Is web-based seminar an effective way of learning in adult education?

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Abstract

The Internet can be used to solve pedagogical problems. To give an example, seminars for crowded courses exceeding a hundred participants would not be possible without web-based arrangements. These arrangements may provide help especially for adult learners. 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. 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 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 the end of the course we analyzed how useful and interesting the students regarded five themes of the course. Differences between the experimental group and the control group were found by studying motivation. From this perspective the study found out that the WWW-based coursework and seminar help adult learners to improve their learning on productivity issues related to PC software and groupware. The younger students of the WWW-based coursework and seminar appear to benefit more from the WWW-based arrangements in the learning of analyzing individual knowledge work. Additionally, the younger students appear to be more motivated in the traditional seminar in the learning of analyzing collaboration and work management. The result reflects the need for looking at student profiles before planning learning activities on the web.

1. Introduction

Today, the motivation to learn information systems science is increased. 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 [28]. 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 [12, 26]. 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 [12]. From this perspective lecturing is not without potential if the previously mentioned problems can be corrected, but other learning methods must also be considered. For example, 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 [9].

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 idea 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 commenting on seminar works created by other students (or groups); and by reading comments expressed by other students.

Web-based arrangements are beneficial especially for adult learners by providing flexibility [21]. According to Aggarwal and Bento [1], one of the strongest pressures for changes toward web-based education come from self-motivated and working students. Thus, it is beneficial to study the success of the web-based seminar from the perspective of adult learners.

This paper introduces our approach to carry out a web-based coursework and seminar. Additionally, it provides the analysis of it focusing on the effect on adult learners.

We want to know
- how the WWW-based coursework affected motivation to learn different themes of a knowledge work course, and
- how the WWW-based coursework affected learning from the perspective of goals of the course.

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

2. Engagement and motivation

From the perspective of our research context many problems in regard to learning the basics of informatics make evaluating motivation important. Romano and Balthazard [25] have summarized the problems. These include limited individualized attention, “cyberphobia”, in other words a fear of computers, a lack of interest in the subject matter, limited or no access to interactive learning software, and information overload leading to failure to make associations.

According to Schunk [27], “motivation refers to the process whereby goal-directed behavior is instigated and sustained”. Most commonly in learning from text, motivation is understood both internally and externally [3, 4, 10, 18]. Internal (intrinsic) motivation reflects a student's own interest in regard to espousing new knowledge. It is associated with a human's high-level needs such as self-actualization. External (extrinsic) motivation reflects the need to reach goals set by others. This is connected to a human's low-level needs such as security and survival.

Motivation in learning from text can be evaluated as shown in figure 1 (see next page). Pre-motivation is the sum of pre-interest and pre-benefit. Post-motivation is the sum of post-interest and post-benefit. Internal motivation is the sum of pre-interest and post-interest. External motivation is the sum of pre-benefit and post-benefit [19].

![Figure 1. Motivation of learning from text [19].](image)

3. Constructivism

Behaviorism is interested in a student’s behavior in relation to teaching while its opposite constructivism is interested in the mental processes which affect the behavior of a student [24]. A traditional lecture is mainly based on the behaviorist approach while coursework and projects are typical of constructivist learning. The objectivist model is close to behaviorism focusing on the transfer of knowledge from an expert to a learner [14].

Constructivism asserts that learners construct knowledge by making sense of experiences in terms of what is already known [6]. In the constructivist approach learning is comprehended as the development of mental models. Brandt [6] 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.
4. The WWW in learning in our context

The problems inherent in any information system such as disorientation, navigation inefficiency and cognitive overload are multiplied on the Internet [6]. However, these problems can be overcome by using a suitable pedagogical approach and/or appropriate tools. The WWW and its hypermedia nature enable learning by constructing knowledge based on the cognitive constructivist principles. Cognitive constructivism emphasizes that learning occurs through many channels: reading, listening, exploring and experiencing his or her environment [23]. Furthermore, the WWW and web-based learning environments support learning based on social constructivism by providing different ways of communication. Social constructivist theory emphasizes the influences of cultural and social contexts in learning [30].

In the case of coursework one approach is to see Internet tools as cognitive tools, in other words, tools for knowledge construction. 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 [14].

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.

In the context of the first courses in informatics it is important, additionally, to discuss education from the perspective of situated action theory and cognitive flexibility theory. These theories can bring forth some important views related to education if we have courses with heterogeneous students. According to situated action theory, the success of a computer-supported learning environment depends on the context in which that software is used [7, 16]. It emphasizes a person's responsiveness to the environment and focuses on the improvisory nature of human activity [22] and the local management of activity as mediated by relevant environmental cues [2, 29]. The implications for learning are that appropriate actions are generated from recognition of appropriate opportunities given by the context. In addition to situated action theory, Jacobson et al. [13] also emphasize the meaning of cognitive flexibility theory affecting hypertext-based learning. It proposes that complex knowledge may be better learned for flexible application in new contexts by employing case-based learning environments.

In the case of a web-based seminar it is useful to discuss the WWW from the perspective of media research. Haythornthwaite [11] stresses the interpersonal ties that affect the character of web-based communication and strong ties between students improve web-based communication. Thus, 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 and the use of the WWW in the spirit of situated action theory is possible.

Based on the above we stress the following three issues. First, we must discuss what the right amount of behaviorist teaching should be. According to Leidner and Jarvenpaa [17], in some situations the behaviorist (or objectivist) model of learning may be most appropriate for factual and procedural learning. On the other hand, Leidner and Jarvenpaa [17] emphasize that learning based on the constructivist principles enables deeper learning if learning occurs by discovering. Second, we must analyze what the right way to use the WWW is. 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 informatics can be built on the constructivist approach by organizing coursework.

5. Methods

We pursued a study including a WWW-based seminar using the Web CT environment. In this section we describe our experiment, sample, and results.

5.1. Experiment

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 [8]. The course of the academic year 2000-2001 lasted seven weeks and consisted of lectures (14 hours), practical exercises in skills with personal computers and groupware (28 hours) and an exam. All the students completed the aforementioned activities. The final seminar and coursework, also included in the course, were completed in two optional ways in two different groups.

The core of the course consisted of coursework in which students were expected to select a typical knowledge work profession (e. g. lawyer, high school teacher, or system analyst) and analyze how different IT tools improve the productivity in this profession. The students worked in groups consisting of 1 to 5 students. The result of the 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. 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. 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. 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. 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. 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 2 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.

5.2. Sample

Eighty-seven randomly selected students, 33 females and 54 males, whose mean age was 22 years (range 18-42 years), participated in the experimental group including the web-based seminar. The students used 13 hours for the coursework on an average. We call this group the WWW group in this paper.

Fifty-four additional randomly selected students, 20 females and 30 males, whose mean age was 23.5 years (range 19-44 years), were involved in the control group. The students used 13 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: PC skills, groupware skills, and organizing knowledge work. The students worked in the groups of 1 to 5 students and no differences were found concerning the size of the groups in the post-questionnaire in the matters studied in this paper. The notable part of the students (over 38%) worked in the group of five students both in the experimental group and the control group. In the experimental group 39.1% of students worked in the group of four students, 16.1% of them worked in the group of three students, and 4.6% of them worked in the group of two students. One student completed the coursework individually in the experimental group. In the control group 9.3% of students worked in the group of four students, 18.5% of them worked in the group of three students, and 16.7% of them worked in the group of two students. One student completed the coursework individually in the control group.
5.3. Collecting data

The goals of the course were learning
- issues related to productivity of knowledge work,
- analyzing individual knowledge work,
- analyzing collaboration and work management,
- PC software as improvement of productivity, and
- groupware as improvement of productivity.

The data for this study was collected by administering a questionnaire both at the beginning and end of the course to both types of groups. The respondents rated each goal of the course with regard to (a) how interesting they considered the goals of the course (where 1=very uninteresting and 5=very interesting), and (b) how beneficial they considered the goals of the course (where 1=very useless and 5=very useful).

Additionally, in both questionnaires the respondents were expected to analyze their:
- PC software use skill,
- groupware use skill, and
- knowledge work management skill.

The respondents ranked these skills on a 5 point Likert scale (where 1=very poor and 5=very good). The survey was based on the requirements of the course given by Faculty of Information Technology at the University of Jyväskylä.

5.4. Results

In the first analysis the dependent variable was the sum of pre-interest and pre-benefit. 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. We calculated the ANOVA scores for pre- and post-motivation of each goal based on the framework presented in section two. In this analysis we did not calculate the scores for internal and external motivation because at the beginning of a course the students did not know whether or not web-based arrangements utilizing the Web CT environment would be used. Thus, the scores of internal and external motivation were not reliable.

The one-way ANOVA test showed significant differences in pre-motivation between the Non-WWW group and the WWW group in regard to analyzing individual knowledge work and PC software as an improvement of productivity (p=.009). However, no differences were found related to the other goals of the course (p varying from .098 to .949).

In the second analysis the dependent variable was the sum of post-interest and post-benefit. The one-way ANOVA test showed significant differences in post-motivation between the Non-WWW group and the WWW group in regard to analyzing individual knowledge work (p=.017) and analyzing collaboration and work management (p=.039). On the other hand, no differences were found related to the other goals of the course (p varying from .460 to .529).

By analyzing pre-motivation in parallel with post-motivation the results showed that the students in the Non-WWW group were more motivated in the learning of analyzing individual knowledge work. Concerning PC software as a source of productivity improvement the students of both groups were equally motivated at the end of the course. However, at the beginning the students of the non-WWW group were more motivated. Thus, the students of the WWW group were more motivated in regard to learning PC software as an improvement of productivity.

In order to clarify whether age affects pre- and post-motivation in the WWW group the Pearson correlation coefficients were calculated. Based on the correlations we can claim that the WWW-based seminar is especially suitable for adult learners in the learning of PC software and groupware. The table 1 shows the details of analysis (see next page).
Table 1. Analyzing pre- and post-motivation WWW group based on age.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Correlation coefficient of WWW group at beginning of course</th>
<th>p</th>
<th>Correlation coefficient of WWW group at end of course</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity of knowledge work</td>
<td>.148</td>
<td>.137</td>
<td>.090</td>
<td>.400</td>
</tr>
<tr>
<td>Analyzing individual knowledge work</td>
<td>.243</td>
<td>.014</td>
<td>.069</td>
<td>.517</td>
</tr>
<tr>
<td>Analyzing collaboration and work management</td>
<td>.242</td>
<td>.014</td>
<td>.193</td>
<td>.068</td>
</tr>
<tr>
<td>PC software as improvement of productivity</td>
<td>.170</td>
<td>.087</td>
<td>.221</td>
<td>.036</td>
</tr>
<tr>
<td>Groupware as improvement of productivity</td>
<td>.120</td>
<td>.231</td>
<td>.288</td>
<td>.006</td>
</tr>
</tbody>
</table>

In order to clarify whether age affects pre- and post-motivation in the non-WWW group the Pearson correlation coefficients were calculated. Based on the correlations we can claim that the traditional seminar is especially suitable for younger learners especially in the learning of analyzing collaboration and work management. The table 2 shows the details of analysis.

Table 2. Analyzing pre- and post-motivation in non-WWW group based on age.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Correlation coefficient of non-WWW group at beginning of course</th>
<th>p</th>
<th>Correlation coefficient of non-WWW group at end of course</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity of knowledge work</td>
<td>.075</td>
<td>.573</td>
<td>.060</td>
<td>.670</td>
</tr>
<tr>
<td>Analyzing individual knowledge work</td>
<td>.090</td>
<td>.497</td>
<td>.045</td>
<td>.750</td>
</tr>
<tr>
<td>Analyzing collaboration and work management</td>
<td>.381</td>
<td>.003</td>
<td>-.012</td>
<td>.935</td>
</tr>
<tr>
<td>PC software as improvement of productivity</td>
<td>.041</td>
<td>.760</td>
<td>.083</td>
<td>.556</td>
</tr>
<tr>
<td>Groupware as improvement of productivity</td>
<td>.204</td>
<td>.121</td>
<td>.010</td>
<td>.942</td>
</tr>
</tbody>
</table>

By analyzing the WWW group in parallel with the non-WWW group the results show that the older students in the WWW group were more motivated in the learning of PC software and groupware from the perspective of productivity. However, from the perspective of motivation the younger students of the WWW group appear to benefit more from the web-based arrangements in the learning of analyzing individual knowledge work. Based on the correlations the younger students appear to be more motivated in the traditional seminar in the learning of analyzing collaboration and work management. Thus, we can claim that certain areas are more suitable for older students to learn via the web as well as certain areas are more suitable for younger students to learn via the web from the perspective of pre- and post-motivation.

Concerning skills, and according to the one-way ANOVA test, the study found that the WWW-based coursework was not useful in the learning of PC software skills and groupware skills generally. The statistical analysis did not show the difference between the groups concerning the knowledge work management skill. The details of the analysis concerning skills are shown in table 3 (see next page). For this analysis the students were expected to evaluate their skills based on a 5-point Likert scale in the questionnaires.
6. Discussion

Our earlier results focused on the process of the coursework show that a web-based seminar is a potential way to organize a coursework including a seminar for crowded courses [21]. The web-based coursework and seminar worked as well as the traditional coursework and seminar in the sense of a learning method. However, the results of this paper show that the traditional methods are better from the perspective of the learning goals of the knowledge work course. However, from the perspective of motivation adult learners (older learners) can benefit from the web-based seminar and coursework in the learning of PC software and groupware issues. In the same way, the younger students benefit more from the web-based seminar and coursework in the learning of analyzing individual knowledge work. Additionally based on the correlations, the younger students appear to be more motivated in the traditional seminar in the learning of analyzing collaboration and work management. This reflects the need for looking at student profiles before planning learning activities on the web. Based on above we can claim that younger students benefit more from the web-based seminar in the learning of administrative (human) matters associated with knowledge work. On the other hand, we can claim that older student can benefit more from the web-based seminar in the learning of IT related matters associated with knowledge work. According to Davis and Naumann [8], knowledge in knowledge work consists of four types: formal (declarative) knowledge, procedural knowledge, meta knowledge, and impressionistic knowledge. Formal knowledge is general knowledge associated with facts. Procedural knowledge is associated with skills. Meta knowledge is connected to management (i.e. knowledge work management), and impressionistic knowledge is hidden type knowledge associated with “creative expertise” or “intuition”. We can claim that a web-based seminar leads to better the learning of formal knowledge in the group of older students. Additionally, meta knowledge may be learnt better in the group of younger students.

Leidner and Jarvenpaa [17] argue learning by discovering knowledge based on the constructivist principles leads to the best understanding of factual and procedural knowledge. In our study both learning methods were this kind of learning. From the perspective of motivation it is useful to look at motivational design process [15]. This process includes four steps: (1) analyzing the audience, (2) defining motivational objectives, (3) designing motivational strategy, and (4) revising the strategy if necessary. Especially, we need to focus on the audience profile. There can be a difference between learners who are at the beginning of learning information systems science and learners who have some knowledge of information systems and technology. According to our previous dealing with a basic course of informatics [20], the students, who studied informatics as a minor, appeared to prefer conventional learning methods at the beginning. We claim that a working combination of the behaviorist methods and the constructivist methods can be found by analyzing other background information including a major subject at the university and computer skills.

Other limitation of this study is the use of technology. We need to know why WWW-based coursework does not improve the learning of skills and why the conventional coursework was even better in this sense. To this question answers will be found by analyzing the questionnaires in detail. In the questionnaires students were required to give reasons for their ratings and analyzing this information will clarify what the reasons for success or failure were. Additionally based on the questionnaires, we need to know which are the features of a web-based seminar that enable building stronger ties between students - a basic requirement in successful web-based communication [11] and collaborative knowledge building in the sense of constructivist learning. However, more evaluation from the perspective of constructivism may be needed. Based on the pre- and post-treatments administered in the academic year 2001-2002 we will compare the learning outcomes of the students who have completed the web-based seminar and coursework to the learning outcomes of the students who participated in the traditional coursework. In the evaluation we will utilize a SOLO (Structure of Observed Learning Outcome) taxonomy based measure to clarify learning outcomes and their quality, because it reflects the quality and development of students’ knowledge structures [5]. In this way we can clarify how successful our web-based seminar has been from the perspective of cognitive constructivism.

### Table 3. Analyzing the students’ skills.

<table>
<thead>
<tr>
<th></th>
<th>Mean at the beginning of the course</th>
<th>Mean at the end of the course</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-WWW group</td>
<td>WWW group</td>
</tr>
<tr>
<td></td>
<td>P (t)</td>
<td>P (t)</td>
</tr>
<tr>
<td>PC software use skill</td>
<td>3.51</td>
<td>3.42</td>
</tr>
<tr>
<td></td>
<td>.470</td>
<td></td>
</tr>
<tr>
<td>Groupware use skill</td>
<td>1.61</td>
<td>1.54</td>
</tr>
<tr>
<td></td>
<td>.595</td>
<td></td>
</tr>
<tr>
<td>Knowledge work</td>
<td>3.20</td>
<td>3.26</td>
</tr>
<tr>
<td>management skill</td>
<td>.697</td>
<td></td>
</tr>
</tbody>
</table>

In order to clarify whether the age affects skills learning the Pearson correlation coefficients were calculated. The correlation was not significant in any case based on data collected both at the beginning of the course and the end of the course (p varying from .079 to .977). Thus, the age does not affect learning skills using both methods significantly.
7. References


