projects. Students gain the possibility of working with real users and their notion of what is "common sense" or "obvious" will change significantly [30]. Students gain more realistic settings and can develop sound understanding of the domain

The modifications consolidated student skills using user-centred design techniques in SE projects, but the results lacked creative solutions. In most cases the first low-fidelity solutions were elaborated to high-fidelity design throughout the project. Though results were usable enough they also showed up a creativity gap between the definition of usability goals and prototyping.

Second modifications made last year aimed to break this creativity gap and concerned both lectures and practical classes. They are:

- bad design examples are presented in lectures, critical review provides a way to think of how to make good initially bad solutions;
- list of assignments is augmented with individual homework, in which students are expected to notice interactive devices (not necessary software) that caused difficulties in use, why they are unusable and how students should improve them;
- unconventional solutions receive extra points in assessment.

These modifications did not teach creativity. They aim to shake students' minds and induce a change in their mindset. The bad examples in lectures and practical classes are not just shown, but also elaborated from various perspectives.

Students like to present problems in searching the required information on web pages or remember their experience when they learned to use new mobile phones. Their examples concern not only software but also other products, such as lifts, copiers, control devices in the cars, etc. These presentations stimulate discussions about further consequences that arise for user while using these devices. A real training in creative design occurs during the brainstorming session where students learn to generate new ideas.

### 5.1.1 Theoretical classes

The basic ideas about course structure are implemented according to ACM SIGCHI Curricula for Human-Computer Interaction [8]. Initially the sequencing of course topics accorded with the above-mentioned recommendations. However, further integration with Team Project I required reorganizing the sequence of lectures. Topics related to iterative user-centred development are discussed deeper and are shifted towards the beginning. Like in T-model [13], we deal with the whole range of HCI topics in overview; while the user-centred design techniques are incorporated into existing software design methodologies are treated deeper.

The recent changes did not influence the course structure but rather content. The poor design examples presented illustrate lecture topics. It is thought-provoking material that activates students during lectures.

### 5.1.2 Practical classes

After the integration of HCI with Team Project I the task for students' teams is unified for both courses. HCI deliverables cover user and task analysis, usability goals and interface requirements, brainstorming session, low-fidelity and high-fidelity prototyping as well as usability evaluations (see Table 1). After recent modifications we begin the course with homework. Students present inconvenient solutions in interactive devices. They analyse consequences for users and propose the way how to make them good.

**Table 1. HCI assignments**

| Week No. | Assignments |
|---|---|
| 2 | 1. Individual homework. |
| 4 | 2. User and task analysis, usability goals |
| 5 | Brainstorming session for generating ideas |
| 6 | 3. Low-fidelity prototypes with usability evaluations |
| 7 | 4. Interface requirements and project recommendations |
| 11 | 5. High fidelity prototype with heuristic evaluation |
| 16 | 6. Working implementation and user documentation |

The final project must due to the end of course. Project outcome is a complete system with user documentation. Programming can be done in any language or system. Final project is defended in public oral presentation, in which students, HCI and TSP lecturers as well as representative of industry partner participate.

Before the integration of HCI with the TP1, one team member rather than the team often designed the user interface. HCI assignments allow avoiding such behaviour. After applying HCI practices to their first project, students apply them to the subsequent projects. Such expectations are accomplished also in the grading of students projects. The HCI grade is partially included into the SE project grade.

Individual homework motivates students to rethink obvious solutions and reflect them from various perspectives. Students comment that they change their minds when they see solutions that are asserted by colleagues as inconvenient for use. Creativeness is social activity, so alternative solutions are generated in brainstorming session. Our experience also endorses that it is hard to admit creative process to rigid time during classes [18]. Therefore, students use wiki installed on faculty server to continue discussions and elaborate the ideas created. Discussion on faculty wiki also helps them to present how alternative solutions generated during brainstorming sessions influenced the design of high-fidelity prototype.

### 5.1.3 Examples

Unconventional solutions gain extra points assessing the deliverables that also motivates to generate more alternative designs. Creative solution has to match with user needs and usability goals.

Below we present two examples of student' projects. The example from Fig. 1 illustrates a prototype of credit limit assurance assessment system. The idea of this project is to help insurance analyst to assert credit limit in a specific case. While making the credit limit insurance decision, the analyst gains the information from the internal and external data sources. Internal data bases provide information of the previous insurance operations. External sources include financial indexes, such as status, turnover, sales, buying, the capital, spending, liquidity ratio, the development and the events from the past contracts. Queries to internal sources are processed immediately. Queries to external sources block the decision-making process until all answers are received. Error prevention is essential. Appropriate visualisation informs which queries are already completed, which are still in progress, and how many

applications for the credit insurance have not been evaluated yet.

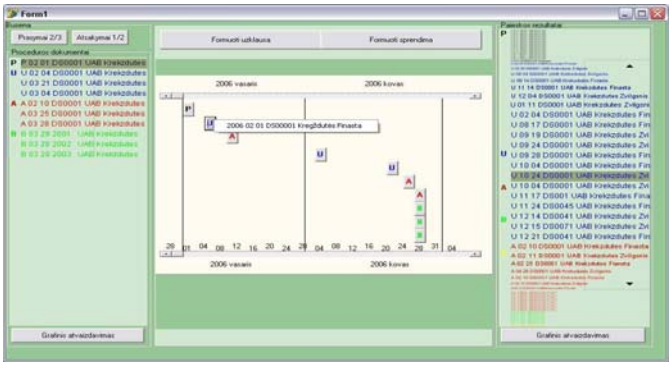

**Fig. 1. Prototype of credit limit assurance assessment system**

In Fig. 2 we can see interface for air traffic control that aims to enhance decision support for aircraft landing procedure. Display presents the one-aircraft landing model where the actual position with relevant parameters is shown. Situational awareness in this display encompasses trajectory view in 3D and 2D projections, velocity variations and true/false diagram about current situation. Sliders on the right part of window allow adjusting safe parameters to the aircraft type (light, medium, heavy).

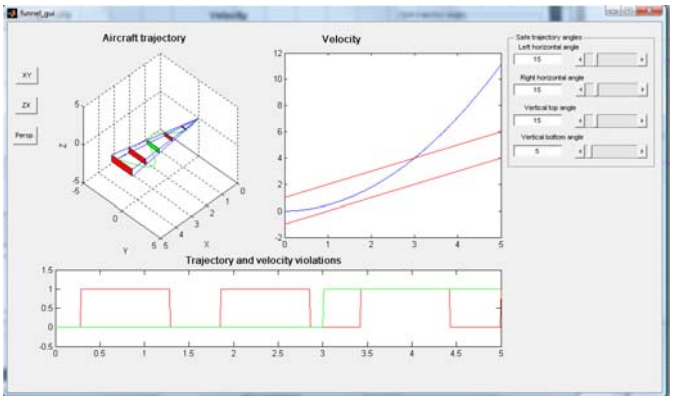


**Fig. 2. Decision support for aircraft landing control**

## 5.2 Teaching HCID

In this section we deal with the teaching of HCID in graduate study programme. We distinguish multidisciplinary aspects in the course content and then show how we use active learning methods from social science education in our seminars.

### 5.2.1 Multidisciplinary aspects of HCID

In this section, we explore teaching methods that help master the challenges in HCI education related to multidisciplinary HCI aspects and present the way we use them in the teaching of HCI courses in Vilnius University.

From the software engineering point HCI essentially focuses on interface design. On the one hand, it is engineering course because it reflects key engineering objectives, such as efficiency and effectiveness. But it connects with social aspects too, such as user satisfaction, communication and collaboration, human perception and cognition abilities and other usage contexts. As an engineering discipline, HCI seeks to improve processes of usability engineering life cycle.

In last decades HCI matured from the scientific viewpoint. Best interface designs influence creation of design recommendations that are generalized to principles and models. While testing with users, the hypotheses are raised, data are collected, analysed and interpreted. From these results the inferences are drawn.

HCI has elements of artistic design, too [31]. Creativity and aesthetics are valued in interface developers' community. Today interfaces aim to affect user emotions. In our analysis we assign these aspects to social aspects.

HCID course is taught according to the book of Preece et al. [32]. Analysing the ways how to teach multidisciplinary aspects in HCID courses we tried to distinguish these aspects in these courses (Fig. 3).

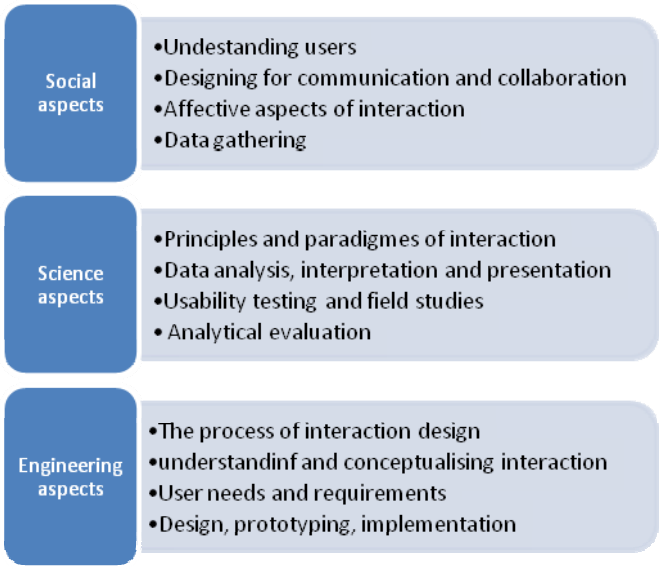


**Fig. 3. Multidisciplinary aspects in HCID course**

Educators have difficulties with these non-technical aspects that are unusual for engineering curriculum. These aspects need various teaching techniques, comparing with structured engineering skills.

This means that assignments covers design aspects and do not cover essential skills in analysis phase. These skills must be developed using teaching methods, developed and approved in these domains.

### 5.2.2 Active learning on seminars

This graduate course has been provided in lectures and seminars format for two years. In the first year, students analysed and presented for peers research papers recommended by lecturer. We experienced the difficulties in involving students for discussions. Many of them viewed seminars as a natural continuation of lectures. Although we encouraged the participation in discussions, many students tended to agree with the presenter.

In the end of semester, students maintained that quality of seminar depended on the practical value of the topic and on presenter. Some seminars were rather passive and continued lecture format, where students agreed with the presenter and each other.

Last year, we enriched the seminars with problem solving cases, where the materials studied pointed to the successful designs, discovered usability problems using cognitive walkthrough and heuristic evaluations. These cases were presented in the debate format where students' groups presented their pro and contra opinions based on prepared usability evaluations.

Dealing with communication and collaboration topics, the debate was dedicated for analysis of technological and community forming aspects. Students argued the factors technological or social are more important for the vitality of the on-line communities.

After the end of the semester, many participants pointed out, that the most successful part of the seminars was debates. Furthermore, skills gained in debates resulted in higher level of student retention in the exam comparing them to skills gained in traditional seminars.

## 6 Conclusions

We presented our approach of teaching an introductory HCI course in SE curriculum. The modifications introduced in SE curriculum enhanced HCI teaching by integrating assignments with SE projects. Last year's modifications encouraged creative thinking. Students gained skills at creating, elaborating and evaluating several alternative solutions.

Undergraduate students generally enjoy presenting homework added to last year assignments. In the homework they deal with unusable designs they found. This exercise is perceived as funny activity.

In previous year the first assignment was user and task analysis, followed by the definition of usability goals. This assignment was asserted by students as hard because it was not easy to think from user perspective without preparation. Searching for unusable interfaces enables them to feel the users' perspective in the beginning of the course. Homework presentations usually raise discussions, activate imagination and involvement. After discussions students better understand the user perspective and define the usability goals easier. So, in our opinion, good and bad design examples stimulate creative thinking in human-computer interaction design.

Brainstorming session and creation of at least two alternative solutions foster to try various interaction styles for defined usability goals. It increases the amount of creative thinking. Positive aspect is wiki available on faculty server that facilitates discussions after the class hours. Presenting project requirements students can easier argument how alternative solutions influenced their final decisions because group discussions are fixed on wiki.

We feel satisfied that students' response to the recent changes in the content of undergraduate lectures and assignments has been mainly positive.

Teaching approaches from social education enrich teaching of non technical HCI aspects. We think that active teaching techniques established in social sciences are useful for dealing with social aspects in the graduate HCID course. In some seminars after the main presentation students from the audience told their opinions that confirmed or contradicted with the presented attitude. Instructor acted here as discussion facilitator. In these succeed seminars we were close to discussion format. After the debates students realized that technological part of on-line communities is significant but not the most important factor.

We are planning further to improve HCI syllabus by dedicating more attention to the emerging interaction techniques and styles such as mobile devices and ubiquitous computing as well as to emphasising a Web development. We have also to rethink the assessment of student projects with more sound dependence between innovative solutions and project marks.

In the graduate course we are planning to introduce the case study for examples of extremely minimalistic interface design in a public hearing format.

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