# 2006-149: UTILIZATION OF WEBCT IN COURSE DEVELOPMENT

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# Utilization of WebCT in Course Development

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## Abstract

In the last decade technological advancement has significantly altered the delivery of teaching and learning processes. As a result of these phenomenal changes, institutions of higher learning across the country have introduced and established electronic classroom in order to attain more effective and productive educational outcomes, especially for students with special needs and those at different learning levels.

In order to achieve similar objectives/outcomes experienced in the traditional classroom, educational technology must be integrated into the entire process of teaching and learning so that it becomes compatible with the conventional classroom practices. The goal of technology is not to replace the traditional classroom but it may be utilized as another tool to enhance what is already established. These tools when used wisely and effectively can further refine and improve upon the methods employed in the traditional classroom.

This paper discusses the findings of study a utilizing the Hybrid WebCT model that was implemented by the Civil and Electronics Engineering Technology faculty during the fall semester of 2005. It also presents the learning outcomes of the student population under study. It was concluded that majority (70%) of the students did not require any additional instruction using WebCT (Table I), 92% found it very useful, 80% stated that it was useful in communicating with the instructor, 62% could upload the assignments using WebCT, 72% experienced no technical difficulties and 60% did state that it enhanced their learning. Majority (82%) of the students stated that they found the tool beneficial and that it facilitated their ability to keep currency with course requirements.

## Introduction

The use of Internet or the "www" (World Wide Web) has grown globally as a vital source of information. Within the educational community, the web is increasingly used both as a learning tool to support formal training and as a means of delivering online learning. The main objective of any educational program is to disseminate knowledge and it remains constant throughout the cycle, whereas the delivery system changes with respect to time. The modern developments in Internet started with Arpanet. In the early part of the 90's, Gophers, a menu based information system with "text only version" was introduced. Later, Mosaic was evolved as a viable information system with both text and a graphics version. The technology has exponentially grown into the modern Netscape, Internet Explorer and other search engines. Web-Based Instructional tools have been developed during the middle of this decade and it has been used largely for distance education. However, it was not well received by the academic population since the user had to learn the Hyper Text Markup Language (HTML). Now, the modern developments in web technology has minimized or eliminated the need to know the markup language, HTML, and hence it has been happily considered as a practical instructive process for

augmenting the conventional classroom education. However, a sizeable number of these technology-based learning innovations are incorporated without any thought given to design issues, and, most importantly, without any thought to methodical evaluation of the impact of these technologies [1]. This is for the most part unfortunate because without this type of feedback on new techniques and innovations, the most effective practices are not emphasized, and those that are ineffective remain. The objective of our WebCT model is to create feedback system which monitors the learning of the students and makes modifications to the delivery system in accordance to the performance of the learners.

Universities and institution of higher learning need to recognize the boundaries of traditional classroom in which education is primarily face-to-face interaction between students and instructors. Some of the limitations of traditional delivery system are, (1) difficulty in providing course handouts and information to the students who are absent; (2) inability to have office hours that is compatible with the schedule of every student, (3) difficulty in administering many quizzes and tests without increasing the workload of grading, and (4) complexity in assessment of class performance. Web-based instruction can be used to eliminate or minimize these limitations [2] and [3]. Supplementing traditional class room learning with WebCT technology will remedy some of these limitations.

The main objective of our hybrid learning WebCT model in engineering technology department is to explore and implement the computer technology tools that will enhance the teaching and learning environment and furthermore provide a closed loop system that will serve as a continuous improvement plan for our delivery system. Authors have received a grant to enhance the existing model. This will include a video-audio enhanced learning element to achieve the goal of high quality learning. The availability of the video-audio enhanced lecture notes and other course material on the web will make possible a 24x7 hours virtual classroom.

The success of Web-based instruction depends on the capability and effectiveness of software tools. These tools in general can be categorized as: (1) course design features; (2) course collaborative features; and (3) course management features. However, it is beneficial to have a single tool that integrates all three categories [4,5].Some of the available Web-based courseware tools include: Course Info; Top class; Convene; Learning Space; Mentor Ware; Mallard [6], WebCT and others . Among these instructional tools, WebCT has been broadly used by many academic institutions and with low cost [7]. Following are the WebCT tools used to create an active learning environment:

- Calendar Tool
- Bulletin Board Tool
- Quiz Tool

***Calendar Tool***: This tool is useful to post the dates for the quizzes, tests, and final examination. This tool is also useful for posting the due dates for homework assignments and design projects. ***Bulletin Board Tool***: This tool is useful to send messages to entire class. The students used this tool to have discussion on homework assignments and design projects. In Digital Systems course a Full Adder problem is given as a topic for discussion. One group discussed design of the Full Adder and other group discussed about the applications of Full Adder.

***Quiz Tool***: This tool was extensively used in both Civil and Electronics Engineering Technology courses. This tool creates test from a data bank of questions and automatically grades the test.
The aforementioned tools served as the backbone for outcome assessment and continuous improvement plan for the courses in both the programs.

The following paragraphs will describe the hybrid WebCT learning and assessment method developed by Savannah State University faculty and Advanced Systems Engineering.

**Hybrid WebCT Learning Model**

Numerous approaches can be used to develop and deliver web based learning. These can be viewed as a continuum. At one end is pure distance learning in which course material, assessment, and support is all delivered online, with no face to face contact between students and teachers. At the other end of the spectrum is an organizational intranet, which replays printed course materials online to support what is basically a conventional face to face course. However, websites that are just database of knowledge, without links to learning, communication, and assessment activities, are not learner centered and cannot be considered true web based learning.

The hybrid delivery model is a mixture of static and interactive materials which ensure that the individual face to face teaching is supplemented by the web based environment. The hybrid model that we developed in Engineering Technology is a composite of two components: the traditional classroom setting and web-based internet technology. The contributions that these components make in structuring a class and its links to learning outcomes are specified below. Our assumption is/was that these components would determine learning outcome.

The authors of this study conceptualized learning outcome as a combination of various components and designed the items (presented in Table I) based on six assumptions that learning will take place:

- If students did not require additional help using WebCT
- If they find it useful for their coursework
- If they could use WebCT to communicate with their instructor
- If they could upload their assignment using WebCT
- If they face no technical difficulties
- If they perceive that WebCT enhanced their learning

.
Once we ascertain that learning did take place we tested the hypothesis that the WebCT will facilitate a student's ability to maintain currency in class.

**Outcomes**

Above assumptions are based on the following literature review which focuses on some of valuable and most recent writings about the Web-based learning. The World Wide Web can be used to provide instruction and instructional support. Web-based instruction offers learners

unmatched access to instructional resources, far surpassing the reach of the traditional classroom. It also makes possible learning experiences that are open, flexible, and disseminated, providing opportunities for engaging, interactive, and efficient instruction [8]. Phrases such as "flexible navigation," "richer context," "learner centered," and "social context of learning," are used in the literature to describe Web-based instruction. Furthermore, cognitive-based theories of learning have extended the design and delivery of Web-based instruction, applying the technical nomenclature to instructional practices [9]. Indeed, Dills and Romiszowksi [10] have identified more than 40 instructional paradigms seeking to advance and improve the online learning experience beyond the traditional classroom.

Qualities shared by the two delivery media include multimedia formats, self-pacing, tailored feedback, and course management functions. Additionally, the unique features of Web-based instruction, flexible courseware modification, broad accessibility, and online links to related materials, instructors, and fellow students, should make possible improvements in learning outcomes beyond Computer Based Instruction (CBI). Learning outcomes from conventional CBI, when compared to conventional classroom instruction, have demonstrated effects significantly above the "no-significant-difference" threshold [11]. Furthermore, Web-based instruction shares elements of good classroom teaching that are not necessarily available in conventional methods. Chickering and Ehrmann [12] outlined seven ways in which technology can leverage practices from the traditional classroom. For example, good practice encourages student contact with faculty, and Web-based environments offer ways to strengthen interactions between faculty and students through email, resource sharing, and collaboration.

**Hypothesis: WebCT will facilitate a student's ability to maintain currency in class.**

There are a multitude of factors that contribute to a meaningful learning environment. Cross and Steadman [13] in their textbook "Classroom Research Implementing the Scholarship of Teaching" , have noted that the classroom assessment has its heritage in the fundamental notion that learning can and should be monitored and that feedback from assessment should lead to more effective instruction, with the ultimate goal of improved learning. In an attempt to gain a methodical understanding of these factors, Kahn [8] developed a framework for Web-based learning, consisting of eight dimensions: (1) pedagogical, (2) technological, (3) interface design, (4) evaluation, (5) management, (6) resource support, (7) ethical, and (8) institutional. Kahn [14] later offered a framework for placing Web-based instruction along a band ranging from "micro" to "macro" uses. The "micro" end of the band involves the use of the Web as a way to supplement or enhance conventional classroom instruction (e.g., providing students in a electronic course with an interactive map of the electronic circuit to help them learn device functions). Further along the continuum are courses that are partially delivered over the Web, such as elective modules that supplement classroom instruction. Clearly, factors beyond pedagogy such as technical reliability, interface design, and evaluation become increasingly important at this level. Finally, at the "macro" end of the band include learning programs and virtual universities that enhance the interest of students in the subject with a higher degree.

**Assessment Method**

The students enrolled in the Electronics and Civil Engineering Technology program at Savannah State University participated in this study. The purpose of this study was to analyze students' interest and awareness with WebCT in order to determine its viability as a tool for delivering classes in an Internet-based environment. In this study, WebCT was used as accompaniment to traditional teaching methods in Digital Systems I course from Electronics program and Structural Analysis from our Civil Engineering Technology program. The method of instruction was based on the hybrid model concept which was a combination of conventional face-to-face teaching supplemented by WebCT. Conventional method included lecture, hands-on activities, and discussions. Students were required to use the WebCT system to study modules developed by the instructor. A typical module would discuss the design of a Full adder with logic circuit. After completing the module the students view the assignment and discussion questions posted by the instructor, and were required to send written assignments to the instructor's mail box. In both Electronics and Civil Engineering Technology courses, at the end of each module, a random quiz is generated using the course management tool. The objective of the quiz was to test the principles and concepts. This information served as a self-evaluation and as a feedback to the instructor for continuous improvement of the course. During the course of the semester students were also given training on the utilization of WebCT.

The students (n = 51) were surveyed during Fall semester of 2005, using pen and paper instrument at the end of the semester after using the WebCT tool for a range of assignments. The survey instrument included questions regarding student's experiences with WebCT. The questions were related to the usefulness of WebCT, technological difficulties and additional help needed to use WebCT. It also inquired if they used WebCT to communicate with their instructor and if they were able to conduct assignments through WebCT. Finally, students gave their viewpoint regarding the value of the WebCT in facilitating their learning as well as its continuity in class. Such factors as what components of WebCT they selected, the problems and issues that were presented and the general opinion of the WebCT were discussed.

**Table 1**
**Outcomes**
**Did Learning Take Place?**
**Descriptive**

| | Independent Variable | Response | F | % |
|---|---|---|---|---|
| 1 | Did you require any **additional instruction*** using WebCT? | Yes<br>No | 15<br>36 | 29.4%<br>70.6% |
| 2 | Did you find WebCT **useful** for your coursework? | Yes<br>No | 47<br>4 | 92.2%<br>7.8% |
| 3 | Was WebCT useful in **communicating** with your instructor? | Yes<br>No | 41<br>10 | 80.4%<br>19.6% |
| 4 | Did you complete your **assignments** on WebCT? | Yes | 32 | 62.7% |

| | | | | |
|---|---|---|---|---|
| | | No | 19 | 37.3% |
| 5 | You had any **technical problems*** with WebCT | Yes<br>No | 14<br>37 | 27.5%<br>72.5% |
| 6 | Did WebCT **enhance** your learning acquisition? | Yes<br>No | 31<br>20 | 60.8%<br>39.2% |
| | **Dependent Variable** | | | |
| 1 | Did WebCT facilitate your ability to maintain currency in class? | Yes<br>No | 42<br>9 | 82.4%<br>17.6% |
| | **Exploratory Items** | | | |
| 1 | Would you like to see video/audio lectures in future? | Yes<br>No | 44<br>7 | 86.3%<br>13.7% |

**Data Analysis**

In order to assess overall learning, the index was computed from six independent variables listed in Table I. These six variables were measured on a nominal level scale, where no=1 and yes = 2. Item by item descriptive statistics are presented in Table 1. This index attained a mean score of 10.39, median of 11 and mode of 11 on a possible range of 6-12. Table II gives frequency distribution of the computed index indicating that majority (62.7%) scored above median.

**Table II**
**Six Independent Variable: Index**
**Frequencies**

| Computed Index | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| 6 | 1 | 2.0 | 2.0 | 2.0 |
| 7 | 1 | 2.0 | 2.0 | 3.9 |
| 8 | 5 | 9.8 | 9.8 | 13.7 |
| 9 | 7 | 13.7 | 13.7 | 27.5 |
| 10 | 5 | 9.8 | 9.8 | 37.3 |
| 11 | 20 | **39.2** | 39.2 | 76.5 |
| 12 | 12 | **23.5** | 23.5 | 100.0 |
| Total | 51 | 100.0 | 100.0 | |

Due to small sample size and advanced statistics could not be performed. Table III gives Cross Tabulation between computed Index and currency variable which shows that nearly 18% (n=9) stated that WebCT did not facilitate their currency in class who also scored mid range (8.9.10) scores on the index.

**Table III**
**Hypothesis II: Index X Dependent Variable**
**Cross Tabulation**

| Computed Index ↓ | | Did WebCT Facilitate Your Ability to Maintain Currency in Class? | | |
|---|---|---|---|---|
| | | No | Yes | Total |
| 6 | Count | 0 | 1 | 1 |
| | % of Total | .0% | 2.0% | 2.0% |
| 7 | Count | 0 | 1 | 1 |
| | % of Total | .0% | 2.0% | 2.0% |
| 8 | Count | 4 | 1 | 5 |
| | % of Total | 7.8% | 2.0% | 9.8% |
| 9 | Count | 3 | 4 | 7 |
| | % of Total | 5.9% | 7.8% | 13.7% |
| 10 | Count | 2 | 3 | 5 |
| | % of Total | 3.9% | 5.9% | 9.8% |
| 11 | Count | 0 | 20 | 20 |
| | % of Total | .0% | 39.2% | 39.2% |
| 12 | Count | 0 | 12 | 12 |
| | % of Total | .0% | 23.5% | 23.5% |
| Total | Count | 9 | 42 | 51 |
| | % of Total | 17.6% | 82.4% | 100.0% |
| Independent Variables | Additional Instruction, Usefulness, Communication, Assignment, Technical Problems and Enhancement. | | | |
| Dependent Variable | Facilitate Currency | | | |

**Discussion**

The results indicated that, for the majority of students (86.3%), this was the first time they had used WebCT. Response to the utilization of the WebCT showed that 70.6% of the students required no additional instruction on using the WebCT. However, during the course of the semester 29.4% of the students were given training on the utilization of WebCT. 92.2% of the students found that WebCT was useful for their coursework. When asked whether WebCT was useful in electronic communications with regard to the class, 80.4% of the students indicated that communicating with the instructor via WebCT was beneficial. A majority of students (72.5%) reported no technical problems but 37.3% of the students had trouble in completing the assignment using WebCT. Qualitative data revealed that submitting assignments appeared to be the most difficult task for those students experiencing problems with the model. At time it was difficult to:

- download files
- Posting and replying was a confusing task
- Write assignment in a different environment and then loading it up within WebCT.
- understand the procedure of checking new assignments

Further analysis showed that majority (82.4%) of the students had a strong positive response to the question of WebCT facilitating towards their ability to maintain currency in the course. When considering enhancement of learning acquisition then 39.2% of the students indicated that they would prefer face-to-face learning environment. Some students also expressed that their Internet connection was too slow in speed for them to download and upload files related to their coursework. Finally, majority (86.3%) of students expressed that they would like to see video/audio lecture incorporated in the course supported by WebCT.

**Conclusion**

Bandwidth of the connection appears to be a significant factor in student satisfaction with system. Supplemental voice and video were desired by the vast majority of the students. The results of the study indicate that WebCT plays a significant role in the pedagogical process. Future research will focus on incorporating an audio/video component to the hybrid WebCT model

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* Reverse coded for index