# Enhancement Effects of MyMathLab and WebCT in a Math Class

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**Abstract:** This paper describes an investigation of the enhancement effects from two different Web-based learning managements systems on developmental mathematics students in the traditional lecture-based classroom. One of the learning management systems was WebCT, and the other, a course management and communications software called MyMathLab (serviced by Blackboard.com), that came packaged with the course textbook. Both software packages were used as vehicles for communication, and as tools to evaluate student learning .

**Introduction:** In the US, the trend toward "global classrooms that harness the latest in computer and Internet technology" (1) has spurred many institutions of higher education to integrate facets of distance learning into traditional teaching environments. However, distance learning projects have not found much success and universities continue to struggle to find effective ways to employ the Internet in formal ways as a classroom tool (2).

Work and personal commitments often create many demands on our students' time. Students increasingly desire flexibility in modes of education. We believe that the virtual classrooms, as adjuncts to the traditional classroom, can provide such flexibility because they allow teachers and students to interact from any place, at any time, and with additional resources as support.

**WebCT:** WebCT at SCSU provides a secured course management system where faculty can place course materials, including syllabi, and assignments. It integrates communication tools, including a bulletin board, private e-mail, and a calendar in one place (a course website), to facilitate interaction between faculty and students. It provides instructional tools to support course content such as self-test, and a quiz module. WebCT also gives faculty the course management tools for grading, tracking student interaction and monitoring class progress.

**MyMathLab:** MyMathLab is a customizable text-specific online course (available for all Addison-Wesley major mathematics titles from basic math through precalculus and service) that integrates Addison-Wesley testing and tutorial software with instructional content in a complete course-management environment, which is entirely supported and maintained on an Addison-Wesley Web server.

All MyMathLab courses are hosted on a CourseCompass server, which is Pearson Education's proprietary version of the Blackboard Inc., course management software.

Students can access their MyMathLab Web course site materials using Internet Explorer 5.0 where the necessary plug-ins have to be installed to take advantage of the many MyMathLab learning resources.

**Design of the Study**: The basic design was to implement the MyMathLab learning management system in two sections of an intermediate algebra course and compare with the WebCT learning management system in one section of the same intermediate algebra course. Three tests were given at three different stages during the semester, a departmental final examination and survey questionnaire came at the end of the semester.

Both WebCT and MyMathLab were used in conjunction with the conventional lecture method of instruction in the three classes and all three classes were taught by the researcher.

**Software In the Classroom**: Both WebCT and MyMathLab were used as a means of communicating with the student and administering and grading quizzes. All course information was available online. This information included a course syllabus and information concerning the various ways in which the instructors could be contacted. Links to various math-related web sites containing important information directly related to certain class topics were posted online. Students were provided with homework assignments, and solution sheets to the homework assignments. Students were provided with University email accounts and these email rosters were furnished to the instructor by the university. The instructor was able to send bulletin board postings or other notices and announcements quickly to the class using this e-mail roster system. Students also used their email to conduct interactive forms of communication with the instructor. Regularly scheduled quizzes were completed and submitted online, at least once a week.

MyMathLab had an additional feature that WebCT did not have. Students using the MyMathLab software could view streamlined video lectures connected with any topic in the book and also do sample homework problems and sample tests on any topic in the book with immediate feedback on their work to help them learn.

**Class Assessment:** Online testing with immediate feedback was a standard feature. All students had online access to quizzes and course grading information. Both course management software had the capability to administer online quizzes. Students were able to take the quizzes from any computer with the appropriate Internet connection. The "remote quiz-taking feature" was utilized to give students "sample" quizzes that they could complete at their leisure, within a certain 2 or three-day time limit.

Some quizzes were short, with only 4 problems, so students were given a 15-minute time limit to do those quizzes online. For longer quizzes, no time limit was set while online. Students accessed the questions for the quizzes via the Internet, took the quizzes and then received immediate feedback as to how well they had done. In some cases, students were allowed to retake the online quizzes, up to three times. In some cases, students were given multiple-choice versions of the quizzes to take home and enter their computed results on an online "scantron", again, with immediate feedback of their results. The

online quizzes were graded as homework problems and contributed as a very small percentage (1.2% each) of the total grade for the course. There were thirteen such online quizzes, where the overall average from these quizzes contributed a grade equivalent to 16.7% of the final average for each student.

Once quizzes were completed, students' grades were placed in the instructor's online grade books. Students were able to access their grades at anytime during the semester using their personal user names and passwords. This kept student's progress in the course salient in their minds. It allowed the instructors to answer any question about grades generally by email, making any necessary changes or corrections more quickly to the grades. This was a feature that empowered students with direct access to information typically under the strict control of the instructor in a traditional classroom.

**Student Performance:** Three tests were given to the students during the semester. Each test was 50 minutes long and had 25 questions, 10 multiple choice problems and 15 "show your work" type problems. Six problems on each test were specifically targeted as means for investigating student comprehension of the numeric, graphic, symbolic and verbal representations of functions, the primary theme of the course.

A summary of student responses on the six items selected from the three tests showed a steady improvement in the scores of the students in all three classes as the semester progressed. There was no remarkable significant difference in their improvement levels from one test to the other. However a pattern emerged indicating a ranking order of improvement that placed the students in the two MyMathLab classes at a higher level of performance than the students in the WebCT class.

The results of the final exam given by the Math Department indicated no significant difference in the average scores of the students in the three classes ($p = 0.134$) . However, it was noted that the average scores of the students on the final exam followed the same ranking order as the three tests scores. Students in the two MyMathLab sections had the highest average on the final exam, then the students in the WebCT class.

**Survey Questionnaire**: The student evaluation surveys were constructed to provide insight into the student's reaction to the introduction of WebCT and MyMathLab into their classes. The survey was administered to the students during the last week of classes. Data was sought in seven areas:

1) Computer Anxiety
2) Attitude toward computer usage in a math class
3) General impact of the software
4) Use of specific software tools
5) Baseline student demographics
6) Available Resources for the software
7) Effectiveness of the software

The students responded to four-point Likert-type scale questions ranging from strongly agree, agree, disagree, strongly disagree that rated usage, usefulness and opinions about the software.

**Survey Results Indicated:**
a) The students in the WebCT class had a lower state of Computer Anxiety than students in the two MyMathLab classes.
b) Students in the WebCT class had less of a negative attitude towards computers than students in the two MyMathLab classes.
c) Students in the MyMathLab classes found the course website more helpful to their learning of mathematics than students in the WebCT class.
d) More students used the internet at home than the school computer labs.
e) In a ranking order of the web related activities, the students listed i) the Internet grade report as having the most positive effect, ii) email messages from the instructor to students, iii) email messages from student to instructor, iv) the announcement/homepage information, v) homework problem solution page, vi) tutorials and practice test/quizzes, and vii) the internet quizzes.

**Discussion of Results**: For this investigation, the software was not a substitute for the traditional aspects of the course, but it is clear that the online software provided students with additional opportunities for communication, 24-hour access to course and grading information, and alternative evaluation opportunities that had a positive enhancement effect on their learning of the subject matter involved in this course.

**Benefits:** The instructor of this course is of the opinion that there were many effective advantages brought to the teaching environment in using the internet to assess student performances. Included among them were the following:

a. It saved classroom time since it was done outside of class.
b. Online assessment was done more frequently than traditional in-class assessment.
c. Online assessment encouraged the students to keep up with the material
d. The assessment results were used to revisit concepts in class that needed clarification.
e. The computer scored the assignments thus significantly reducing grading time and facilitating grade book management.

**Challenges:** The process involved in setting up and running such a course with an enhanced learning management system involved more preparation time initially for the instructor. Increased time was also required to conduct effective communications with the students by email.

Student perceptions of the two online systems were sometimes similar and sometimes different. The students who used WebCT reported that the software was easy to use and understand. Students using MyMathLab had more complaints, mainly with difficulties

accessing the many features available at that site. The slow pace of dial-up modems at home, student inability to install all of the required plug-ins and players necessary for viewing the many features of MyMathLab increased their computer anxieties and negative attitudes of computers.

**Reality:** However optimistic the instructor's goals were for the online learning management system, the reality was that this approach did not always work when dealing with first year students in a developmental math class. Using a Web-based course management delivery system required that the students be independent and sometimes constructivist learners. But for most cases, developmental math students were usually the ones who had been previously entrenched in a traditional teacher-centered mode of learning. These students were usually the ones who believed that they were perpetual "empty vessels " needing to be filled with knowledge. These students were usually the ones who wanted a "quick fix" to the majority of their problems and if that was not the case, they were easily frustrated. These students were usually the ones who could not find the "spare time" to devote to a rigorous schedule that required them to invest two hours of study time to each hour of face-to-face class time.

On a positive note, it was observed that as the semester progressed, student attitudes toward learning improved. Their abilities to work things out for themselves also improved. The panic email communications for help between students and the instructor that flourished during the early part of the semester ceased. Students developed more of a working relationship with the instructor and with their classmates. The MyMathLab students spent more time logging into the system and using the multiple learning aids from the textbook publishers that were directly related to the textbook contents. The rewards of this extra time spent using the learning management system was evident in their higher grades and steady improvements in their class work.

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