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WWW-Based Seminar as a Part of Knowledge Work Course? Is it Worth it?

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ABSTRACT

The Internet can solve some pedagogical problems. To give an example, seminars for crowded courses exceeding a hundred participants would not be possible without web-based arrangements. In the academic year 2001-2002 we organized a web-based coursework and seminar during the Knowledge Work and its Tools course for some students (experimental group). Simultaneously, we ran the same course including a conventional coursework and seminar for other students (control group). During the coursework and while in the seminar the students were expected to work in small groups of two to five students. In 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 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 focusing on the learning outcomes of the students concerning the basic concepts of the content area. The analysis of learning outcomes is based on the SOLO (Structure of Observed Learning Outcome) taxonomy and we compare the students who completed the Web CT-based coursework to the students who participated in the conventional coursework. Learning outcomes were significantly better in the group of students who completed the WWW-supported coursework. The result shows that by using web-based seminars students can learn the concepts of a content area better and thus, they may achieve deeper learning results.

INTRODUCTION

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.

One of the goals of the Knowledge Work and its Tools course is teaching the basic ideas of groupware. Using Web CT and its presentation feature it is possible to demonstrate the meaning of shared workspaces in practice. During the process of seminar work students can familiarize themselves with shared workspaces. This occurs by publishing and presenting seminar work; by reserving three other seminar works for commenting; by commenting on seminar works created by other students (or groups); and by reading comments expressed by other students. 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 and Cunningham, 1996).

This paper introduces our approach to carry out a web-based coursework and seminar. Additionally, we analyze the strength of our approach by comparing the learning outcomes of the students who participated in our web-based coursework to the outcomes of those who participated in the conventional coursework.

Before discussing the study itself, we first provide the theoretical background of the study.

NATURE OF LEARNING CONCEPTS

Our study recognizes a web-based learning tool as a knowledge construction tool and learning as knowledge construction. The psychological perspective of our research approach can be divided into a perspective based on cognitive psychology and a perspective based on developmental psychology. In this section we introduce these perspectives. They both emphasize that learning is knowledge construction.

Perspective of Cognitive Psychology

From the perspective of cognitive psychology we distinguish declarative and procedural forms of knowledge. Declarative knowledge represents cognizance or awareness of some object, event, or idea (Ryle, 1949). Declarative knowledge of ideas is often characterized as schemas (Rumelhart & Ortony, 1977), which are ideational constructs that are defined by attributes that they inherit from other schemas. Procedural knowledge describes how learners use or apply their declarative knowledge. Ryle (1949) describes this type of knowledge as knowing how. An intermediate type of knowledge is structural knowledge, which mediates the translation of declarative into procedural knowledge and facilitates the application of procedural knowledge. According to Diekhoff (1983), structural knowledge is the knowledge of how concepts within a domain (e.g. in informatics) are interrelated. It describes how declarative knowledge is interconnected.

The basics of informatics include two kinds of learning. First, students learn to understand the field of informatics and its basic concepts. Second, students learn to use computers and utilize instructions to facilitate the use of computers. These two goals emphasize the learning of both declarative and procedural forms of knowledge. Since both forms of knowledge are important, we argue that the structural form of knowledge is important. Structural knowledge enables learners to form the connections that they need to use scripts or complex schemas (Jonassen, 1992).

It is typical of the basics in informatics that the basic concepts form structures. For example, in our knowledge work course the themes (for more details about the contents of the course, see subsection 5.1) form structural knowledge. Thus, we comprehend learning as a knowledge construction process of both declarative and structural knowledge. In this process a learner's goal is to approach an expert's knowledge structure which is the same as the requirements of a course.

Perspective of Developmental Psychology

From the perspective of developmental psychology conceptual knowledge can be approached using Collis's (Collis, 1975) modification of Piaget's stages of development. This approach creates a basis for evaluating learning outcomes and emphasizes the quality of learning concerning a single concept and interrelatedness between the concepts.

Based on Piaget's stages of development a SOLO (Structure of the Observed Learning Outcome) taxonomy has been developed which divides learning outcomes into five classes (levels). These classes reflect the quality and the awareness of a learning outcome. Learning outcomes (i.e., definitions of concepts) can be classified as follows using the SOLO taxonomy (Biggs & Collis, 1982):

- prestructural,
- unistructural,
- multistructural,
- relational, and
- extended abstract.

A student's response can be classified according to the capacity, relating operation, and consistency and closure of his/her response. Prestructural responses are based on irrelevant or inappropriate data (level 1). Unistructural responses are based on conclusions on one aspect (level 2). Multistructural responses are based on isolated relevant data (level 3). Relational responses are based on relevant data and an understanding of the interrelations of different data in responses (level 4). Extended abstract responses are based on an understanding of data and interrelations both in the context of a question and in unexpected situations (level 5).

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. Brandt (1997) emphasizes that constructivism is an essential basis when applying the WWW for teaching and learning.

In the case of coursework one approach may be by seeing Internet tools as cognitive tools, in other words, tools for knowledge construction. Jonassen (1992) 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.

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. Therefore, 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 should examine the optimal ways to use the WWW. 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 Knowledge Work and its Tools are (1) knowledge work and its productivity, (2) personal computer software, and (3) groupware. The course was inspired by a textbook, Personal Productivity with Information Technology (Davis & Naumann, 1997). The course of the academic year 2001-2002 lasted seven weeks including lectures (14 hours), practical exercises in skills with personal computers and groupware (28 hours) as well as the final seminar and exam.

The core of the course consisted of coursework in which students were expected to analyze a typical knowledge work profession (e. g. lawyer, medical doctor, high school teacher, university professor, or system analyst). This included at least

- a productivity analysis,
- an analysis of the character of the profession, including tasks and activities,
- the use of personal computer software,
- the use of Internet tools, and
- the use of groupware in a selected knowledge work profession.

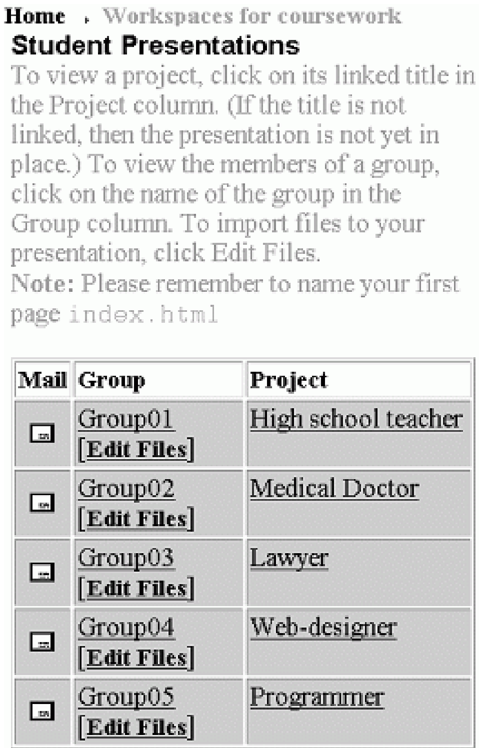
Additionally, the students were encouraged to deal with handheld devices (e. g. Palm models) and mobile solutions (e. g. WAP technologies) in their coursework. The students worked in groups consisting of 1 to 5 students. The result of coursework was a coursework report covering all aforementioned aspects. Before the start of the coursework all students were randomly divided into groups for conventional coursework and seminar and groups for Web CT-based coursework and seminar.

For the conventional coursework requirements the coursework reports were written in six weeks. The reports were presented in a conventional seminar. In the course of the academic year 2001-2002 we had four sessions for the presentations and in each session the main points of six coursework reports were presented to other participants of a session. We had two hours for those six presentations in each session. After a presentation, the other session groups were expected to comment on the findings of the presenting group. The coursework groups of each session were expected to familiarize themselves with the coursework of three other groups before the session. Based on this, the groups had to explain (1) what they had learnt after reading each coursework, (2) whether they agreed with the group concerning the productivity in a selected knowledge work profession, and (3) whether they agreed with the group concerning the support provided by different technologies in a selected knowledge work profession. The coursework reports were distributed in the way that each coursework report had been read by at least three other groups. The students acquired the reports of other groups two days before the seminar.

In the Web CT-based coursework 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 as in the conventional coursework. 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 Web CT-based groups had as much time as the groups of the conventional coursework (six weeks). After these six weeks the groups were expected to comment on at least three other coursework presentations, as was the case in the conventional seminar, 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 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

Figure 1: Student Presentations Page as the Starting Point of Web CT-based Seminar.



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.

Sample

Forty-two randomly selected students, 21 females and 21 males, whose mean age was 21 years (range 18-25 years), participated in the experimental group including the web-based seminar. Thirty-eight additional randomly selected students, 15 females and 23 males, whose mean age was 22 years (range 18-37 years), were involved in the control group.

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 filled in by the students at the beginning of the course showed that the students - both in the experimental group and the control group - were at the same competence level in regard to the main topics of the course: PC skills, groupware skills, and organizing knowledge work. A notable part of the students (31%) worked in the groups of five students in the experimental group. The rest of the experimental group students worked either in the groups of four students (26,2 %), in the groups of three students (28,6 %), or in the groups of two students (14,4 %). In the control group 10.5% of students worked in the groups of five students, 57.9% of students worked in the groups of four students, 15.8% of them worked in the groups of three students, and 15.8 % of them worked in the groups of two students.

Measures and Tests

We utilized a SOLO taxonomy based measure to clarify learning outcomes and their quality (see subsection 2.2). Both the pre-treatment and the post-treatment contained 12 separately selected items. These items were chosen randomly from 50 critical concepts of the whole learning area. The selection of the critical concepts was based on the course syllabus confirmed by the faculty of IT and the textbook that we used for the course. In each test respondents produced 12 definitions of randomly selected basic concepts. The responses of the students were ranked from 1 to 5 based on the quality of learning. The basis for the rankings was the contemporary definitions of these concepts that were included in the course material.

In the responses the students were expected to define concepts using certain sentences clarifying the basic properties of each concept and connections between these properties. Additionally, based on the SOLO taxonomy the students were also expected to express alternative definitions for the concepts and the meaning of a concept in a larger sense, if they found it necessary.

The pre-treatment was administered at the beginning of the first lecture. Since our intention was to study the effect of the WWW as a complementary part of conventional lectures and lecture notes, the post-treatment was administered as the first part of the final examination. Both in the pre- and post-treatments the students had as much time as needed to produce their responses.

Results

We compared WWW-supported learning (the experimental group) to learning without the support provided by the WWW (the control group). The dependent variable was the quality of learning (based on the SOLO taxonomy). Since the data based on the responses of the students agreed with the normal distribution, the one-way ANOVA test was appropriate for this experiment.

The pre-treatment one-way ANOVA test did not show a significant difference between the experimental group and the control group ($p=.985$). The mean for the experimental group was 1.35 and the mean for the control group was 1.35.

The post-treatment Mann-Whitney test showed that the difference between the experimental group and the control group was significant ($p=.006$). The mean of the experimental group was 2.68 and the mean of the control group was 2.50.

The learning outcomes of the students who completed the WWW-based coursework were better compared to the students who completed the coursework in the conventional way. Based on this result we can claim that by using web-based seminars we can achieve better and deeper learning results.

DISCUSSION

The results show that a web-based seminar is a potential way for organizing a coursework which includes a seminar when we have a crowded course. Especially, it helps the learning of concepts of a content area. Therefore, it may cause deeper and long-lasting learning. The result is positive from the perspective of our earlier research which we conducted by administering a questionnaire both at the beginning and end of the course to both types of groups (Makkonen, 2002a & b). These results show that both seminar methods are equal.

From the perspective of constructivism both learning methods can be seen equal. In other words, they both can be understood as learning by constructing knowledge. However, from the perspective of the cognitive type of constructivism, which emphasizes cognitive development, the results of this paper are fruitful. Web-based arrangements improve learning from this point of view.

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). Answers to these questions will be sought by analyzing the post-questionnaires of our earlier data 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.

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