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The Learning Web: A Technical Evaluation of WebCT in Concurrent Classroom and Distance Education Sections of a Software Engineering Graduate Course

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Introduction

The Software Engineering Research Network (SERN) is funded by industry and administered by the Industrial Software Engineering Chair at the University of Calgary to support the dissemination of good practice in software engineering. One component of SERN's activities is a thesis-based masters program with a specialization in software engineering targeted at students with industrial experience in full-time employment (Shaw & Gaines, 1998). This program has dual objectives: to develop highly qualified personnel, and to encourage industry-based software engineering research with a focus on good practice. Coursework includes requirements that have been developed in consultation with the industry partners. The learning environment is unconventional and reflects the industrial experience of the students. After the first lecture in a required course, students take on much of the responsibility for presentations on the various topics that draw upon their experience and that of their colleagues. The instructors' role is that of facilitator, "guide on the side", managing a process of debate and exploration rather than attempting to be the "sage on the stage" authority in the domain.

The overall aim of the masters program is to provide a supportive and nurturing learning environment in which experience and knowledge can be shared and created, and errors and omissions made without censure but with ready access to diagnostic help. Student assignments are submitted on the World Wide Web making them accessible to others. A list server is used for continuing discussion of the course topics outside the class environment. These two features have made it possible for students whose companies allocate them to work in other locations, or who change jobs to companies in other locations world-wide, to continue to participate in the courses. Remote students who have already come to know their colleagues can continue to present and share material through the web and participate in discussion through the list server. It becomes clear to students as they progress through the program that, while there are no easy answers to the core questions of industrial practice in software engineering, there are many useful perspectives and that simplistic answers generally have very limited applicability.

We are currently addressing the challenge of making our graduate program formally available and accessible to students who want to participate from a distance. A first step has been to develop and offer parallel sections of SENG 611, a six-week graduate course in Requirements Engineering. One section of SENG 611 was delivered on campus, and the other delivered at a distance using facilities provided by WebCT. Of the 21 students in the course, 7 chose to participate in the distance section, and 14 on campus in a conventional face-to-face learning environment. In addition to individual assignments, all students completed a major group project that was presented during the final lecture. The on-campus students recorded and summarized classroom discussions that were posted on the Web for the distance students.

WebCT and Technical Support for SENG 611

The technical support requirements for SENG 611 were concerned with two main issues: 1) supporting the organization and delivery of the course, and 2) minimizing the differences in student engagement. Although the course material already existed as web pages, WebCT was chosen as the web-based software tool to support the dissemination of course related information in this experiment (see Goldberg, Salari, & Swoboda, 1996). WebCT offered encapsulation and paths through the existing course content, student presentation areas for groups of students, individual student tools for note-taking, and a chat facility for synchronous, online discussions. It was the preferred choice for a number of reasons, including free testing of WebCT with full functionality at the University of Calgary, inexpensive licenses, a large customer base, proximity of developers, ease of access via common web-browsers, and ease of customization (if needed).

In Spring 1998, WebCT was installed on a local server so we could experiment with many of its features. This led to enough confidence in WebCT for its use with the graduate course in Fall 1998. The technical support person and a course instructor were well versed in HTML, scripting, and other computer-related activities which influenced the evaluation and usage of WebCT. Based on the current experiment using WebCT, we have made the following observations:

1. Support from developers of WebCT is very good. Queries and requests were dealt with quickly and to our satisfaction.
2. It is easy to (a) install WebCT (beta 1.3 on Windows NT took slightly more time than 1.2 on Unix), (b) create courses as an administrator, and (c) encapsulate existing course material.
3. It is moderately difficult to get used to all of the WebCT concepts and to develop a mental map of the course structures, and to keep information up-to-date in a course, because the tool imposes a certain approach to structuring on-line course materials. One must become familiar with the affordances and constraints inherent in WebCT's design in order to construct well-organized course materials.
4. It was difficult to customize WebCT to add connections to the external list server; Perl scripts had to be modified to add a mailto: hyperlink (referring to the list server) to WebCT's common button bar.

WebCT is geared to non-technical course designers; faculty with little or no prior experience with HTML will find the inherent structure and design of WebCT to be useful starting points. However, it was our experience that the WebCT designer interface often hampered the HTML-knowledgeable instructor's efficiency in building and maintaining the course material. For example, sequencing course materials requires the designer to set up a "path", which involves a number of intermediate steps that would not be required if the designer was using only HTML. However, for an instructor who is new to creating web-based documents, the structure and tool set offered by WebCT provide valuable entry-level supports and templates as they construct course materials.

We found that WebCT was not completely applicable to the current offering of the SENG 611 course. However, based upon research that compared WebCT to other web-based course tools (e.g., Kristapiazzi, 1998), we expect that other web-based course tools are also not completely applicable and would require customization for SENG courses. Courses in the research-based M.Sc. program have been developed within an open architecture philosophy and the belief that there should be public access to past and present SENG course materials and student work. Inherent to the design of WebCT is a closed architecture philosophy -- courses are password protected, and information in courses is not easily accessible to the general public.

WebCT's student tools, in particular note making and group presentation areas, offer useful tools for online courses. The e-mail and chat facilities in WebCT were not used for the current experiment; an external, publicly accessible list server remained in use. WebCT's quizzes, which employ selected response and open-ended questions, and so on, were not useful for this graduate-level course. However, we did employ these features in the service of a midterm examination for a large undergraduate course (CPSC 533) in Artificial Intelligence. We have found the online testing features of WebCT offer a reliable and useful environment for exams. In order to provide some practice with the WebCT exam environment prior to the midterm, we required students to login, change their password, and complete a short, pre-exam survey. In this way, those students who experienced difficulties had an opportunity to seek assistance before attempting the online midterm exam. Our findings, in brief: students were frustrated with a) the time clock feature, which only updates when an answer is submitted, thus giving a false impression about time left to complete, and b) having to submit each answer individually rather than the entire completed exam.

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