Is Optional Web-Based Seminar an Effective Way of Learning as a Part of Information Management and Information Systems Development Course?

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ABSTRACT

This paper describes the use of the web as a complementary addition to conventional lectures in the learning of the basic concepts of information management and information systems development. We utilize conventional lecture material, search engines on the web, and the Optima learning environment. The solution enables a web-based seminar supporting learning in various ways. First, in our approach the students compose a coursework report focusing on the main concepts of the subject area. This occurs by using lecture handouts and search engines on the web. Second, in the web-based seminar students can familiarize themselves with the coursework reports of other students. We claim that in this way learning can be promoted in the spirit of both cognitive and social constructivism. During the coursework and while in the seminar the students worked in small groups of two to four students or they completed the coursework as an individual task. In the web-based seminar the students had a workspace in the Optima environment for publishing their coursework presentations. At the final phase of the course the students were expected to familiarize themselves with the presentations of other groups. In this paper we analyze the benefit of our WWW-based seminar based on the goals of the course. At the beginning and end of the course the students were expected to analyze their own knowledge of the themes of our course. These themes were: (1) administrative view to information resources management, (2) technological view to information resources management, (3) building information systems, and (4) organizational applications. In addition, the students were expected to analyze how they experienced the coursework. The study found out that the WWW-supported coursework and seminar have a neutral effect on learning different themes of the course in most cases. However, the students of IT faculty benefited more from the web-based coursework in the learning of topics 1 and 3. We also found that the Optima-based coursework suits a little bit better for younger students, males and the students of information technology and it may be more effective as an individual task.

Keywords: Learning of information systems, web-based learning environment, constructivist learning.

INTRODUCTION

In a traditional classroom, learning occurs in the behaviorist manner (behaviorism). The traditional classroom puts a learner in the position of an object of assessment: an instructor initiates, a learner responds, and the instructor then closes the sequence by either accepting or rejecting the learners' turn (Sinclair & Coulthard, 1975). The constructivist learning approach (constructivism) contrasts to the behaviorist approach. From the perspective of these learning approaches, the last decade has been the time of constructivism even at the university level.

Traditional lecture-based teaching is problematic in many ways (Isaacs, 1994 & Rosenthal, 1995). Problems associated with this type of teaching include ineffectiveness, passiveness, and alienation of students. In the context of technology and related sciences, some revisions have been suggested to improve lecturing as a teaching method by activating students using, for example, co-operative learning in small groups and essay-writing assignments about technical topics (Isaacs, 1994). From this perspective lecturing is not without potential if the previously mentioned problems can be corrected, but other learning methods must also be considered.

In the constructivist approach learning is comprehended as the development of mental models. Brandt (1997) emphasizes that constructivism is an essential basis when applying the WWW for teaching and learning. It provides the teacher with a structure for teaching. By focusing on concepts and connecting them to mental models, teachers can gain both confidence and control over the amount of material they cover in the small blocks of time usually allotted to teaching and training. Integrated with experiences that learners use to alter and strengthen mental models, the constructivist approach to teaching information retrieval also gives users the structure needed to get the most out of the Internet.

Based on the aforementioned we suggest a coursework focusing on the main concepts of the learning area. First in this coursework, students need to report what they learned from a lecture handout and give some examples of learning. Second, the students need to search area-related information on the web and give some examples of learning. In this way the students can focus on the main concepts and enrich their learning in a constructivist way.

In the spirit of the social constructivist learning theory for improving the benefits of our web-supported coursework we suggest the use of a virtual learning environment (Optima) and its shared workspace feature. This occurs by publishing and presenting seminar work; by commenting on seminar works created by other students (or groups) and by reading comments expressed by other students.

This paper introduces our approach to carry out a web-supported coursework and seminar. Additionally, it provides the analysis of it focusing on the success of our coursework and seminar from the perspective of the goals of the course. This occurs by comparing the ratings of the students who completed the web-supported coursework to the ratings of the students who did not participate in this coursework.

Our analysis has many goals. We want to know

- how the students' knowledge of different themes was improved,
- how the students experienced the coursework methods, and
- whether age, group size, a gender and a faculty affected the effectiveness of the learning of different themes.

Before discussing the study itself, we first provide an overview of constructivism and the WWW in learning from the perspective of our study.

CONSTRUCTIVISM

Widely known and discussed views associated with (computer-supported) learning include behaviorism and its opposite, constructivism. Behaviorism is interested in a student's behavior (reactions) in relation to teaching (stimulus) while constructivism is interested in the mental processes which affect the behavior of a student (Risku, 1996). A traditional lecture is mainly based on the behaviorist approach while coursework and projects are typical constructivist learning. Most web-based instruction today is based on behaviorism (Morphew, 2002).

Jonassen (1994) summarizes what he refers to as "the implications of constructivism for instructional design". The following principles illustrate how knowledge construction can be facilitated by:

- providing multiple representations of reality,
- representing the natural complexity of the real world,
- focusing on knowledge construction, not reproduction,
- presenting authentic tasks (contextualizing rather than abstracting instruction),
- providing real-world, case-based learning environments, rather than predetermined instructional sequences,
- fostering reflective practice,
- enabling context-and content dependent knowledge construction, and
- supporting collaborative construction of knowledge through social negotiation.

According to Brandt (1997), constructivism asserts that learners construct knowledge by making sense of experiences in terms of what is already known. In constructivist learning the concept of a mental model is essential. Learning is comprehended as the development of a learner's mental models (or a student's knowledge structures). Brandt (1997) emphasizes that constructivism is an essential basis when applying the WWW for teaching and learning. While the goal of constructivism is to recognize and help to facilitate a learner's ability to construct knowledge when applied to teaching information retrieval on the Internet, it also provides the teacher with a structure for teaching. By focusing on concepts and connecting them to mental models, instructors and teachers can gain both confidence and control over the amount of material they cover in the small blocks of time usually allotted to teaching and training. Integrated with experiences that learners use to alter and strengthen mental models, the constructivist approach to teaching information retrieval also gives users the structure needed to get the most out of the Internet.

Despite the promise of constructivism several researchers emphasize the importance of guidance. For example, Silverman (1995) points out that by providing the right amount of traditional instruction, students seem to favor constructivist environments. Additionally, he suggests different tools (e.g. a multimedia authoring environment, better communication media, and easily integrated microworld simulators) to support lessons based on the constructivist approach.

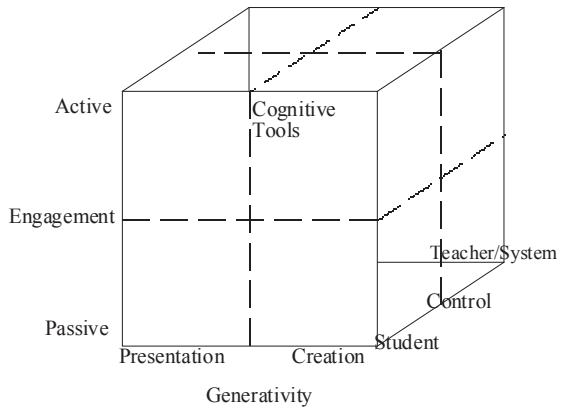
THE WWW IN LEARNING IN OUR CONTEXT

Vast information resources are available to teachers and students via the WWW. However, the problems inherent in any information system such as disorientation, navigation inefficiency and cognitive overload are multiplied on the Internet (Brandt, 1997). On the other hand, these problems can be overcome using a suitable pedagogical approach and/or appropriate tools.

In the case of coursework one approach may be by seeing Internet tools as cognitive tools, in other words, tools for knowledge construction. A cognitive tool is a term introduced by Jonassen in his discussion of hypermedia tools (Jonassen, 1992). He claims that cognitive tools actively engage learners in the creation of knowledge that reflects their comprehension and conception of the information rather than focusing on the presentation of objective knowledge. These tools are learner controlled, not teacher or technology driven. The use of a cognitive tool changes the role of the student into that of an active learner. Figure 1 shows cognitive tools in the general three-dimensional framework for computer-based learning. (Jonassen, 1992). These dimensions are generativity, control, and engagement.

In the same way, web-based tools, like Optima, can be seen in an active context. The students can use Optima and its presentation feature for introducing their ideas, receiving feedback, and managing coursework. This leads to learning by constructing knowledge based on both a student's own ideas and other students' ideas.

Figure 1. Cognitive tools in the general framework of computer-based learning



In the case of a web-based seminar it is useful to discuss the use of the WWW from the perspective of media research. Haythornthwaite (2001) stresses the interpersonal ties that affect the character of web-based communication. According to her, strong ties between students improve web-based communication: based on this we claim that traditional teaching and learning are needed as a part of a course. The traditional parts of a course develop these ties in the way that is not possible in a totally virtual training setting. In this way we can create contexts in which effective WWW-based learning is possible.

Based on the above, it is important to appreciate these views of learning while outlining courses and to understand the use of the WWW in learning. We stress the following three issues. First, we must discuss what the right amount of traditional (behaviorist) teaching should be. Second, we must analyze what is the right way to use the WWW. Active learning must be promoted and situations conducive for successful web-based learning must be created. Third, scaffolding support is needed to support constructivist learning based on the WWW. We claim that after the introductory course level many courses of information systems science can be built on the constructivist approach of learning. This occurs based on coursework that works as the core of the course.

METHODS

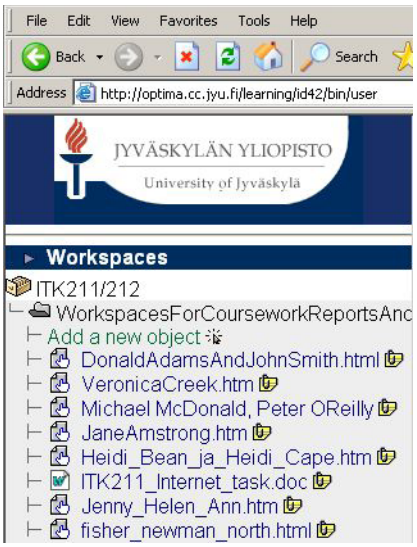
We pursued the study, including a WWW-supported coursework, using the Optima environment. In this section we describe our experiment, sample, and results.

Experiment

At the University of Jyväskylä, the themes of the course Information management and information systems development are (1) administrative view to information resources management, (2) technological view to information resources management, (3) building information systems, and (4) organizational applications. The course was inspired by a textbook, Information Technology for Management: Transforming Business in the Digital Economy (Turban et al., 2002). The course usually lasts for seven weeks including lectures (36 hours), coursework (feasibility study) as well as the final exam. The course given in fall 2004 also lasted for this length of time and included the above-mentioned activities and in addition material and activities on the WWW to support the lectures in the constructivist fashion.

To realize the benefit of the lecture notes we organized a coursework in which students were expected to enter their findings in their diaries. Before this the students were expected to familiarize themselves with the lecture handout of the course (128 pages) and try to find more information from the web to understand the possible difficult matters in our material. The students needed to report what (a) they learned based on the lecture handout, and (b) what useful links they found by using search engines and directories. Additionally, the students were expected to give various examples (for example www links) of what they had learned during the coursework. To promote the students' participation in the optional coursework, the students got credits by completing the coursework for the final examination. Although the coursework is a constructivist part of the course, the

Figure 2. Screenshot from students' workspace of web-supported coursework



teacher's office hours were available as an additional resource to promote their work. The students had six and a half weeks for the coursework before the final examination. The work was expected to be conducted as an individual task or in groups of two or three students.

The groups placed the presentations in the web-based workspace on the Optima web-based learning environment. Other groups were expected to familiarize themselves with these presentations. All the groups had permission to upload files to this workspace. Additionally, it was possible to attach comments regarding any work of other groups on this workspace. For authoring the coursework, the groups had six weeks. After these six weeks the groups were expected to comment on at three other coursework presentations. These comments were placed in the Optima workspace. The students had one week for this. In the comments the students were expected to clarify what they learned by reading a coursework report given by others.

Figure 2 shows the first view of students' workspace on Optima. With the help of this outlook the students had a possibility to upload and see files, and comment on the presentations created by other groups. By clicking a yellow button after the filename of a presentation the students were able to comment on the reports by other groups.

Sample

Forty-five students, 14 females and 31 males, whose mean age was 24 years (range 18-39 years), participated in the experimental group including the web-based seminar. 6 students studied informatics as a minor and 39 students as a major. 40% of them completed the coursework individually, 11.1% in groups of two students, 40% in groups of three students, and 8.9% in groups of four students. We call this group the WWW group in this paper.

Forty-six additional students, 10 females and 36 males, whose mean age was 23 years (range 17-46 years), were involved in the control group. 13 students studied informatics as a minor and 33 students as a major. We call this group the non-WWW group in this paper.

All the students had been initiated into the use of a PC and a WWW browser, and all of them were familiar with university lecturing. The pre-questionnaire conducted at the beginning of the course showed that the students both in the experimental group and the control group were at the same level concerning the main topics of the course: (1) administrative view to information resources management, (2) technological view to information resources management, (3) building information systems, and (4) organizational applications.

Collecting Data

The data for this study was collected by administering a questionnaire both at the beginning and the end of the course. The respondents rated the personal competence level of four main topics with regard to how excellent they considered the knowledge of each topic (where 1=very poor and 5=very good). Additionally, the respondents rated how beneficial they considered the coursework of the course (where 1=very useless and 5=very useful).

Results

How students' knowledge was improved

Since the data based on the responses of the students concerning the goals of the course agreed with the normal distribution, the one-way ANOVA test was appropriate for the analysis of the data. Concerning knowledge to learn different themes, and according to the one-way ANOVA test, the study found that the WWW-based coursework was equally useful in the learning in most cases. The statistical analysis did not show any difference between the groups except for the learning of building information systems. The details of the analysis concerning skills are shown in table 1. For this analysis the students were expected to analyze their skills based on a 5-point Likert scale in the questionnaires.

How students experienced coursework in general

Table 2 shows the students of the WWW-group ratings on the coursework and seminar in general. The students were expected to rate how they experienced the coursework generally. The result shows that their attitude is mainly positive in both groups concerning the coursework generally.

Evaluating the effect of age, group size, gender and faculty

In order to clarify whether age affects the learning of different themes, the Pearson correlation coefficients were calculated. Based on the correlations younger students appear to benefit from the web-supported coursework and the use of the Optima tool. Table 3 shows the details of our analysis in the non-WWW group and table 4 (see next page) in the WWW group.

Table 1. Analyzing the students' knowledge of different themes

	Mean at the beginning of the course			Mean at the end of the course		
	Non-WWW group	WWW group	P	Non-WWW group	WWW group	p
Administrative view to information resources management	2.46	2.53	.141	3.23	3.48	.070
Technological view to information resources management	2.39	2.47	.117	3.26	3.40	.435
Building information systems	2.44	2.33	.294	3.30	3.73	.004
Organizational applications	2.31	2.23	.156	2.83	3.00	.309

Table 2. Students' attitude concerning coursework generally

n	44
Mean	4.02
Very insignificant	0
Insignificant	2
Moderately significant	2
Significant	33
Very significant	7

Table 3. Analyzing ratings based on age in non-WWW group

At the beginning of the course	Administrative view to information resources management	Technological view to information resources management	Building information systems	Organizational applications
Correlation Coefficient	.188	.355	.379	.191
p	.210	.016	.010	.210
At the end of the course				
Correlation Coefficient	.280	.097	.224	.112
p	.059	.521	.134	.457

Table 4. Analyzing ratings based on age in WWW group

At the beginning of the course	Administrative view to information resources management	Technological view to information resources management	Building information systems	Organizational applications
Correlation Coefficient	.396	.412	.297	.438
p	.007	.005	.048	.003
At the end of the course				
Correlation Coefficient	.382	.285	.011	.315
p	.010	.058	.944	.035

By analyzing ratings based on group size we found that group size does not affect the learning of most themes. The one-way ANOVA test did not show significant differences in the ratings between the students who completed the individual course work (n=18) and the students who did the coursework in the groups (n= 24) at beginning of the course (p varying from .121 to .147). On the other hand, at the end of course we found the significant difference (p=.045) between the WWW-group and the non-WWW group concerning the learning of the building information systems theme. The learning of this theme worked better as an individual task.

The analysis of ratings based on gender shows that the gender affects the perceived benefit of any topic to learn ((1) administrative view to information resources management, (2) technological view to information resources management, (3) building information systems, and (4) organizational applications). By analyzing the ratings of females we found that the web-supported coursework does not affect the learning of most themes. The one-way ANOVA test did not show significant differences in the ratings between the female students both at the beginning and end of the course (p varying from .165 to .695). On the other hand, we found by comparing the ratings of males that web-supported coursework is beneficial for them. The one-way ANOVA showed no significant difference concerning ratings between the male students of the WWW-group and the male students of the Non-WWW-group (p varying from .145 to .907) at the beginning of the course. At the end of the course there was a significant difference between the groups concerning topic 1 (p=.022) and topic 3 (p=.009). These themes were better learned in the WWW-group.

Finally, we compared the ratings of the students of the faculty of information technology to the ratings of the students of other faculties (including open university, economics, humanities, and natural sciences). The analysis of ratings by using the one-way ANOVA test shows that the faculty usually affects equally the perceived benefit of the studied features ((1) administrative view to information resources management, (2) technological view to information resources management, (3) building information systems, and (4) organizational applications) in the coursework. At the beginning of the course the statistical analysis did not show the difference between the groups in any faculty. However, the analysis shows that the students of IT benefit more from the web-based arrangements in the learning of administrative view to information resources management (mean of the WWW group of IT faculty students is 3.40 and p=.029, mean of the non-IT faculty students is 3.21 and p=.255) and building information systems (mean of the WWW group of IT faculty students is 3.61 and p=.003, mean of the non-IT faculty students is 3.15 and p=.976).

DISCUSSION

In this paper we analyzed a web-supported coursework focusing on the effect on the topics to learn. The results show that a web-based coursework including a seminar is a potential way to organize a coursework if we have a crowded course. The results are promising because most teachers appreciate the cost-effectiveness of web-based education (Morphew, 2002). Our comparison shows that the Optima-based coursework suits a little bit better for younger students, males and the students of information technology, and it may be more effective as an individual task. The Optima-based coursework suits better for the students of the IT faculty in the learning of administrative view to information resources management and building information systems.

Our results show that the students´ attitude concerning web-supported coursework was positive. This could be the basis for the next step of our research. As mentioned the constructivist approach of learning is divided into two schools. In our approach the first phase, creating a coursework report, represents the cognitive constructivist approach of learning. In this phase the main focus of learning is concepts. In contrast to this, the second phase, participating in a web-based seminar, represents the social constructivist approach of learning. The key point here is interaction and brainstorming through the web in this phase. Based on this it is fruitful to compare the attitudes of the students concerning the first and second phase of the web-supported coursework. The phases present different sides of constructivism.

Nevertheless, this paper demonstrates that a successful seminar for a crowded course is possible using the Optima environment. Without the Optima or other related tools it may not be always possible. In this way the WWW brings new possibilities for education.

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