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Americas Conference on Information Systems (AMCIS)

2005

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

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ABSTRACT

We organized a web-based coursework (feasibility study) and seminar during our information management and information systems development course for some students (experimental group). The students worked on the given development problems of information systems in small groups. For the web-based seminar each group had their own workspace in the Web CT environment for publishing and presenting coursework. At the final phase of the coursework the students familiarized themselves with the presentations of other groups. After this course we ran the same course including a conventional coursework for other students (control group).

We found that the WWW-based coursework and seminar have equal effect on learning different themes of the course. The students of IT faculty benefited more from the web-based coursework in the learning of building information systems. The Web CT-based coursework suits a little bit better for older students and it can enable effective group work in the bigger group.

Keywords

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

INTRODUCTION

Today, students are more interested in the learning of information systems science. At the same time, countries like Finland have increased the amount of relevant education at universities. At the everyday level this means crowded courses and impossibility to organize seminars where students can discuss each other's work. It seems that this leads to lower motivation and inferior learning. One solution to this problem may be web-based seminar work. In a web-based seminar, students can place their seminar assignments and presentations in their own web-based workspaces. Other students can visit these workspaces and comment on the work. This solution is beneficial at least in three ways. First, it is possible to increase the intake of students in a seminar-based course. Second, a seminar can take place at any time. Third, a seminar can take place anywhere.

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.

In information systems science a seminar utilizing information technology and its new possibilities may be a good and natural alternative to conventional ways of education. A web-based seminar can bring real constructivist learning to education whereupon learning is an active process of knowledge constructing rather than knowledge acquisition (Duffy & Cunningham, 1996).

Using Web CT and its presentation feature it is possible to demonstrate the meaning of shared workspaces in practice. This solution enables learning in the spirit of constructivism. During the process of seminar work students can familiarize themselves with shared workspaces. This occurs by publishing and presenting seminar work; by reserving three different

other seminar works for commenting; 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 network-based seminar with asynchronous collaborative work support (web-based 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 web-based coursework to our traditional 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 (web-based or traditional), and
- whether age, a group size, a gender and a faculty affect 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 pre-determined 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.

The WWW and its hypermedia nature enable learning by constructing knowledge in the sprit of the cognitive school of constructivism. Cognitive constructivism emphasizes that learning occurs through many channels: reading, listening, exploring and experiencing his or her environment (Piaget, 1977). Furthermore, the WWW and web-based learning environments support learning based on social constructivism by providing different ways of communication. The social constructivist theory emphasizes the influences of cultural and social contexts and interaction in learning (Vygotsky, 1978).

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.

In the same way, web-based tools, like Web CT, can be seen in an active context. The students can use Web CT 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.

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 part 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-based seminar, using the Web CT environment. In this section we describe our experiment, sample, and results.

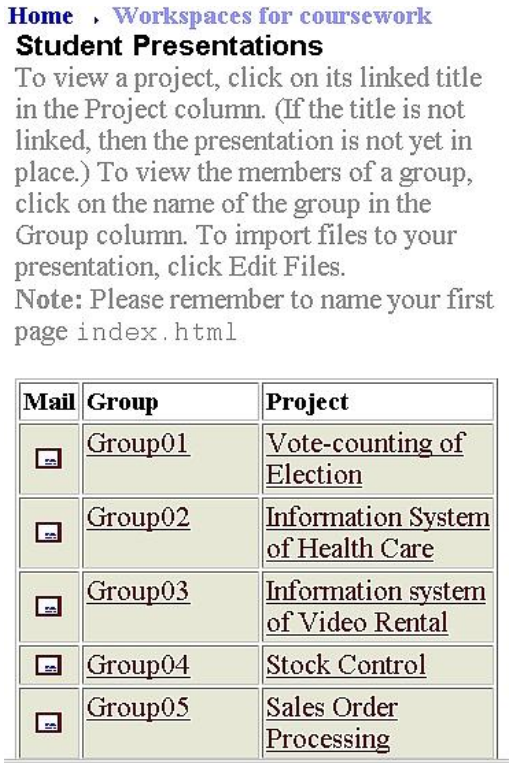
Experiment

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 is an obligatory course in the bachelor degree program of information systems and an optional course in the bachelor degree program of business economics. As a course of the basic level of information systems the course is open for any registered student of any faculty including the open university It was inspired by a textbook, Information Technology for Management: Transforming Business in the Digital Economy (Turban et al., 2002). The course usually lasts seven weeks including lectures (36 hours), coursework (feasibility study) as well as the final exam. Also, the course of the academic year 2002-2003 included the aforementioned activities and, in addition, the final seminar in an optional way.

The core of the course consisted of coursework in which students were expected to determine the probability of success of the proposed information system solution. The students worked in groups consisting of 1 to 5 students. The results were presented in a coursework report.

The groups placed the presentations on their own web-based workspaces in the HTML, or Word Document, or RTF format. Other groups were expected to familiarize themselves with these presentations. All the groups had permission to upload files to all workspaces. Thus, it was possible to upload comments regarding the work of other groups to any workspace. For authoring the coursework, the groups had six weeks. After these six weeks the groups were expected to comment on at least three other coursework presentations including the same three points based on the work of other groups. These comments were placed on the Web CT workspaces. The students had five and a half days for this.

The workspaces were created before the course using the presentation feature of the Web CT environment. All the groups, involved with the Web CT-based coursework, got permission to upload, download, and view material on any workspace. Thus, communication was possible between the groups, enabling the web-based seminar. Figure 1 shows a simplified example of the first page of students' presentations on the Web CT. With the help of this page the students had a possibility to upload, download, create, and see files by clicking Edit Files first.



Home › **Workspaces for coursework**

Student Presentations

To view a project, click on its linked title in the Project column. (If the title is not linked, then the presentation is not yet in place.) To view the members of a group, click on the name of the group in the Group column. To import files to your presentation, click Edit Files.

Note: Please remember to name your first page `index.html`

Mail	Group	Project
	Group01	Vote-counting of Election
	Group02	Information System of Health Care
	Group03	Information system of Video Rental
	Group04	Stock Control
	Group05	Sales Order Processing

Figure 1. Student presentations page as the starting point of Web CT-based seminar

After this course we ran the same course including a conventional coursework for other students. For the conventional coursework requirements the coursework reports were written in six weeks. The students worked alone or in groups two to five students. The results were presented in a coursework report which was returned to the instructor of the course.

Sample

Eighty-five randomly selected students, 22 females and 63 males, whose mean age was 24 years (range 18-44 years), participated in the experimental group including the web-based seminar. 23 students studied informatics as a minor and 62 students as a major. 14.1% of all the students completed the coursework in groups of two students, 37.6% in groups of three students, 37.6% in groups of four students, and 10.6% in groups of five students. The students spent 9.7 hours (range 2-32 hours) on the coursework on average.

Seventy-seven randomly selected additional students, 17 females and 60 males, whose mean age was 23 years (range 18-50 years), were involved in the control group including the conventional coursework. 11 students studied informatics as a minor and 66 students as a major. 33.8% of all the students completed the coursework in groups of two students, 31.2% in groups of three students, 31.2% in groups of four students, and 3.9% in groups of five students. The students used 7.2 hours for the coursework on an average. 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. The course was not advertised in any special way. The first-year students of information systems entered the course automatically participating in either the WWW-group or non-WWW group based on

a random selection. Additionally, some students of other faculties and open university selected the course based on their personal interest. In the same way, these students were assigned randomly to the WWW-group or non-WWW group.

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. The statistical analysis did not show any difference between the groups. 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.

	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	2.29	2.28	.980	3.16	3.15	.977
Technological view to information resources management	2.30	2.19	.437	3.14	3.21	.572
Building information systems	2.39	2.21	.213	3.45	3.54	.522
Organizational applications	1.94	2.02	.481	2.61	2.65	.751

Table 1. Analyzing the students' knowledge of different themes

How students' experienced coursework in general

Table 2 (see next page) shows the students' 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.

	Non-WWW group	WWW group
Mean	3.90	3.84
P	.601	
N	85	77
Very insignificant	0	0
Insignificant	4	1
Moderately significant	21	20
Significant	45	42
Very significant	15	14

Table 2. 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. In the non-WWW group the p values were significant concerning most themes at the beginning of the course. However, at

the end of the course the p value was significant only concerning the learning of administrative view to information resources management. Thus, we can claim that younger students benefit more from the conventional coursework.

On the other hand, in the WWW group the p values were equally significant concerning the themes administrative view to information resources management and technological view to information resources management. Concerning the topic of building information systems the p value was significant at the beginning of the course, but not significant at the end of the course. Additionally, the correlation analysis shows that at the beginning of the course the p value was not significant concerning the learning of organizational applications. However, and the end of the course the p value was significant. Based on these p values the web-based coursework is equally beneficial regardless of age. Because the conventional coursework was more beneficial for younger students, we can claim that older students appear to benefit more from the Web CT-based coursework and the use of the Web CT tool. Table 3 shows the details of our analysis in the non-WWW group and table 4 (see next page) in the 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	.373	.272	.263	.162
p	.001 (significant)	.017 (significant)	.022 (significant)	.163 (not significant)
At the end of the course				
Correlation Coefficient	.275	.153	.144	.131
p	.016 (significant)	.188 (not significant)	.215 (not significant)	.260 (not significant)

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	.347	.206	.305	.181
p	.001(significant)	.060 (not significant)	.005(significant)	.099(not significant)
At the end of the course				
Correlation Coefficient	.353	.058	.199	.299
p	.001(significant)	.596(not significant)	.069(not significant)	.006(significant)

Table 4. Analyzing ratings based on age in WWW group.

In order to clarify whether group size affects learning the Pearson correlation coefficients were calculated. The analysis shows that while studying by using the Web CT environment the learning of the content area is also effective in a bigger group. In the WWW group the p values are not significant concerning the learning of any theme both at the beginning and end of the course. In the conventional coursework smaller groups are needed for effective learning.

Table 5 shows the details of our analysis in the non-WWW group and table 6 in the 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	-.268	-.381	-.291	-.097
P	.019 (significant)	.001 (significant)	.010(significant)	.402(not significant)
At the end of the course				
Correlation Coefficient	-.246	-.269	-.115	-180
P	.031(significant)	.018(significant)	.320(not significant)	.117(not significant)

Table 5. Analyzing ratings based on group size 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	-.162	-.104	-.015	-.062
p	.137(not significant)	.347(not significant)	.892(not significant)	.574(not significant)
At the end of the course				
Correlation Coefficient	.026	.072	.079	.011
p	.831(not significant)	.514(not significant)	.478(not significant)	.924(not significant)

Table 6. Analyzing ratings based on group size in WWW group.

The analysis of ratings based on gender shows that the gender does not affect 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). The one-way ANOVA tests concerning any of these features did not show significant differences in the ratings between genders (p varying from .269 to .923).

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 building information systems (mean of the IT faculty students is 3.65, mean of the non-IT faculty students is 3.09 and p=0.28).

DISCUSSION

In this paper we compared a web-based coursework to a traditional coursework focusing on the effect on the topics to learn. The results show that a web-based seminar is a potential way to organize a coursework including a seminar if we have a crowded course. The results are prospective because most teachers appreciate the cost-effectiveness of web-based education (Morphew, 2002). Our comparison shows that the Web CT -based coursework suits a little bit better for older students and it is a quite logical result because older students may study as a part-time activity and web-based arrangements helps this kind of studying notably. Additionally, the web-based coursework enables effective group work even in the bigger group. The Web CT-based coursework suits better for the students of IT faculty in the learning of building information systems.

The study found out that the WWW-based coursework and seminar have equal effect on learning different themes of the course. Our comparison shows that the authoring of the coursework may be the most fruitful part of our web-based assignment since this was expected to complete both in the WWW group and non-WWW group. Additionally, in our previous paper (Makkonen, 2003) dealing with the web-based seminar as a part of an information management and information systems development course we showed that in the web-based seminar the authoring phase is more beneficial for learning than the commenting phase. This is consistent with the discussion by Brandt (1997) on constructivist learning. He (Brandt, 1997) emphasizes that learning should be connected to concepts. From the perspective of the general constructivist learning theory we can claim that cognitive constructivism is more important than social constructivism. In our coursework the authoring phase represented cognitive constructivism and the commenting phase is connected to the social constructivist learning theory.

We need to know whether the WWW-based seminar improves learning or not and why so, and which are the features of a web-based seminar that enable building stronger ties between students - a basic requirement in successful web-based communication (Haythornthwaite, 2001). To these questions answers will be sought by analyzing the post-questionnaires in detail. In the post-questionnaires students were required to give reasons for their ratings, and analyzing this information will clarify the reasons for success or failure.

Associated with ties one additional step in our research is analyzing the motivation of students. The motivation reflects the successfulness of the web-based coursework and this occurs especially from the perspective of the constructivist learning

theory. Jonassen's framework (Jonassen, 1992) emphasizes the meaning of engagement as a success factor of computer-based learning. In learning from text, motivation is understood both internally and externally (Linnakylä, 1988). By studying pre- and post-questionnaires we can analyze the engagement and motivation of the students. In these questionnaires the students were asked to explain both how interesting (internal motivation) and how beneficial (external motivation) they regarded four themes of the course. Thus, motivation, in this context, is assumed to be the sum of interest and benefit.

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

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