Apply the We!Design Methodology in E-learning 2.0 System Design: A Pilot Study

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Abstract

During the emergence of Web 2.0, the methodologies and technologies of E-learning have developed to a new era, E-learning 2.0, emphasises on social learning and the use of social interaction tools. The students are the main end-user of the E-learning 2.0 systems, so it is essential to take students' opinions into consideration during the design process of such systems. The We!Design participatory design methodology is proposed for incorporating undergraduate students in the development of educational systems. This pilot study aims to investigate how the We!Design methodology would work and what the results might propose, and gather initial preferences and improve the quality and efficiency of the larger scale studies in the future.

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1 Introduction

The We!Design is a student-centred educational system design methodology, which supports typical content-independent educational processes and can be easily applied in real educational contexts [1]. Undergraduate students are the main end-users of the e-learning systems, and they have substantial abilities to propose the problems and even the solution to the problems according to their e-learning experience. Besides, undergraduate students, especially those who are studying computer science, are willing to participate in the process of educational system design [2]. The design process involves both the system designers and the students, and provides a tool to exchange knowledge between them [3], hence helps system designers gather the potential end-users' real needs.

As one of the participatory design methodologies [4][5], the We!Design engages undergraduate students, the potential end-users of the results of the design activities, as important participants in the design process. With the coordination of coordinator(s), the students participate in the design tasks and make design decisions by cooperating and discussing. Comparing to other participatory design methodologies, the We!Design methodology 1) requires a short period of time of cooperation between designers and students, which makes it easier to involve and motivate students; 2) towards the design of learning systems rather than learning content, which supports content-independent educational process, such as note-taking and various forms of assessment; 3) exploits the design competencies of highly computer-literate students rather than the participation of the students with average technological knowledge, which is conductive for the students to contribute to the user interface prototype design in an efficient manner [6]. For these reasons, we choose the We!Design as the participatory design methodology in our research.

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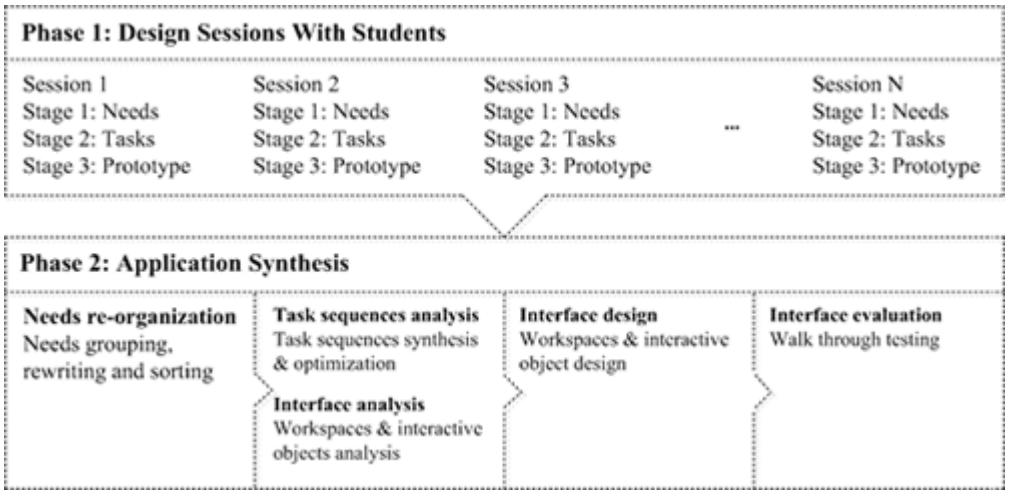

Figure 1 The We!Design Methodology [1].

This pilot study conducts the We!Design methodology in a small scale experiment. The main goals of this study presented in this paper are: 1) exploring how the We!Design methodology would work and what the results could be proposed; 2) gathering initial preferences and improving the quality and efficiency of the larger scale experiments in the future. The remainder of the paper is organized as follows. Section 2 describes the process of the experiment applied the We!Design methodology and the experiment results. Section 3 discusses the problems occurred in the experiment and the possible solutions. Section 4 draws the conclusions.

2 Experiment

As shown in Figure 1, the We!Design methodology contains 2 phases. In the first phase, several parallel design sessions take place with small groups of students. Each design session is conducted with the coordination of coordinator(s), in order to guide the students and facilitate their collaboration during the whole session. This session includes 3 stages, needs collecting, tasks sequencing and prototype. By going through the session, a requirements list and a low-tech prototype are expected to be proposed. In the second phase, the system designers analyse the results proposed in the first phase and synthesize them in a single system with an ordered requirements list [6].

In this study, the experiment was conducted with the participation of 2 coordinators and 6 fourth year undergraduate students. One coordinator was a computer science Ph.D. from the University of Nottingham; the other coordinator was a computer science Ph.D. student from the University of Warwick. The students were from the Computer Department of 'Politehnica' University of Bucharest, Romania, studying a course on 'Semantic Web'.

A short seminar was conducted at the beginning of the experiment, in order to introduce the experiment process, explain the experiment goals, and recall the required background knowledge such as how to design a system and what an e-learning system is. With some case studies of e-learning systems, the students became more confident to discuss and present their ideas, so the coordinators could focus on time controlling and summarizing.

2.1 Phase 1: Design Sessions with Students

Two parallel design sessions were conducted in the first phase. Each design session involved 2 coordinators and 3 students, and lasted for about 2.5 hours. One coordinator was a human computer interaction (HCI) expert preserving the usability of the system; the other coordinator was an e-learning system expert preventing the students from going too far away from the system design goals. Besides, both coordinators were also in charge of guiding and facilitating the students to go through the session, and providing support without interfering in the process of decision making. In front of the students, there was a table with pens and big white paper for the students to record their ideas and draw the user interface of the prototype. The experiment process was recorded by a video camera, so the coordinators could focus on guiding the experiment and noting the problems occurred [1].

In the first stage, the students were asked to extract a set of needs for the new e-learning system based on their experience of using such systems. Initially, the students proposed the important features that they expected to be provided by an e-learning system and the problems they found during using e-learning systems. Next, they summarized all the ideas into a needs list, and continually elaborated, categorized and evaluated these needs. Finally, 97 raw needs were proposed and ordered into a requirement list according to their importance.

The second stage aimed to satisfy the needs proposed in the first stage, by describing the interactions between end-users and the system. *Personas* and *scenarios* [7] were adopted to describe the process. A persona is a 'hypothetical archetype' of an actual user. S/he is not a real person, but is used to represent a real persona in the design process [8]. A *scenario* is a description of a *persona* who is using a system to fulfil several tasks in a specific context to achieve goals [9]. 4 personas were created to represent the types of users in the use scenarios. One of the examples designed by the students is:

Bob is a freshman, taking the module of 'Java programming language'. He hasn't learnt any other programming languages before, so there are several concepts that he doesn't understand, such as the reason of Object Serialization and the difference between Interfaces and Abstract Classes. He is keen to get the answers by discussing with his friends rather than reading a chapter. He finds Alex has lots of programming experience, so he decides to ask Alex. Bob sends a message to Alex to describe his problems. Alex describes his understanding about Object Serialization. And then Bob asks him to send some coding examples.

At the end of the second stage, one student in the group presented the task sequences, while the HCI expert coordinator wrote down the task sequences during the discussion.

In the third stage, the task sequences were refined and converted into more concrete system requirements. The students were asked to identify the key features of the task sequences, in order to sketch out the layout and the user interface for the low-tech prototype on the big white paper (shown in Figure 2). At last, a stereotypical role-play testing was conducted, to evaluate the usability and note the problems and potential solutions.

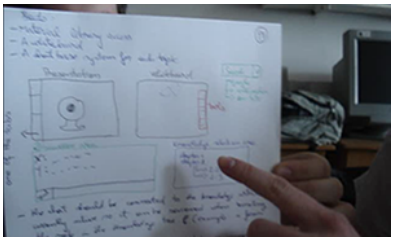

Figure 2 User interface of the prototype for the e-learning system.

2.2 Phase 2: Application Synthesis

In the second phase, the requirements proposed during the design sessions were synthesized into the final system [6]. Firstly, the system designer gathered the requirements from the two sessions, grouped the similar requirements, and removed the duplicates. Subsequently the importance of these requirements was estimated according to the number of times the requirement appeared in the design sessions and importance suggested by the students. Finally, the designer synthesised a list containing 28 requirements, ordered by the importance, and divided them into 4 categories, which represent the main areas for which features could be built within a system, as shown in Table 1.

Table 1 The Final Requirement List.

Category	Requirement	N[1)]	I[2)]
Learning	Use multiple types of files, e.g. PDFs, photos, videos, slides, etc.	5	1
	Tag and flag up topics in the learning path	1	2
	Take tests after learning a topic	4	3
	Get assessment and feedback from teachers	5	4
	Access to open learning resource, e.g. Wikipedia	6	5
	Search learning resource within and outside of the system	6	6
	View learning progress in percentage	5	7
	Contribute to learning materials by creating and uploading files	3	8
	Choose to view the whole or partial learning path	1	9
Social Networking	Create groups that are registered for the same topic	3	1
	Share and/or recommend learning materials	2	2
	Ask and answer questions of other students	5	3
	Discuss the current learning topic with other students	6	4
	Use feedback & questions forum at the end of each lesson	5	5
	Use communication tools to chat and leave messages	4	6
	Write comments/notions wherever and whenever they want	5	7
	Create groups that share common learning interests	4	8
	View history discussion when selecting a particular topic	1	9
Adaptation	Recommend topics according to student's knowledge level	4	1
	Recommend other topics according to the current learning topic	5	2
	Recommend topics by referring to other students' rating	2	3
	Adapt learning path according to learning progress	2	4
	Adapt learning tools according to student's user-level	1	5
Usability	Use graphical user interfaces	4	1
	Get instructions and tips	3	2
	View system status	2	3
	Select full screen option	1	4
	Set themes, layout, etc.	2	5

1) N: The number of times the requirement appeared in the students' suggestions, in one form or another;
2) I: The average importance of the requirement proposed by the students from the two design sessions.

3 Discussions

The *cold-start* problem appeared as expected. At the beginning of the experiment, the coordinators explained the process and goals of the experiment, and introduced some required background knowledge followed by several case studies, but it was still not easy to

get the students started, because they were afraid of proposing something that might not make sense. Therefore, the coordinators should have the ability to recognize the students' problems and find out good solutions and encourage them to participate in the discussion and presentation. One feasible method is to ask some open-ended questions and give some typical answers, so the students can realize what kinds of questions and answers are appropriate.

In the needs collecting stage, the students tended to explore the solutions to satisfy the needs as well, but the objective of this stage is to focus on needs collection rather than to find the solutions. Hence the coordinators should remind them in appropriate way and stop them in time. *Personas* and *scenarios* were adopted in the stage of tasks sequencing. It is necessary to keep in mind that people are diverse; they have different experiences, different expectations and different preferences, so it is difficult to design for all of them. The solution Cooper proposed is to identify the *primary persona* as the individual "whose needs must be met, but whose needs cannot be met through an interface designed for any other personas" [9][10]. *Scenarios* are short, fictional stories that describe a set of tasks and interactions of the *personas*. The more-detailed scenarios can provide more information for tasks sequencing, but due to the short period of time, the coordinators should guild the students to design an appropriate level of detail. In the prototyping stage, some design flaws were founded, and the students might be reluctant to fix them or need extra time. The coordinators should encourage them to fix the flaws as well as control the time, because even incomplete work can still help to inspire the system designers.

In the application synthesis phase, an ordered requirement list was proposed in a generic detail level, which means it is necessary to generate the requirements specification (intermediate detail level) and then the application specification (high detail level) in the next step [11]. Besides, the system requirements were arranged by the system designers, according to students' content-based descriptions, so it is possible for the designers to misunderstand students' intention. Therefore, it is necessary to ask the students to check the consistency between the reorganized requirements and their original ideas.

4 Conclusions

In this paper, we have applied the We!Design participatory design methodology in a small scale experiment for a pilot study. Two coordinators and six computer science undergraduate students were involved in the experiment. Two parallel design sessions were conducted in the first phase. The students went through the stages of needs collecting, task sequencing and prototype designing, and proposed a requirement list and a low-tech prototype. In the second phase, the system designer synthesised the requirements proposed in the first phase into the system requirement list, categorized them according to the features that could be built within a system, and sorted them according to the importance.

We discussed the problems occurred during the experiment process and investigated the possible solutions. The key to better conduct the experiment is to encourage the students to participate in discussion and presentation. Due to the lack of time, the coordinators should keep the balance between the detail level of discussion and time controlling, and it is better that they provide some tools and tips during the experiment, e.g., *personas* and *scenarios*. We also discussed the importance of mutual understanding between the system designers and the students. A feasible way is to ask the students to check the consistency.

This pilot study helped us to explore the requirement analysis experiment applied the We!Design participatory design methodology. A much larger study will be conducted in the future to analyse the system requirement for a real e-learning system design.

References

1 Triantafyllakos, G., Palaigeorgiou, G., Demetriadis, S. and Tsoukalas, I.A. The We! Design Methodology: Designing Educational Applications with Students, In *Proceedings of the 6th International Conference on Advanced Learning Technologies*, pages 997-1001, 2006.

2 Siozos P., Palaigeorgiou G., Triantafyllakos G. and Despotakis T. Computer based testing using 'digital ink': participatory design of a Tablet PC based assessment application for secondary education. *Computers & Education*, 52(4):811–819, 2008.

3 Roda, C. Participatory system design as a tool for learning, In *Proceedings of IADIS International Conference of Cognition and Exploratory Learning in Digital Age*, pages 366-372, 2004.

4 Muller, MJ. and Druin, A. Participatory design: the third space in HCI. In *Handbook of HCI. Edited by Muller MJ.*, pages 1-31, 2003.

5 Kyng, M. Bridging the gap between politics and techniques: On the next practices of Participatory Design. *Scandinavian Journal of Information Systems*, 22(1): 49-68, 2010.

6 Triantafyllakos, G. N., Palaigeorgiou, G. E., and Tsoukalas, I. A. We!Design: A student-centered participatory methodology for the design of educational applications. *British Journal of Educational Technology*, 39(1):125-139, 2008.

7 Cooper, A. and Reinman, R. *About Face 2.0: The Essentials of Interaction Design*. John Wiley & Sons, Inc., 2003.

8 Calabria T. An introduction to personas and how to create them. Captured in: http://www.steptwo.com.au/papers/kmc_personas/index.html, viewed 8/07/2012.

9 Cooper, A. *The Inmates Are Running the Asylum*. Indianapolis, Indiana: SAMS, A Division of MacMillan Computer Publishing, 1999.

10 Cooper, A., Reimann, R., and Cronin, D. *About Face 3, The Essentials of Interaction Design*. Published by Wiley Publishing, Inc., 2007.

11 Sommerville, I. and Sawyer, P. *Requirements Engineering: A Good Practice Guide*. John Wiley & Sons, Inc., 1997.