

A College Course on the Internet on the Internet

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Abstract

This paper discusses the successes and failures of a college level computer science course that has been moved onto the Internet. This course was intended to be on-line but accommodations for many learning styles meant that lectures, demonstrations and help sessions with the instructor were needed.

Key discoveries where:

- 1) E-mail and the on-line web site must be monitored at least daily.
- 2) Web based learning tools won't work the same on all systems.
- 3) Students still prefer reading from a book over searching and learning from the Internet.
- 4) Unless encouraged by the instructor, students will not exchange resources with one another via e-mail or other on-line means.
- 5) Students find it difficult to form study groups when connected only via the Internet.
- 6) The course must adhere to a strict schedule.
- 7) As the course matures, faculty load is moderately reduced.

Introduction

Augsburg comprises three student populations: Day School – traditional two semester per year with courses during normal working hours, Weekend College – two or three courses each trimester on Friday evening, Saturday or Sunday and Rochester -- weeknight schedules similar to the Weekend College Student. Computer Science 240 – Introduction to Networking - is a required course for Computer Science and Management Information Systems majors at Augsburg College. This course is taught in 7 or 8 sections of more than 20 students each academic year. Due to the topic of the course and the availability of on-line course management software, the course was offered on-line in the fall of 2002. Sixty-five students in 3 sections were enrolled in the pilot offering. The on-line course continues in the spring semester of 2003. Table 1 highlights the basic course structure.

Table 1: Course Schedule

First week:
Meet first scheduled class session
Introduce Blackboard software, the text and the first few chapters
For practice the students take an introductory sample quiz of 10 questions
-- just like the actual quizzes (doesn't count toward grade)
Begin taking quizzes, one for each chapter of the book
Second week:
Students take a first impression survey. This is a non-graded survey of student effort and impressions of the course.
Continue with chapter quizzes (approximately 3 per week)
One class meeting per week with Day School students (one hour/week)
Subsequent weeks:
Continue with chapter quizzes (pace quickens to 4 per week)
Continue weekly meetings with Day School students
Meet for 3 hours every 3 to 4 weeks with Weekend College and Rochester students
After 7 weeks:
Students take a mid-course survey
Final week:
Comprehensive 20 questions final exam and a final survey.

From the students' perspective, the course was not unlike previous lecture-based versions. The text book has 38 chapters of about 20 pages each [1]. Approximately 10 exercises at the end of each chapter gave the students opportunity to review the topic and perhaps explore more deeply. By breaking the topic into smaller chunks, students were able to read a chapter, review the exercises, review the quiz questions and take the quiz in one sitting.

Using the Blackboard On-Line Course

Initially students took the quizzes by going on-line, reading the question, researching the answer, and answering questions one at a time. This meant the students spent from 2 to 3 hours on-line taking one quiz. Often during this time a student would lose connection over the phone line and the quiz software would lock out the student from answering any further questions. The only way to complete the quiz was for the instructor to reset the quiz back to zero and have the student take it all over again.

To shorten the test taking time, all quiz questions were put on-line at the same time the quiz was made available. Students could research questions and have answers ready before taking the quiz. Lost connections and quiz resets were greatly reduced.

Quizzes were available for approximately 2 weeks after the lecture which covered the chapter. As students come into the Blackboard course they see an Announcement Screen (Figure 1). Links on this screen lead to the available quizzes. On the left of this screen are links to other course materials and tools.

Figure 1: Blackboard Announcement Screen

The screenshot shows a web browser window titled "Netscape: Blackboard: Courses". The address bar displays a URL starting with "http://www.uugsburg.edu/...". The page header features the Uugsburg College logo and navigation links for "Home", "Help", and "Logout". Below the header, there are tabs for "Your Blackboard", "Courses", and "Academic Web Resources". A sidebar on the left contains a vertical menu with the following items: "Announcements", "Courses Information", "Study Appointments", "Assignments", "Communication", "Virtual Classroom", "Discussion Board", "Groups", "External Links", "Tools", "Resources", "Course Map", and "Control Panel". The main content area is titled "ANNOUNCEMENTS" and includes filters for "VIEW TODAY", "VIEW LAST 7 DAYS", "VIEW LAST 30 DAYS", and "VIEW ALL". The date "February 4 - 11, 2003" is displayed. A list of announcements follows, each with a date, a message, and a "Post by" field. The announcements are:

- Tue, Feb 11, 2003 - Please take this course survey before Feb 29th. To begin taking the survey click the first expression Survey [click here](#). Posted by Blackboard Administrator
- Tue, Feb 11, 2003 - Quiz 20. To begin taking the quiz click Chapter 20 Quiz [click here](#). Posted by Neil Pelt
- Tue, Feb 11, 2003 - Quiz 17. To begin taking the quiz click Chapter 17 Quiz [click here](#). Posted by Neil Pelt
- Tue, Feb 11, 2003 - Quiz 20. To begin taking the quiz click Chapter 20 Quiz [click here](#). Posted by Blackboard Administrator
- Tue, Feb 11, 2003 - Quiz 20. To begin taking the quiz click Chapter 20 Quiz [click here](#). Posted by Blackboard Administrator
- Tue, Feb 04, 2003 - Quiz 20. To begin taking the quiz click Chapter 20 Quiz [click here](#). Posted by Blackboard Administrator
- Tue, Feb 04, 2003 - Quiz 20. To begin taking the quiz click Chapter 20 Quiz [click here](#). Posted by Blackboard Administrator
- Tue, Feb 04, 2003 - Quiz 20. To begin taking the quiz click Chapter 20 Quiz [click here](#). Posted by Blackboard Administrator
- Tue, Feb 04, 2003 - Quiz 20. To begin taking the quiz click Chapter 20 Quiz [click here](#). Posted by Blackboard Administrator

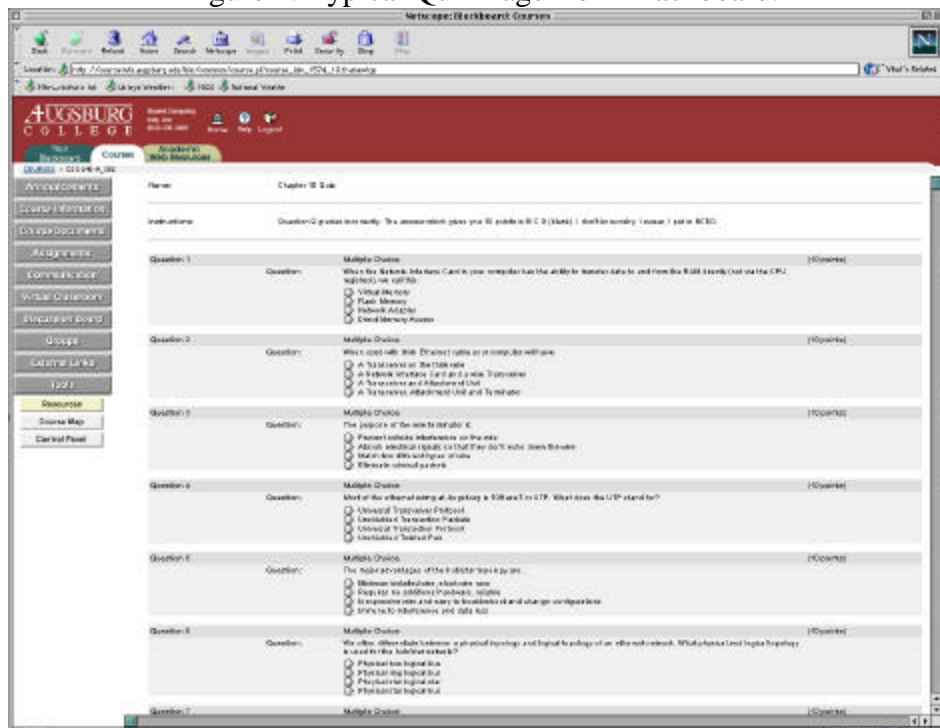
The footer of the page includes the "AugNet" logo, the text "POWERED BY Blackboard", the Blackboard logo, the URL "www.blackboard.com", and the copyright notice "Copyright © 2002 Blackboard Inc. All Rights Reserved."

To simplify course administration, all quiz questions were multiple choice, true/false or matching. Blackboard automatically grades these types of questions. The software allows short essay questions as well, but these must be individually graded by the instructor. Because of the large number of students and questions, grading many short answer questions was impractical.

Multiple choice questions are difficult for students in an introductory course because they are just learning the language of the discipline. Students often complained that questions were ambiguous or vague even though they were clear to the instructor.

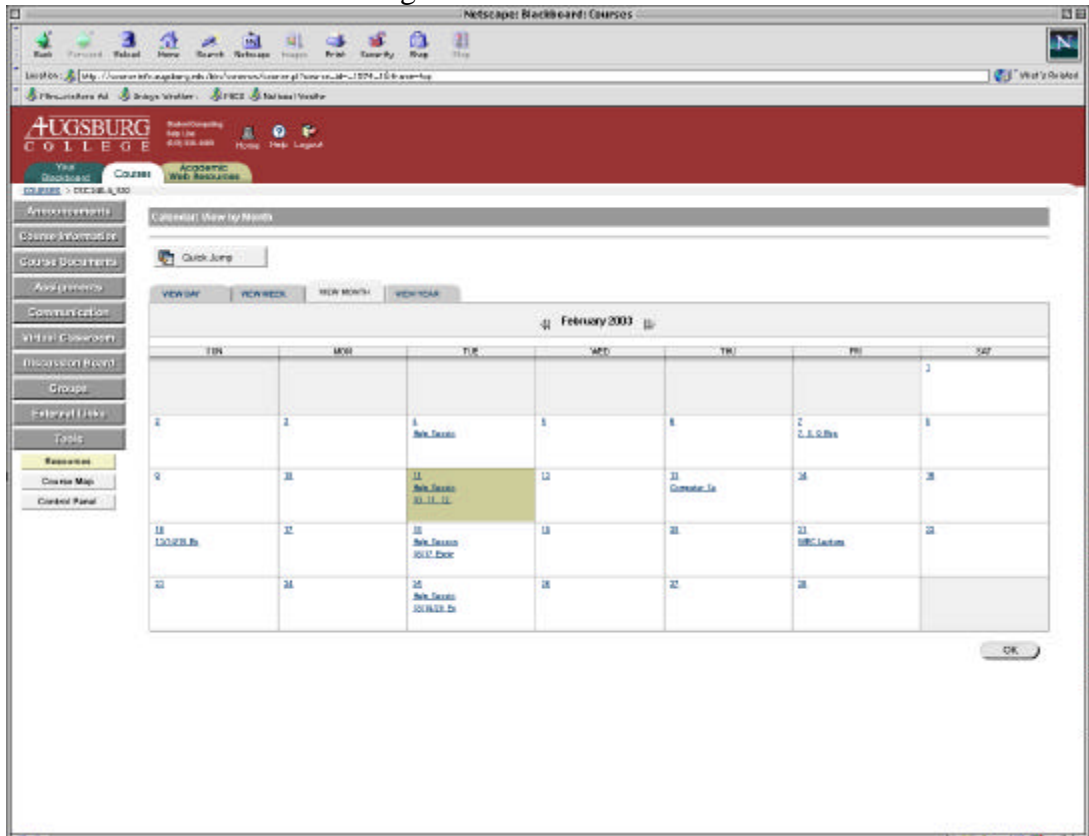
Students take quizzes on-line by clicking on the answer button (Figure 2). Their grade is shown and an explanation of each question is given once the student submits the quiz for grading. Students are given only one chance at each quiz, but the quiz can be reset by the instructor. Once reset, the quiz must be taken over again from the start.

Figure 2: Typical Quiz Page from Blackboard.



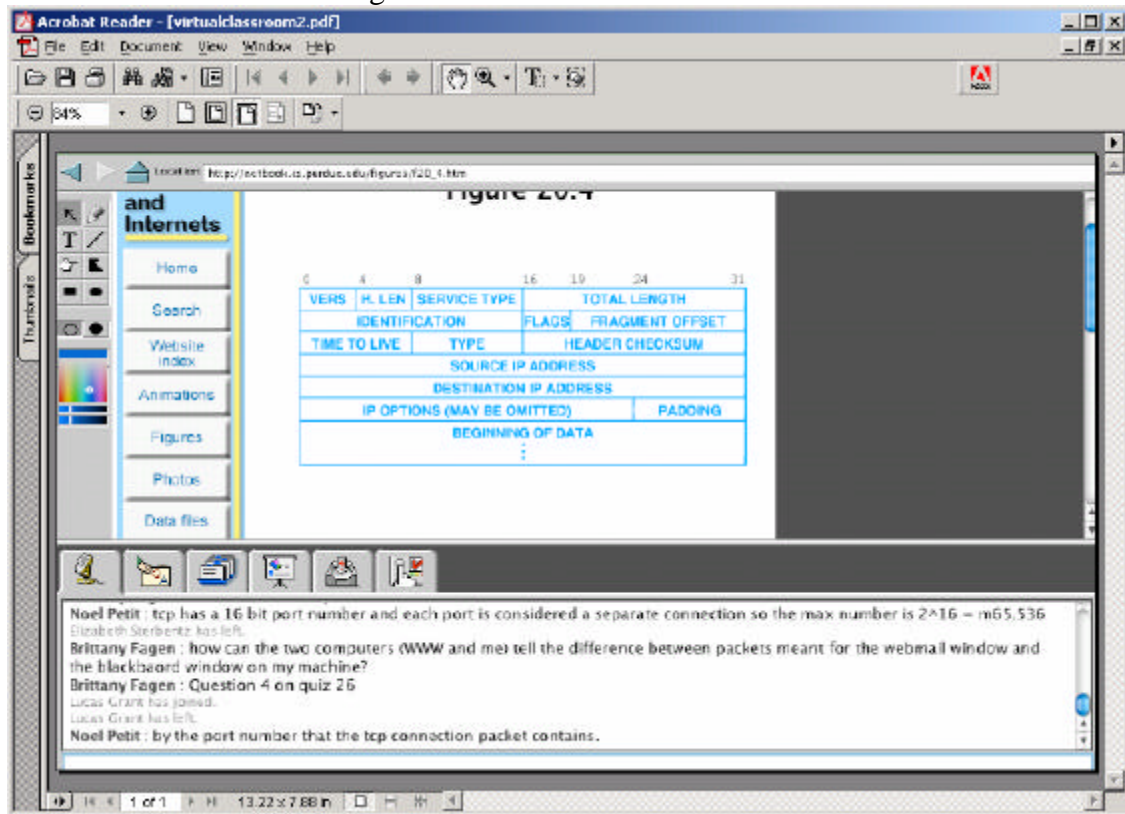
The on-line course calendar keeps students informed of the upcoming quizzes, help sessions and lectures (Figure 3).

Figure 3: On-Line Calendar



Each Tuesday night students and the instructor used Virtual Classroom to answer questions and clarify topics. The Virtual Classroom screen has two sections: the upper section is a general graphics window that can be loaded from any URL, the lower section is a chat room that scrolls as students and faculty type messages (Figure 4).

Figure 4: Virtual Classroom Screen



Other tools that are available in Blackboard include:

- E-mail list to all or selected students
- Discussion groups that record messages by topic
- Pages for course documents, syllabi, etc
- A digital drop box to pass assignments to the instructor
- On-line grade book arranged by assignment or student

These tools were used sparingly. The students see course announcements at every login so it was more efficient to put information in the announcements. This saved the students from having to seek out any new information with lots of clicking on links. E-mail to all the students was used only 6 times during the course.

Most telling were the students' responses to the three surveys. The first survey was given in the first week to get a starting point. The next survey was given at the mid-semester week and a final survey was given during the last week of class. Some of the students' initial impressions were:

- Too many questions from material not in the text (15 % of respondents)
- Questions are not written clearly (20%)
- Questions with multiple correct answers are difficult (15 %)
- Class and demonstration time is too short (20%)

The mid course survey reinforced some of the difficulties pointed out in the initial survey so changes were made:

- Eliminated questions with multiple correct answers.
- Put questions in Course Documents so students could research the question before going on-line to complete the quiz

For the mid-term survey students still commented on difficulties:

- Questions needed to be clearer
- It was difficult to find answers from material not in the text
- Class should meet more often

The end of course survey found most students satisfied with this course format:

- Complaints on unclear questions dropped to 10 % of the comments
- Complaints of questions from material not in book dropped to 5 %
- The major complaint was still too little class time from 25 % of the respondents.

In addition, complaints about the text itself, having more hands-on laboratory time, and the scheduling of quizzes all dropped to less than 5% of the respondents.

There were some quantifiable results from the surveys:

Table 2: Where Do Students Get Most Quiz Answers?

	First Month	Middle of Course	End of Course
Textbook	40 %	50 %	55 %
Internet	56 %	50 %	37 %
Other Students	0 %	0 %	0 %
Other books/sources	2 %	0 %	8 %

Students were evenly split between the text and the Internet as their source of quiz answers. Perhaps they became better acquainted with the jargon of the text and it therefore became easier to read.

Table 3: Time Spent Per Quiz

	First Month	Middle of Course	End of Course
Less than one hour	21 %	41%	37%
1 to 2 hours	52 %	50 %	55 %
2 to 4 hours	27 %	9 %	8 %
More than 4 hours	0 %	0 %	0 %

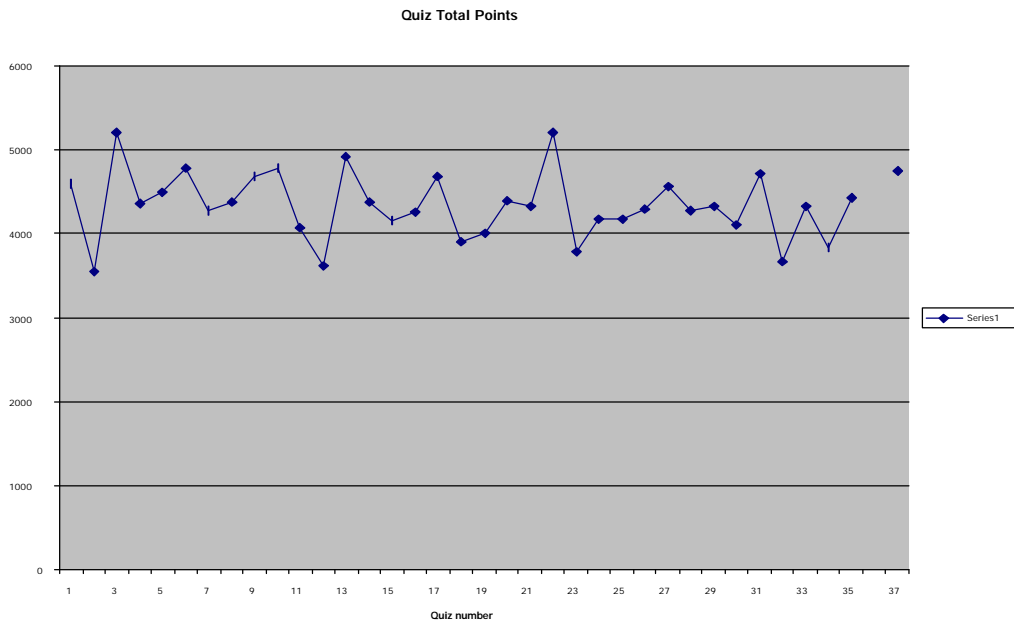
Students spent from 1 to 2 hours researching and taking each quiz. With 4 quizzes per week this amounted to a major time commitment on a regular basis. This didn't include time spent reading the material which would add another 1 to 2 hours per week. Also note that 27% of the students indicated spending 2 to 4 hours per quiz at the beginning of the course. That number dropped steadily to 8% at the end of the course. This too indicates an improvement in the students' ability to comprehend material as they work through the course and its jargon.

Table 4: Are Quizzes Changing with Time?

	First Month	Last Month
Easier	18 %	16 %
Same	50 %	47 %
Harder	29 %	37 %
Much Harder	3 %	0 %

There is not much change in the students' perception of the quiz difficulty. This is good in that the quizzes were certainly more technical toward the end of the course. Students perceived that the quizzes were somewhat harder but only by a small percentage. Figure 5 indicates that the quiz scores did not change significantly over the semester. Students got better at researching and taking the quizzes as the quizzes got more challenging and technical.

Figure 5 – Average Quiz Grades over the Semester



Using other Course Resources

Table 5 indicates the percentage of students who participated in the help and virtual classroom sessions at the three survey times.

Table 5: Help and Virtual Classroom Session Participation

	First Month	Mid Term	End of Course
Participate in Help Sessions	6%	26 %	32 %
Participate in Virtual Classroom Sessions	12 %	35 %	39%

The help sessions were every Tuesday night on campus. These sessions included Virtual Classroom on-line question and answer sessions using Blackboard. It should be noted that a significant number of the students were regular participants in these sessions. For these students, contact hours with the faculty and other students were roughly double the contact hours of the other students. One challenge of these help sessions was that as they became more popular, it became difficult to answer the large number of questions posed from many sources (in-room, e-mail, virtual classroom) simultaneously. If the class size is much larger and help sessions more popular, it may become necessary to have more than one help session per week. The maximum number of students serviced at a 3 hour help session was typically 10 students. Beyond that, the instructor would not be able to meet the needs of all students.

Other general impressions are summarized as follows:

Table 6 – Impressions of the Textbook

	Easier than others	Average text	Harder than others
How does the Comer text compare to other textbooks?	12 %	62 %	30 %

Table 7 – Impressions of Blackboard

	Easy to use	Frustrating
How did you find the Blackboard Course Software?	95 %	5 %

These were probably the most reassuring result of the course. The software did not detract from the material. There were many times that quizzes had to be reset, but most students felt that the freedom to take the quizzes at their own pace (in their pajamas)

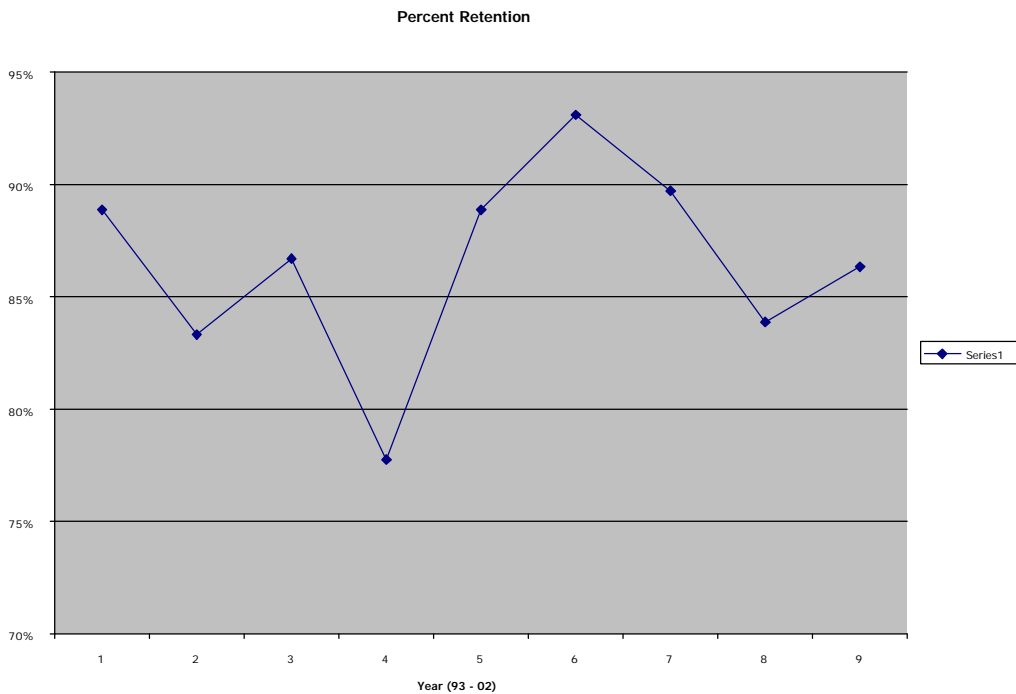
compensated for technical difficulties. We are still very tolerant of software. I wonder how long that attitude will last?

Interestingly, at the end of the course, 60 % of the students said the worst part of this teaching method was little or “no contact with others”. The significance of that statement is difficult to evaluate. Overall 50 % of the end of course surveys indicated they liked the on-line course format. Only 20 % of the respondents indicated a negative impression of the course format and usually those correlated with those who wanted more class time and more instructor contact.

Grades and Retention

Now the question is “Is the on-line version of the course equivalent to previous renditions?” We can look at a number of different measures. Course retention (percentage of registered students who complete the course with a passing grade) has fluctuated from 78 % to 93 % over the past 10 years. The on-line course retention was 87 % -- well within the range of this course’s history (see Figure 6).

Figure 6: Course Retention for Introduction to Networking



Course grades were equivalent to previous years. The final average grade was 3.25 and previous years averaged to about 3.30. The on-line final exam averaged to 148 points. Comparable previous years’ final test scores averaged to 154 points on a hand graded exam. Students learned as much with the on-line course as with the traditional lecture course as indicated by equivalent final exam results.

Faculty Load

How many faculty hours were spent on this course? Since this was the first semester of this course, there was a significant learning curve and work load to get the course running smoothly. Each month of the first semester of this course consumed approximately 133 hours of faculty time:

- Weekly meetings (5 hour Day School, 5 hour Rochester, 5 hour WEC)
- Weekly help sessions (12 hours)
- Quiz preparation (45 hours)
- Answering e-mail (45 hours – approximately 1 hour/month-student)
- Blackboard administration (16 hours)

For the second semester the faculty load dropped to approximately 78 hours per month as follows:

- Weekly meetings (5 hour Day School, 5 hour WEC)
- Weekly help sessions (12 hours)
- Quiz repair/modification (10 hours)
- Answering e-mail (30 hours – still about 1 hour/month-student)
- Blackboard administration (16 hours)

Note also that the first semester had 65 students in three sections and the second semester had 30 students in two sections. This makes it difficult to compare the two semesters but there seems to be a slight drop in faculty load now that the major work of quiz preparation is done. Next year each quiz will be modified; this should raise the faculty load to nearly that of the first semester.

From the faculty point of view, the major advantage of Blackboard and its automatic grading system is the elimination of a paper gradebook and the work of maintaining grades. That is done automatically and the students can see their own grades at any time. Once in the middle of the course an approximate grading curve is published so that the students can see what their grade would be if the course ended mid-term.

Student Study Groups

Despite encouragement from the instructor only one study group formed in the two semesters of the course. Students who used Virtual Classroom religiously only numbered 5 or 6 students in each semester. They did very little communication among themselves and directed most of the questions at the instructor. One small group of three met each Monday and Wednesday at the normal class time to work on the quizzes. That was an open period for all of the students but no one else took advantage of the time to work together. Blackboard provides a discussion board for students to leave questions and exchange information – much like news groups. Only five messages were left on the

discussion board the whole year. They found their own answers and shared very little with each other.

Blackboard and this course format do not encourage student interaction. This may be the weakest part of this teaching technique. With a normal lecture course there is interaction among students before, during and after class. This is especially true for the adult students (Weekend College) since they may not encounter anyone else with similar interests during their working day. Weekend College students may need to have the course run as on-line quizzes and still maintain the 8 three-hour sessions during each trimester to take full advantage of the student interaction part of education.

Conclusion

The jury is still out on distance learning and on-line teaching [2][3]. This effort was meant to evaluate a hybrid of on-line and face-to-face instruction in a topic closely related to the teaching tools. Student response was positive. Faculty load was high at first but tapered to a manageable level during the second semester. There were no major detractions from the technique and students learned the material.

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