8-6-2005

A Study Of Student Use Of An Online Message Board In An Introductory Physics Class

Wenjuan Song

A STUDY OF STUDENT USE OF AN ONLINE MESSAGE BOARD IN AN INTRODUCTORY PHYSICS CLASS

By

Wenjuan Song

A Thesis
Submitted to the Faculty of
Mississippi State University
in Partial Fulfillment of the Requirements
for the Degree of Master of Science
in Physics
in the Department of Physics and Astronomy

Mississippi State, Mississippi

August, 2005

A STUDY OF STUDENT USE OF AN ONLINE MESSAGE BOARD IN AN INTRODUCTORY PHYSICS CLASS

By

Wenjuan Song

Approved:

Taha Mzoughi
Associate Professor of Physics
(Director of Thesis)

David L. Monts
Professor of Physics
Graduate Coordinator of the Department of Physics and Astronomy

John T. Foley
Professor of Physics
(Committee Member)

Anastasia D. Elder
Assistant Professor of Counseling, Educational Psychology and Special Education
(Committee Member)

Jeff A. Winger
Professor of Physics
(Committee Member)

Philip B. Oldham
Dean of the College of Arts and Sciences

Name: Wenjuan Song

Date of Degree: August 6, 2005

Institution: Mississippi State University

Major Field: Physics

Major Professor: Taha Mzoughi

Title of Study: A STUDY OF STUDENT USE OF AN ONLINE MESSAGE BOARD IN AN INTRODUCTORY PHYSICS CLASS

Pages in Study: 61

Candidate for Degree of Master of Science

With the rapid development of the Internet, increasingly universities and colleges transfer some of their teaching assignments online. Online learning plays an important role in assisting or sometimes substituting for the traditional face-to-face learning. An online message board is one of several online communication tools which are used to assist online learning.

We have conducted a study on the role of the online message board in teaching one of these courses, an introductory course in calculus-based physics. The study analyzed students' use of the message board and investigated whether use is correlated with performance in the class.

Results suggest that students have benefited from using the online message board. Both homework related message board activities and non-learning message

board activities were found to be correlated significantly to the grades the students earned in the course.

DEDICATION

I would like to dedicate this thesis to my family.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and appreciation to my supervisor Dr. Taha Mzoughi, for his guidance and magnanimity in expanding time. Many thanks go to Dr. Anastasia Elder whose assistance was vital in this study. I would also like to thank my committee members Dr. John Foley and Dr. Jeff Winger for reviewing this document and serving in the defense committee.

TABLE OF CONTENTS

CHAPTER Page

LIST OF TABLES

TABLE Page

LIST OF FIGURES

CHAPTER I

INTRODUCTION

1.1 Background

Technological advances and sociological changes during the last few decades have affected how we learn and how we teach. The technology boom has affected many aspects of our life. Children now are exposed to video games, computers, and instant messaging at a very young age. Communication technologies and the Internet are allowing us to have easy access to a vast amount of information. The amazing increase in readily available computational power and the array of newly developed visualization technologies are allowing us to easily simulate and demonstrate complex and abstract concepts. On the other hand, changes in the way we grow crops and manufacture products are resulting in an increased need for higher education and for opportunities for lifelong training. One significant change in higher education is due to the student population shifting from just high school graduates to adults who have been in the workplace for many years [1]. Our society is moving rapidly from an industrial or manufacturing-based society into an information or knowledge economy and online learning responds to an information or knowledge-based economy [2]

Education evolved with more and more technology incorporated into our teaching. Most universities and colleges have deployed new technologies that have transformed classes and the way students are taught. With these rapid changes, there is a need for education research to document the effect of the changes and to identify the most effective avenues for enhancing learning.

In today's universities the chalk board is being replaced by a SmartBoard [3] or a Mimio device [4]; tools that allow the teacher to record what was written and later provided to students via web. Teachers quite often use personal computer to project their lectures notes on a screen. Some provide online versions of their notes to students to allow them concentrate on understanding the material instead of writing. Others use personal response devices (or clickers) or laptops to have students answer questions electronically while attending classes [5]. Some have even transformed the layout of the lecture room to promote collaboration and discussion between students [6] [7]. Some have replaced lecture by a studio learning environment [8]. Other changes include the use of what is referred to as online classes and web-enhanced or hybrid classes.

Education research is changing from a field that was pursued exclusively by education faculty to a field common to many content departments. This is particularly true in physics where the new emphasis on education research has resulted in the

creation of a yearly conference about physics education research and a new peer-reviewed journal [9]. One result that is shared by the education research community is that there is a need to actively engage students in their learning [10]. More particularly, some researchers emphasize the need to promote collaborative learning in our teaching. Particularly, some studies in physics education research have reported those students who engage in collaborative learning score better than others in conventional lecture [5]. One of the most prominent promoters of collaborative learning is Eric Mazur. He promotes the use of clicker or similarly designed devices to engage students in collaborative learning in large lecture halls. Under his scheme, students are provided with a question that they need to answer by using the clicker. Once the teacher collects all answers, he shows student a bar diagram of the class answer distribution. He then asks the students to discuss the questions with their neighbors and then use the clicker the newly agreed on answer. Collaborative learning occurs through the heated discussion between students [5]. Some teachers and researchers promote the use of online media such as chat and forums/message boards to promote collaborative learning [11][12].

The use of collaborative learning probably predates the use of all technologies discussed in this thesis. It occurs whenever the learners share their knowledge, and discuss their findings without interferences from an instructor. Students often hold

different views from each other, but they are good at explaining difficult and abstract concepts to each other. Collaborative learning environments encourage students to freely to discuss questions and state their opinions. Knowledge grows and develops through interactive debate. Changes in our learning environment are putting more emphasis on the need for using collaborative/cooperative learning as part of our teaching. Thomas R. Guskey states: “In this changing assessment world, teams have become essential at both the teacher and students level. For students, cooperative learning groups present unique and important opportunities and benefits for instruction, assessment, and reporting results”[13]. Technological innovations and proliferation of web-mediated learning and teaching are creating new opportunities for conceptualizing, designing, facilitating and thereby enacting collaborative learning [14]. In the past, the only time students engaged in collaborative learning was when they formed study groups. This kind of learning confined the collaborative learning to a certain population and a location. Online collaborative tools provide an opportunity to enable students to engage in online learning from anywhere and at anytime.

1.1.1 *Online Versus Traditional Learning*

Online learning has been growing rapidly since the advent of the Internet and the development of many types of course management systems. More and more schools and universities offer various kinds of online courses enabling students to

access an internet learning opportunity regardless of geographical, time, social, physical and economical constraints [15]. Online learning is particularly useful for non-traditional students like full time workers trying to enhance their skills. However, even regular students often benefit from online offerings. With online classes they don't have to worry about scheduling conflicts or about staying on campus to take a summer course. William Draves argues that there are three major differences between learning online and traditional classroom lecture [2]. According to his view, online learning is active, self initiated and requiring self-discipline. Moreover, online learning is results oriented. By comparison, he states that traditional lectures are more passive and responsive.

In a traditional or face to face learning environment, students are required to attend classes at a particular schedule at a certain location. This offers the students the ability to see the professor and their peers face to face. Usually, they can get their questions immediately answered by their peers or the professor. In some cases, professors or fellow students can provide them with individualized instruction or assistance on problem areas. Students can meet with other students for friendship, fellowship, and study. Collaborative learning for students in face-to-face courses usually takes the form of activities like the ones promoted by Mazur, Beichner, etc.[5][16][17][18] or simply through study groups. Some of the disadvantages of the

best planned face to face classes include the difficulty students often face in scheduling classes, and sometimes the actual physical environment of the class [19]. Most importantly, courses are taught usually at the level of the average student in the class. Advanced and weak students often do not reap as many benefits by taking the course.

Online learning has been developed in various forms. In some courses, students are provided with access to videos of lectures. They are also asked to purchase books and read chapters from the books. Testing and quizzing is done online. Traditional office hours are replaced by online office hours via chat. Online message boards and email are used for announcements and further communication. Some online courses are self paced, in others; the pace is set by the instructor. Some online courses take more advantage of Internet-enabled tools like simulations, animations, and guided tutorials [20][21]. Usually the text book is replaced by an online book. Some require students to complete tests at pre-selected testing centers. Depending on the discipline taught, labs are usually replaced by online activities. In some cases, students are required to buy kits that enable them to complete the laboratory activities at home.

In addition to online courses, universities and colleges have started using hybrid and web-enhanced courses. The following section provides a description of both of these.

1.1.2 *Hybrid Courses and Web-Enhanced Courses*

Hybrid courses refer to courses that include both campus-based and off-campus activities/classes. They combine traditional face-to-face instruction and online instruction [22]. Online instruction replaces part of the in-class seat time. The amount of in-class time depends on the course, professor and institution. Some of the benefits of hybrid courses are: saving commuting time for students and saving classroom space for the institutions. However, in addition to maximizing physical resources, hybrid courses can benefit student learning [23]. According to Thomas Gould, hybrid courses have the potential of enhancing student learning in a variety of ways [23]. The hybrid instruction combines both face-to-face and online instruction forming a new teaching style that can be highly effective in the delivery of knowledge. With the right combination of instructional design, hybrid instruction can offer both flexibility and efficiency for instructors and students. Properly designed hybrid courses can capitalize on the strengths of both course delivery formats while avoiding their weaknesses. Students can be highly engaged in the course progress, benefiting with both online and face-to-face interaction with their peers and their instructors. One of the reportedly successful use of hybrid course is UNITAR (the University of Malaya, Malaysia.) [24]. UNITAR offers a hybrid model that consists of three components. The three components are the interactive, multimedia content in CDs and on the Web, face-to face meetings, and an Internet-based support system that provide continuous

interaction between the students and faculty. Studies based on this model show that the model provides convenience for working students as well as full-time students to engage and commit themselves to the course.

Web-enhanced courses use the same technology as hybrid courses but do not occupies the out of class time of students [25]. Like hybrid courses, web-enhanced courses integrate online content into teaching and learning. The difference is that hybrid courses apply the technology out of class while web-enhanced courses use technology in class and/or for homework. The level of use of technology in web-enhanced courses depends on the teacher, course and institution. For instance, at the Department of Physics and Astronomy at Mississippi State University, "web-enhancement" of courses varies from simply providing the syllabus and copies of previous tests online, to providing online quizzing, messaging, and guided interactive-tutorials [26]. Klaus Schmidt addresses in his paper "The Web-Enhanced Classroom" four fundamental components to successfully web-enhance a course: Administration, Assessment, Content and Community. He also states that well-developed web-enhancement components increase teacher efficiency and student learning. The four components help to improve the delivery of content, and enhance communication among students and between teacher and students [27]. Many research papers have addressed the use of hybrid and web-enhanced courses in their study [14]

[23] [25] [28].

Online and hybrid courses and sometimes web-enhanced courses use a variety of online communication tools. These tools are often expected to provide an avenue for collaborative learning. The next section describes the various communication tools used.

1.1.3 *Online Communication Tools*

Most courses use a variety of online communication tools to help enhance student-student and student-teacher interaction. One of the most commonly used tools is email. Most universities in the United States provide teachers with a mailing list for each of their courses. At the least, these lists can be used by the teacher to make class announcements. Some teachers allow all students in the class to send messages to the list. Others require students to use the list as part of a classroom collaborative activity. Some course management software provides students with access to a private email account that can be used by only the teacher and the students participating in the class. The purpose of a course specific email is to help students sort out relevant emails and avoid spam. Furthermore, in most cases, course specific email allows students to select one or several recipients instead of emailing the whole class.

Another method for classroom communication is chat. Chat, a method of instant communication quite popular among students is offered as part of most course

management software. In this case, students can interact synchronously with other students connected to the same chat room. When offered by Internet access providers, chat allows users to chat in several rooms at the same time. It also allows the user to chat individually and separately with several people at the same time. Most often chat is communicated via shorthand text. Some chat utilities allow users to share documents, photos and videos. Some allow the users to communicate via voice while others even allow communication via video. Most often, chat is used in education to provide an online substitute for an office hour. Students are told that they can chat with the professor at that particular time. Chat is also used to hold online conferences or discussion sessions. Advantages of chat are the ability of the student to get immediate answers to their inquiries. Some chat utilities allow users to record the chat script and to access the script later when needed. Unfortunately, the recorded scripts cannot be easily categorized making it difficult for students who were not present during some chat session to find the information they are seeking. The synchronous nature of chat also makes it difficult for some students to participate in some chat sessions.

A third method for classroom communication and the focus of this study is the online message board (OMB). The OMB is often referred to as a “forum” or a “discussion board”. OMBs have been used in instruction since the early days of the Web [29]. Currently there are numerous types of OMB in use for education; most

come bundled with course management software like Blackboard and WebCT [30]. Common features among online message boards are message threading and archiving. When using an OMB, students can access previous discussions, contribute to available discussions or start their own topic of discussion. The discussions are usually grouped into what is commonly called a thread. When used properly, each thread is made up of a discussion of a single topic. Since the communication is asynchronous, even though it is sometimes possible for students to receive answers to their inquiries immediately, answers are usually not available until a later time. Like chat, the medium of communication in OMBs is text, yet, in most cases, users can include html formatting and links. Some OMBs come equipped with sophisticated tools for posting and sharing information, most simply provide the user with the ability to post and read messages. Some allow users to post messages anonymously, others require authentication. It is theorized that OMBs offer students the ability to replicate and enhance learning through group interactions [31,32]. The teacher can easily supervise the course of the discussion without interfering.

In short, OMBs facilitate interactions among students and between students and teachers. They provide a new medium for students to ask questions, voice opinions, increase their participation in class discussions and get an opportunity to reflect over what they have posted and what other students have posted. They also supply students

with another avenue for peer-tutoring. For teachers, OMBs allow teachers to monitor student learning, and to extend learning to outside the classroom walls.

1.2 Previous Research

Many studies investigating the use of the online message boards focus on the effectiveness of using the OMB to provide a collaborative learning environment. For example, Curtis et al. investigated the extent to which evidence of collaborative learning could be identified in students' textual interactions in an online learning environment [33]. In their study, students were divided into five groups. Members of each group interact with each other by using email and by postings on the discussion board. Students utterances indicative of their behaviors were studied by analyzing both emails and postings. Students were then asked to comment on the work involved in the collaboration, to list advantages and disadvantages, and to indicate whether the experience were valuable. Their results show that students' contribution to online discussion provides evidence of effective collaborative learning. They also have concluded that the emails and discussion board do influence students interactions.

In another study, Chong investigated how an OMB might facilitate collaborative learning and social interaction in large classes [1]. The OMB used in the study is referred to as the "Electronic Classroom"(EC). Her study was conducted between 1990 and 1993, before the arrival of the Internet. Yet, like with the Internet,

users had access to the OMB via the campus network and via direct connection with a modem. The study sought to observe how instructors utilized an asynchronous computer-conference system in larger college classes and the effect of OMB on the classroom climate, student-student and student-teacher interactions. According to the study, three models of the use of the OMB by instructors were identified. Actual use consisted of variations of the models. Under Model A, the OMB was used to conduct discussions throughout the semesters on topics selected by the instructor. In case B, the OMB was used for case study analysis. In Model C the OMB was used for test preparation and assessment of student learning. Students across classes using the EC were surveyed as to their opinions on the use of this then new technology in learning. Students stated that what they appreciate most about the EC was the opportunity and ease of receiving supplemental information from the instructors. They also thought that the EC has improved their ability to express themselves or to learn from each other. Student remarks were overwhelmingly positive. The only negative remark stems from the primitive technology and the lack of easy access during the time of the experiment. At the same time, the faculty seemed extremely willing to use the student-centered aspects of EC. In conclusion, Chong claims that results of these case studies reveal that thoughtful use of the medium could improve student involvement in the learning process, even in very large classes.

One study has researched the use of OMB in physics, Car et al. have investigated whether the presence of online interaction affected students' understanding of light and color concepts [34]. Two versions of an online independent understanding of light and color tutorial modules were constructed. One included a set of online message boards through which students were required to interact with each other while going through the tutorial, the other version lacked the message board. A pre-post test experimental design was used to compare both groups. The results suggest that the use of the message board likely played an important role in online learning and that the message boards are most effective when students are very active in participating in discussion, sharing experience and questioning each other. Analysis of the 239 postings collected during the study indicates that significant scaffolding occurred during the interaction.

Another interesting study by Carr et al. [35] compares face-to-face student interaction with interaction on the message board. During the time of the study, faculty were asked to record the number and the quality of student interaction during face-to-face classroom activities. The same method was used in evaluating student postings on the OMB. The results suggest significant difference in interaction patterns and quality patterns between both media. They speculate that "the on-line environment enables some students to more successfully communicate given different space and

time restrictions". They also stress that "neither face-to-face discussions nor on-line message boards comprise an ideal interaction environment." And that "Instructors must continue to create new and as-yet unimagined "spaces" within which students can work, learn, and interact".

In another study, Dutt-Doner et al. [36] investigated the use of OMBs to develop alternative venues for classroom discussion in an Elementary Education Pre-service teacher course. The study involved 68 students from three sections of the course and 800 messages. All messages were content analyzed and grouped according to themes. Questionnaires completed during the last week of classes asked the students to list three things they liked, three things they disliked, and an aspect of the OMB that surprised them. Additional data was collected during a group debriefing session during the last class meeting. They listed four important findings. Self directed discussion on the OMB created an environment for active participation. Students using the OMB began to rely on each other for support and guidance. Students used the OMB to shared ideas with classmates in order to help them develop their professional knowledge about teaching (the subject of the course in this case). When using the OMB, students used high level reflection skills to integrate new information and to expand their knowledge.

1.3 Purpose of the Study

Most of the studies we found have either investigated various uses of online message boards or evaluated the effectiveness of online message boards in facilitating collaborative learning. The only study we found that correlated online message board activity to learning was the one by Car et al. [34]. However, Car's results focus on the use of the online message board as part of an online tutorial and not as part of a regular course. Even though, these studies are valuable in helping us identify better uses of online message boards to facilitate student learning, a correlation analysis of an online message board use with overall performance of students in a regular course is of interest to most teachers. The aim of this project is to investigate whether such correlation exists. In particular, the purpose of this project is to examine student use of an online message board in a web-enhanced introductory physics class. The project analyzes students' use of the message board and investigates whether the use is correlated with student performance in the class. It also investigates whether the use is different among genders or between semesters.

CHAPTER II

EXPERIMENTAL DESIGN

2.1 Setting

This study was completed during parts of 2004 and 2005. It focused on pre-existing data that was collected as part of the normal classroom related activities of an Introductory Calculus-based college physics course at Mississippi State University. The course was taught by the same professor during the Fall 2002, Spring 2003 and Fall 2003 semesters. The format and use patterns of the online message board were not affected by the study. Data was collected by the professor teaching the course and shared with the investigator after identifying information was replaced by pseudonyms.

2.1.1 *Course Information*

The course, Physics I, is the first of three introductory calculus-based physics course sequence offered to science, math and engineering majors. The university course code is PH2213. Classes met either twice or three times a week for a total of 150 minutes each week. In this particular study, the teacher taught two sections of the

same course during Fall 2002 and Fall 2003 and one section of the course during Spring 2003. Coincidentally the sections taught during the Fall 2002 and Fall 2003 by this instructor met Mondays, Wednesdays and Fridays for fifty minutes each time, the section that was taught during Spring 2003 met on Tuesdays and Thursdays for one hour and fifteen minutes each time. The two sections that were taught by the instructor during the Fall 2002 and Fall 2003 semesters were scheduled consecutively with a 10 minute break in between. There were no recitations or laboratories associated with this course. Course requirements, assignments, and assessments were the same for all semesters and sections. Student enrollment for all sections included in the study is shown in Table 2.1.

Table 2.1 Students enrollment in course sections included in the study

Semester	Section	Number of Students	Female	Male
Fall 2002	01	51	26	84
	02	59		
Spring 2003	02	65	13	52
Fall 2003	01	61	27	95
	02	61		

As shown in Table 2.1 the percentage of female students is lower than the male counterpart; overall, only 22.2% were females. The disparity between females and

males is common for this type of course. Seventy seven percent of the students were pursuing Engineering majors; 28% were freshmen, 59% were sophomore, and 12% were juniors. Students from different sections of the same semester shared the same online message board, the same assignments and completed the same tests at the same time.

The course followed a web-enhanced format. Each of the course sections has a dedicated web page. The page included a calendar of classroom activities, links to the course syllabus, tests from previous semesters, simulations related to the lecture content, as well as links to course related activities. These include the online message board, pre-lecture quizzes, and the online homework delivery system. The tools used to deliver the web content including homework, pre-lecture quizzes and the online message board are part of PERC, a set of locally developed tools for facilitating web-supported instruction [26][37][38]. The tools enabled the instructor to deliver the same content to both sections of the same course. Additionally, this allowed the instructor to set the same due dates for online assignments for both sections of the same course. The tools also enable students from the both sections to use the same online message board. Figure 2.1 shows a snapshot of the course webpage for one of the sections.

Figure 2.1 A snapshot of the webpage for the PH2213 course used in the study

Homework was assigned twice weekly and was completed online. Homework questions were similar to the numerical end-of-the chapter problems in typical books used for the course. Students were assigned different numerical versions of the same homework problems. They were allowed an unlimited number of trials on each homework problem. However, the numeral version of the homework question changed every time they made an attempt. They were encouraged to work on the problems algebraically before attempting to submit answers. They were not penalized for making numerous attempts. Detailed solutions to the problems were provided after the deadline. Tests were completed in class during the evening. Each test was made up of six questions. Students had to complete only five of the six. They were required to

choose the five they wanted graded. All questions were show-your-work questions. The grading focused mainly on the procedure used rather than the numerical answers. Even scheduling provided two benefits. As mentioned earlier, the instructor was able to use the same tests for all sections. Most importantly, this allowed for extra time for the students who need it. The lecture format included a combination of traditional lecturing while using PowerPoint slides and a chalkboard, just in-Time Teaching [39] through the use of the pre-lecture quiz results, and peer-instruction strategies through the use of a Personal Response System [40]. The course grade was calculated according to the rubric shown in Table 2.2.

Table 2.2 The rubric used for calculating the overall grade for the course

Activity	Percent of the Grade
Homework	24%
Test and Final	51%
Pre-lecture & Lecture Quizzes	10%
Other Online Activities	15%

No grade was given for participating in the online message board. The additional online activities include timed-online quizzing and performance on several online guided-tutorials.

2.1.2 *The Online Message Board*

The Online Message Board used in this study has two separate interfaces one for students and one for the instructor. The only difference between the interfaces is that the former does not show the identity of the poster while the later will let the identity appear on the message board. Consequently, the students can post messages without exposing their identities to their peers. They were made aware that the teacher could see the ID of the posting author. They were also told that the instructor could delete a message if he/she found it to be inappropriate. Messages posted by the instructor were marked as ”posted by your professor.” Except for messages that were posted inadvertently numerous times, no message was deleted during the study period.

Figure 2.2 Student Interface of the Online Message Board used in the study. Threads are listed sequentially from recent to old. The "NEW" icon signals new messages added to the thread since the last time it was viewed. The content of the thread can be viewed by clicking on the thread title.

Figure 2.2 shows the student interface of the message board. This interface is reached after the student completes his/her login to one of the PERC utilities. The most important feature of this online message board is that it provides a simple interface. Each message thread is numbered sequentially from bottom to top. A marker is used to signal new messages added to a thread since the last viewing of that particular thread. By clicking on the title of one of the threads, a user can view the list of postings related to that thread. As shown in Figure 2.3, these postings are ordered by the posting date from the earliest to the latest. The numbers of postings in each thread varies from just

one to close to 100. Once a student views a thread, they have the option of posting a reply, starting a new thread, or just going back to the main listing of the threads. Except for messages posted by the instructor, as mentioned earlier, the student interface does not show the identity of the author of the message. Messages posted by the instructor are prominently marked.

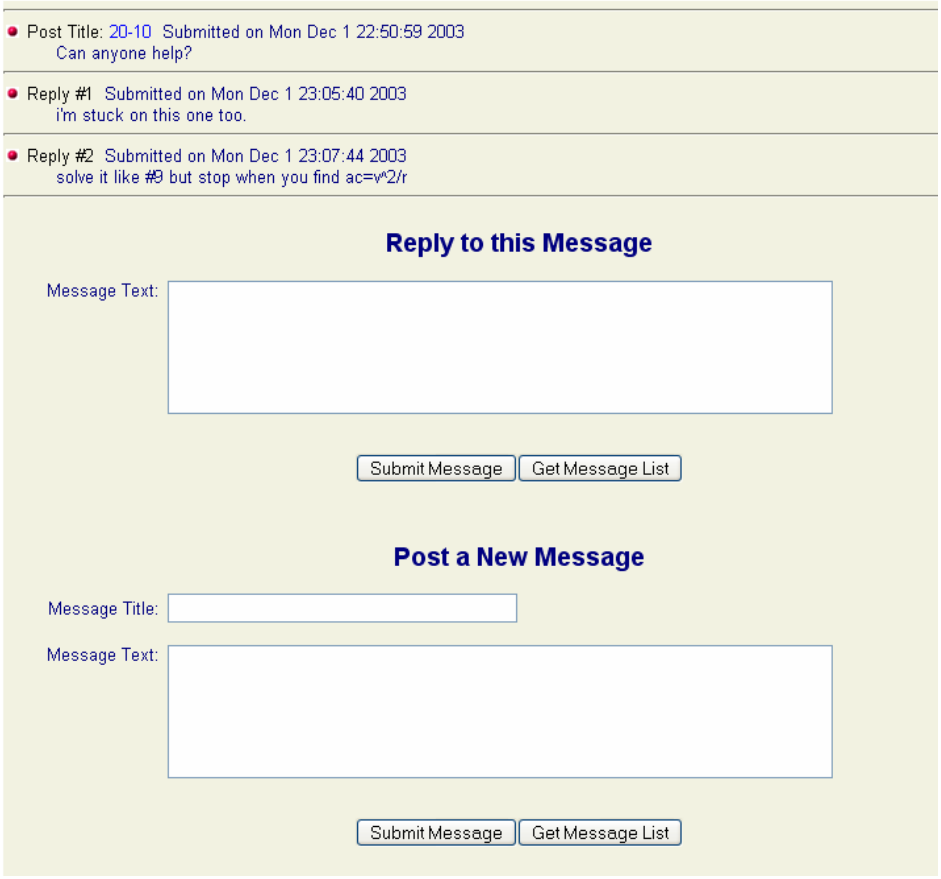

Figure 2.3 An example of an Online Message Board thread. Messages are added to the thread sequentially from old to new. The student can add a message to a thread or start a new thread from this same interface.

As mentioned earlier, to stimulate greater participation in the message board, and to facilitate his monitoring task, the instructor chose to have all sections of the course he was teaching at that time to transparently access the same message board.

2.2 Data Collection

Three types of data were collected during this study. They are classroom records, data collected from the analysis of the content of the message board, and data collected from the analysis of classroom website computer logs.

2.2.1 *Classroom Records*

Because of his interest in physics education research, the teacher teaching the course usually collects ACT, gender, major, and classification data in addition to detailed grade records. The instructor combined data from different sections of the same semester then stripped any identifying information. He then provided the data to the researcher in the form of a Microsoft Excel spreadsheet. Data included grades for each of the assignments as well as the ACT math and composite score, gender, major, and classification. This data was later combined with the data obtained from the analysis of the message board content.

2.2.2 *Message Board Analysis*

Messages were first divided into two categories: messages posted by the instructor and messages posted by the students. It was observed that the instructor diligently supervised the activity on the message board. However he deliberately refrained from answering most of the questions. His interventions occurred only when he felt it was necessary, like to make an announcement, to make a correction, to help a stalled discussion or to respond to students' desperate pleas. Since the focus of the study is focused on the student use of the message board, future discussion will be limited to student related activity analysis.

After a preliminary analysis of the data, a code was developed to categorize each of the messages. To be able to track student activity, the instructor interface was used for collecting this data. Under this interface, the NetID, a student identifier, was used to identify the message author. At the time of the study, the NetID was readily availably through the campus online directory. However, the researcher was not privy at that stage to any additional student identifying information.

The main author of the study then examined each of the messages and classified it according to the developed message codes. Integrity of the data was verified by having a randomly selected set of messages given to another examiner for classification and the results compared. The data was then provided to the instructor, who stripped from it any identifying information, combined it with classroom records

data and returned it to the researcher for statistical analysis.

Initially, detailed categories for each of the messages were developed. But it was found that in most cases the relatively small sample size made any analysis with that data insignificant. We then combined data from related categories in the categories listed in the Table 2.3. Most of the activity was what was referred to as “Learning Activity”. It included homework related activity, lecture related activity, test related activity, and other activities related to learning. Further information about the coding scheme is available below.

Table 2.3 The coding scheme used to categorize students’ messages in the OMB

Behavior	Activity	Code	Description
Learning Behavior	Homework Activity	ACTHW	Students put on messages related to homework
	Lecture Activity	ACTLECT	Students put on messages related to lecture
	Test Activity	ACTTEST	Students put on messages related to test
	Other Learning Activity	ACTOTH	Students put on messages related to other learning activity
Other Behavior	Non-Learning Activity	OTHACT	Students put on messages related to non-learning activity

2.2.2.1 Homework Related Activity

The code that was used for homework related activity is ACTHW. A message

was assigned this code if the student asks or answers homework related question. Figure 2.4 provides examples of homework related activity. The examples include message content, the post titles or reply titles and the posting time. Different types of messages are listed. For instance, the first example is a message of a student submitting his/her solution for a homework problem and asking for help. The second example is an answer to a homework problem that a student has submitted. The third is from a student who is asking for help without showing any work.

```
1) I used the equation Vf^2=Vi^2+2Ax(Xf-Xi). I plugged in 1/4 h max for
Xf and solved for Vf and I keep getting the wrong answer. Why doesn't this
work?
(Post Title: homework 6.2 Submitted on Mon Sep 16 12:48:23 2002)

2) don't even worry about w2. The way that you are finding the angle gives
you a negative angle, but just take the opposite of it (it ought to come
out as positive). Just use the y equation.
T1=w1/sin of the angle you found.
This is your answer
(Reply #33 Submitted on Tue Oct 8 00:30:57 2002)

3) Can someone plz help me with this one. I would greatly appreciate it.
Thanks
(Post Title: Hw 20-1 Submitted on Mon Dec 1 14:58:58 2003)
```

Figure 2.4 Examples of Messages Categorized as Homework Related Activity (ACTHW)

2.2.2.2 Lecture Related Activity

The code that was used for lecture related activity is ACTLECT. A message was

assigned that code if the student asks or answers any lecture or pre-lecture quiz related question. Figure 2.5 provides examples of this activity. In the first example in this case, the student is asking about a lecture related assignment. In the second message, a student answers a question that was started in lecture but never finished. The professor provided bonus credit for the person who posts the correct answer first. The third is from a student trying to get information about the class he/she missed.

```
1) is there a prelecture for tomorrow?
(Post Title: friday prelecture??  Submitted on Thu Nov 20 15:10:39 2003)

2) Eb = mbgh2
EB = mBgh1
E'B = mBgh3
EB-E'B = mBg(h1-h3) = Delta EB
Eb + Delta EB = mbgh2 + MBg(h1-h3)
(Post Title: Class Problem  Submitted on Mon Nov 17 10:24:22 2003)

3) wasn't feeling well this morning, so I unfortunately missed today's
material in class. Did Dr. Mzoughi get through all of the …….
I'd really appreciate hearing anything else I missed today, thanks so
much.
( Post Title: Material for the test  Submitted on Mon Sep 22 22:59:33
2003)
```

Figure 2.5 Examples of Messages Categorized as Lecture Related Activity (ACTLECT)

2.2.2.3 Test Related Activity

The code that was used for Test related activity is ACTTEST. A message was assigned that code if the student asks or answers any online quiz, test preparation, or

test related question. Figure 2.6 provides examples of this activity. Message 1 and 2 in this case ask about online quizzes. Some of the test related messages include discussions of questions from prior tests

```
1) Professor I had to do this problem 5 times. Every time i set it up
for ax i would add the forces in the x direction and divide by the mass.
the only time the i got it right, ax was the same as its reciprocal.
Fx = -35N + 23N = 12a ax= -1
ax =12/(-35+23) or ax =(-35+23)/12 ????
Fy = 30N =12a ay = 2.5
magnitude of a = (-1^2 + 2.5^2)^(1/2) = 2.69
Was I suppose to divide the forces in x by mass, or mass by the forces
in x?
(Post Title: quiz 6-1 Submitted on Thu Oct 10 15:12:51 2002)

2) Does anyone know if question 2 from the practice quiz 3 is on the real
quiz.If so, how do you do it?
(Post Title: Quiz Today!  Submitted on Wed Sep 3 16:25:31 2003)

3) when are we gonna get the grades on test 2?
(Post Title: test 2 grades Submitted on Mon Oct 20 15:43:27 2003)
```

Figure 2.6 Examples of Messages Categorized as Test Related Activity (ACTTEST)

2.2.2.4 Other Learning Activity

The code that was used for other learning related activity is ACTOTH. A message was assigned that code if the student asks or answers any question that can be construed as a learning activity but cannot be listed as any of the activities listed above. Figure 2.7 provides examples of this activity.

1) Where can we find the link to complete the tutorial? On the calendar it is listed as due Monday 9/9 by 8am
(Post Title: Motion Diagram Tutorial Submitted on Sat Sep 7 15:37:41 2002)

2) Dr. M dont forget to bring the eggs Monday!! I want to see the demo!!
(Post Title: E-G-G-S!!!!!! Submitted on Sun Nov 16 11:46:43 2003)

Figure 2.7 Examples of Messages Categorized as Other Learning Activity (ACTOTH)

2.2.2.5 Other Activity

The code that was used for other learning related activity is OTHACT. A message was assigned that code if the student asks or answers any question that can be construed as a non-learning activity. These mainly include social messages. Figure 2.8 provides examples of this activity.

```
1) I was trying to make it really hard. I guess that is what happened
when you are doing homework sick
(Reply #2 Submitted on Mon Sep 16 21:02:52 2002)

2) I have had enough of this for tonight fellow physicians. So I hope
im not the only one who got just over half of them done and lets hope
Dr. M will forgive us somehow :)
(Post Title: GOOD LUCK TO ALL Submitted on Mon Nov 10 21:59:02 2003)

3) I'm with ya buddy!
(Reply #2 Submitted on Mon Nov 10 22:00:39 2003)

4) Yes, thank you for making the material challenging because it required
me to learn the material. Thanks again and I hope you have a Happy Holiday
(Reply #1  Submitted on Tue Dec 16 12:37:11 2003)
```

Figure 2.8 Examples of Messages Categorized as Other Activity (OTHACT)

2.2.3 *Website Logs*

Whenever the students logged into the PERC utilities at the course website, a record of their interaction was kept. Figure 2.9 shows an example of the information recorded after all identifying information was replaced by pseudonyms. These records were use to compute the number of message viewings for each of the students. Microsoft Access was used to sort the data and provide a separate log record for each of the students. The obtained individual log records were used in case studies to analyze particular student activity.

```
2213-02      Tue Jan  7 09:32:25 2003   sp03name75  SecureView
2213-02      Tue Jan  7 09:35:03 2003   sp03name75  messageBoard-
2213-02      Tue Jan  7 09:35:07 2003   sp03name75
      messageBoardmessage-1.post-1
2213-02      Tue Jan  7 09:53:21 2003   sp03name232  SecureView
2213-02      Tue Jan  7 09:54:14 2003   sp03name224  SecureView
2213-02      Tue Jan  7 09:54:56 2003   sp03name224  messageBoard-Get Message
List
2213-02      Tue Jan  7 09:55:07 2003   sp03name224
      messageBoardmessage-1.post-1
2213-02      Tue Jan  7 09:56:11 2003   sp03name232  SecureView
2213-02      Tue Jan  7 09:56:20 2003   sp03name232  SecureView
2213-02      Tue Jan  7 09:56:27 2003   sp03name232  SecureView
2213-02      Tue Jan  7 09:56:45 2003   sp03name232  SecureView
2213-02      Tue Jan  7 09:57:31 2003   sp03name232  messageBoard-
2213-02      Tue Jan  7 10:01:58 2003   sp03name102  messageBoard-Get Message
List
2213-02      Tue Jan  7 10:02:04 2003   sp03name102
messageBoardmessage-1.post-1
```

Figure 2.9 An Examples of the Online Message Board Log Record

CHAPTER III

RESULTS

The instructor conducted informal end of semester surveys of his students. Among the questions asked were questions about the OMB. The surveys were not part of this study. However, the survey findings were: all respondents claimed to check the online message board regularly; 93% of them claimed that the message board helped their learning; 30% claimed that they rarely post any message; 38% claimed that they occasionally post messages; 84% preferred the message board to remain anonymous with 40% stressing that their contribution would diminish if it were anonymous; 53% of the respondents wanted the instructor to participate more often in the online message board.

3.1 Message Board Activities Analysis

The online message board activity for this study consists of 1,404 threads from three semesters, making for a total of 6,289 messages. Six hundred and twenty-three messages were posted by the Instructor. Only messages posted by students who have completed homework assignments, all tests, and have received a final overall grade in

the course were included in the analysis.

3.1.1 *Instructor Activity*

Analysis of the 623 messages posted by the instructor show that 82% of them were learning activities. Most of these were answers to student questions about homework or tests or providing a short explanation of some of the material in the course. Some of the messages posted by the Instructor are announcements about due dates and classroom activities. The rest of the messages are postings of a social nature. In summary, the online message board has provided the instructor with an additional avenue for communicating and providing assistance to students.

3.1.2 *Student Activity*

After categorizing all messages according to the codes described in Chapter 2, the number of messages in each category for each of the students was decided. Table 3.1 shows a summary of the results obtained. Upon further analysis we have identified that five students have never contributed to the message board. We also have found that the posting data for three of the students was very different from the rest of the students. The access data for two of the students is also quite different from the rest. Statistical analysis showed that data from these ten “outliers” was affecting the results. We decided then to remove them from the bulk of the analysis and to investigate their

activity separately as special cases.

Table 3.1 Summary of the number of messages posted by students for each of the activity categories*[1]

Activity		Code	Min	Max	Sum	Mean	Std. Deviation
Posting Messages	Related to HW	ACTHW	0	425	3696	13.59	33.46
	Related to Lecture*	ACTLECT	0	5	34	0.13	0.52
	Related to Tests*	ACTTEST	0	5	47	0.17	0.59
	Other Learning Activity*	ACTOTH	0	2	8	0.03	0.19
	Non-Learning Activity	OTHACT	0	91	1631	6.00	8.10
Posting messages on the message board		POSTING	0	517	5438	20.00	43.26
Viewing messages without posting		VIEWING	0	3254	158541	582.87	546.23
Total posting + viewing		ACCESS	0	3361	163979	602.864	573.27

As shown in Table 3.1, the average number of postings per student was 20.00 which is much smaller than the average number of times a student viewed the content of a thread (582.87.) About a fifth of the students (19.48%) never posted a message. Moreover, most of the postings are homework related (average 13.59) and surprisingly the second largest number of postings is for non-learning activities (average 6.00.).

[1] Because there are so few students engaged in these activities, we will not analyze them further.

Messages related to homework activity make 68% of the postings with 30% of the postings focusing on Non-Learning Activities (activity?)**. It is worth noting that in some cases the OTHACT postings were used to discuss plans for future courses and future use of OMBs. Some postings also suggest that students used the OMB to coordinate face-to-face study sessions in preparation of major tests.

3.1.2.1 Correlation Between Student's Performance and Their Message Board Activity

Table 3.2 provided the mean of the number of message board activities for each course grade earned. Considering that the average number of threads per semester is 468, the data shows that students checked the message board regularly. Interestingly, the mean for each of the activities listed peaks for B earners. They are the ones who post more messages and view more messages. Students who earned a D viewed many threads (mean of 518), but did not post many (mean of 4) The table also shows that students who have failed the course did not contribute much to the message board activity. It must be noted however, that engineering students (77% of the students) are required to repeat the course if their grade is below a C.

Table 3.2 Mean number of activities by grade in class

Activity	A (N=58)	B (N=67)	C (N=65)	D (N=37)	F (N=35)	Average
VIEWING	374	595	498	518	102	432
POSTING	9	15	8	4	1	7
ACTHW	9	17	9	12	3	11
OTHACT	5	8	5	5	1	5

Table 3.3 shows distribution in grades for each of the main message board activities. A distinction was made between the ones who never post messages (Viewer) and the ones who post messages (Poster). Item "All" represents all participating students including the 10 special case students that were not included in previous analysis. Again, the data shows that B earners tend to post more messages. Interestingly, students who earned an A or F make more then half of the population of whose only message board activity is viewing. Students who failed the course constituted only 9% of the posters.

Table 3.3 Grade distributions of student types

	All (n=272)	Viewer (n=48)	Poster (n=219)
A	22%	27%	21%
B	26%	6%	30%
C	24%	22%	26%
D	14%	18%	14%
F	14%	27%	9%

Table 3.4 shows the results of one-way ANOVA test [41] on the difference among OMB activity for the 5 different grades earned in the course. The results show that the differences are statistically significant at an Alpha level of .05 for all four activities. Viewing is the least significant activity among all four. Further study shows that most of these differences are statistically significant only between B and F students.

Table 3.4 One-way ANOVA test comparing the various OMB activities for students with grade from F to A

		Sum of Square	df	Mean Square	F	Sig.
VIEWING	Between Groups	2177750	4	544437.484	2.414	.049*
	Within Groups	5.8E+07	257	225510.239		
POSTING	Between Groups	12516.25	4	3129.062	6.224	.000*
	Within Groups	129203.5	257	502.737		
ACTHW	Between Groups	5634.590	4	1408.647	5.342	.000*
	Within Groups	67765.11	257	263.677		
OTHACT	Between Groups	1219.035	4	304.759	5.314	.000*
	Within Groups	14739.06	257	57.350		

The results of a Correlation analysis between online message board activities and course grades are shown in table 3.5. As done earlier, the 10 students whose data was very different from the rest were not included in the analysis.

Table 3.5 Bivariate Correlational Analysis of OMB activities and grades earned in the course. Overall Grade is the overall numerical grade for the course.

Activity	Overall Grade	Homework Grade
VIEWING	0.102	0.129(*)
POSTING	0.208(**)	0.264(**)
ACTHW	0.180(*)	0.247(**)
OTHACT	0.215(**)	0.236(**)

** Correlation is significant at the .01 level (2-tailed)

* Correlation is significant at the .05 level (2-tailed)

This table shows that there is a significant correlation between any online message board activity and the homework grade. The correlation is however stronger for postings. The correlation between the overall course grade and the message board activity is not significant for viewing. It is interesting to note that non-learning activity (OTHACT) provides the strongest correlation with the overall grade. However, the correlation coefficient (0.102) is not very different from the correlation coefficient for the Posting activity. Since student background can play a significant role in the grade he/she receives in a particular course, the results of Table 3.5 are not sufficient for determining whether the message board related activity could have affected their course grades. Since ACT composite (ACTC) scores are considered strong predictors of student performance, we calculated a partial Correlationals with ACT composite score as a control variable. The results are shown in Table 3.6. ACT composite score

used since preliminary did not show a significant difference between the effects of ACT math and ACT composite on the data.

Compared with results in Table 3.5 which were analyzed without controlling factor, the correlation coefficients shown in Table 3.6 are higher. The only noticeable change other than the increase in the correlation coefficients values, are the fact that highest correlation for both the homework grade and the overall grade is now with the posting activity. Note that Activity related to homework (ACTHW) and non-learning activity (OTHACT) is subsets of postings.

Table 3.6 Partial Correlation Analysis of OMB activity and grades (Controlling for the ACT-composite score)

Activity	Overall Grade	Homework Grade
VIEWING	0.123(*)	0.140(*)
POSTING	0.247(**)	0.280(**)
ACTHW	0.222(**)	0.265(**)
OTHACT	0.240(**)	0.245(**)

** Correlation is significant at the .01 level (2-tailed)

* Correlation is significant at the .05 level (2-tailed)

3.1.2.2 Gender Comparison

Since only 22.2% of the students are females one would wonder if their

interaction with the online message board is different from that of their male counterparts. Results of an independent T-Test [42] comparing the genders for each of the factors investigated in this study are shown in Table 3.7. The results show that there is a statistically significant difference between two genders with an Alpha level of 0.5 only in the Non-learning Activity. In that case the mean number of activities for Females is 7.3 and for Males is 4.4, the T value is 2.580.

Table 3.7 Independent T-Test comparison of the OMB activity for both genders.

	Gender	Mean	Std. Deviation	t	Sig.
VIEWING	M	545.2	481.0	0.877	0.381
	F	606.7	477.3		
POSTING	M	14.6	22.1	1.932	0.054
	F	21.2	26.5		
ACTHW	M	9.9	16.5	1.313	0.190
	F	13.1	17.6		
OTHACT	M	4.4	7.1	2.580	0.010*
	F	7.3	9.6		
OVERALL	M	72.3	21.0	0.669	0.504
	F	74.4	23.5		
HOMEWORK	M	81.6	25.5	1.045	0.297
	F	85.4	23.8		

3.1.3 *Semester Comparison*

The results listed previously include data from all three semesters. One might wonder if there is change in the way students use the online message board during this period. Table 3.8 provides the mean number of messages for each of the investigated

activities. The data shows that there are slight differences. At Mississippi State University, spring semester is considered as the “on” semester for that course. Adequately prepared students take the course during their second semester at the university.

Table 3.8 Mean number of OMB activity per student for each semester

SEMESTER	VIEWING	POSTINGS	ACTHW	OTHACT	OVERALL	HOMEWORK	ACTC
FL02 (Fall 2002)	573	18	13	5	73	85	24
SP03 (Sprin2003)	583	20	14	6	75	85	26
FL03 (Fall 2003)	532	12	7	5	71	78	25

Table 3.9 shows the results of one-way ANOVA test on the data. The results show that the difference are significant at an Alpha level of .05 for the number of homework related postings (ACTHW) and ACT composite score.

Table 3.9 One-way ANOVA Test comparing the various OMB activities for all three semesters

		Sum of Square	df	Mean Square	F	Sig.
VIEWING	Between Groups	131766.07	2	65883.034	.284	.753
	Within Groups	60002115	259	231668.399		
POSTING	Between Groups	3212.978	2	1606.489	3.004	.051
	Within Groups	138506.80	259	534.775		
ACTHW	Between Groups	2786.578	2	1393.289	5.110	.007*
	Within Groups	70613.117	259	272.683		
OTHACT	Between Groups	144.541	2	72.270	1.184	.308
	Within Groups	15813.551	259	61.056		
OVERALL	Between Groups	566.171	2	283.086	.608	.545
	Within Groups	120684.28	259	465.962		
HOMEWORK	Between Groups	3273.515	2	1636.758	2.624	.074
	Within Groups	161560.34	259	623.785		
ACTC	Between Groups	282.070	2	141.035	3.775	.024*
	Within Groups	9675.548	259	37.357		

A post-hoc analysis showed there is a statistically significant difference between Fall 2002 and Fall 2003 and Spring 2003 and Fall 2003 in the number of message related to homework (ACTHW). Finally, there is a statistically significant difference between Fall 2002 and Spring 2003 in the ACT composite scores (ACTC).

3.2 Special Cases

Students were only encouraged to use the message board with this class; they were not required to do so. During the three semesters of the study, five never visited the message board. Consequently, they were not included in the analysis that was

provided earlier in the text. Information about these students and the grade they have earned for the class is shown in Table 3.10. Four of five of the students failed the course and half were male.

Table 3.10 Grade and gender information for students who never visited the OMB*

User	Grade	Gender
Jerry	F	M
Rose	F	F
Christine	F	F
Peter	F	M
Tom	B	M

On the other side of the spectrum, there are students who used the message board extensively. Their activity level was so much higher than the rest that we had to treat them separately. Table 3.11 shows the students who have posted the most messages in the message board. Table 3.12 shows the students who have accessed the message board the most often.

* Pseudonyms are used throughout the section

Table 3.11 Grade, Gender, and Number of Postings for the top three message posters*

User	Number of Postings	Grade	Gender
Sarah	517	C	F
Linda	299	B	F
Lily	187	C	F

Table 3.12 Grade, Gender, and number of accesses for the top three OMB visitors*

User	Number of Accesses	Grade	Gender
John	3361	D	M
Camilla	3036	B	F
Sarah	2814	C	F

Interestingly, none of these very active students earned an A in this course. Sarah is the only one who earned the distinction of being both a top posting students and a top viewer of the message board. She accessed the message board 2814 times and posted 517 messages. Sarah's data was removed from the statistical analysis because of her posting activity and not because of her viewing activity. Even though high, initial statistical analysis showed that her viewing activity cannot be considered an outlier. Another interesting fact about top posters is that they are all female.

By checking the detailed log of the activities of these students we found that these students spent more time on the message board when working on homework. They alternate between doing homework and using the message board. Records show

that these students liked to often ask homework related questions and sometimes post help to others while working on the homework problems. For instance, Sarah, who is both a top viewer and a top poster, always visits the message board while doing her homework and seldom logs on the message board for other purposes. Moreover, most of her activities on the message board were questions she asks about homework problems.

Table 3.13 provides further insight on the activity of these students. For comparison, similar data were added from three randomly selected students whose message board activity level is average. In addition to message board (OMB) related activities, we added a count of the number of times these students have submitted homework questions for grading. Note that since they allowed an unlimited number of attempts on homework problems, the homework activity count can be large. We have also added a count of the daily and weekly frequency with which these students check the message board.

Table 3.13 Detailed analysis of OMB activity for the top users as well as three users "Typical Users" *

	OMB Access	Homework Activity	OMB Posting	Grade	Weekly Access	Daily Access
Case:						
John (Fall 02)	3361	4756	107	D	5-6	3-4
Sarah (Fall 02)	2814	2071	517	C	3-4	2-3
Lily (Fall 02)	1349	720	187	C	3-4	2-3
Camilla (Fall 03)	3036	1826	106	B	4-5	3-4
Linda (Fall 02)	2604	1098	299	B	4-5	2-3
Typical:						
Cathy (Fall 03)	1886	2921	19	C	2-3	3-4
Matt (Spring 03)	326	1228	20	A	2-3	1-2
Paul (Fall 02)	531	1123	18	C	3-4	1-2

The data suggests that the five special case students visited the message board frequently both in a weekly basis and daily basis. The data also suggests that the special case students contribute to the message board activity more than to the activity of other course component. For example, their OMB access number is larger then the homework access number, which is opposite to what we observe for the randomly selected students. It is also interesting to note the data for Matt a student who earned

an A grade in this course. Matt has the lowest accessing and posting number among the students listed in this Table. In further analysis and as it can be inferred from Tables 3.2 and 3.3, his activity level is typical of students who have earned an A.

CHAPTER IV

DISCUSSION AND CONCLUSION

This research has investigated the use of an online message board (OMB) in an introductory calculus-based physics course. Students' information and course background from three semesters have been included. The first analysis focused on message board activities. The instructor OMB activities were small compared to the overall activities. This suggests that the instructor was successful at getting the students to use the OMB for mainly peer-to-peer interaction. Students have mainly used the message board to collaborate on homework problems (ACTHW), 66% of the postings, and to socialize (OTHACT), 32% of the postings. Since homework was completed online for this class, the level of homework related activity is not surprising. The relatively high level of OTHACT suggests that students might have adopted the class OMB as a collaboration and communication tool. The data also shows that the posting activity is much smaller than the viewing activity and that a fifth of the students never post messages. Still, most of the non-posters tend to view the OMB messages. This suggests that the OMB provides a medium of active participation into

classroom activity, even when that activity is limited to viewing posted messages. This activity can be compared to the activity of students who pay attention to other student activities during face-to-face classroom discussions. An interesting follow up to this study would be to compare face-to-face to OMB activity.

Meanwhile correlational analysis suggests a statistically significant correlation between the students' message posting numbers and their overall course and homework grades. The correlation coefficients are not very high, ranging from 0.123 to 0.28. A stronger correlation with the homework grade might suggest that students are just using the OMB to share answers. Lower positive and statistically significant values can lead us to conclude that collaborative learning is occurring instead. This is further supported by the fact that the correlation coefficients with the homework grade are not very different from the correlation coefficient with the overall grade. The fact that the Posting activity results in a larger correlation coefficient than the rest might suggest that posting might results in higher level learning. However, further analysis is needed to substantiate the claim. It is especially worth investigating whether the posting activity results in a higher level of active engagement. Analysis of the activity of the various grade holders suggests different activity for different student levels. The fact that the only statistically significant difference was identified between B holders and F holders only suggests the need for further study. Two questions arise: would a larger student sample result in more statistically significant differences among the

different grade holders? Did the activity of B students help them get to the B grade or was the result just coincidental? In summary, even though there is suggestion in the data that students might have benefited from using the OMB, further analysis is needed before establishing whether causality between the OMB activity and classroom performance exists.

Analysis of the OMB activity data for gender differences shows that there are no major differences. The only statistically significant difference is on the OTHACT. However, most of the students removed from the analysis were females. The top three posters are female and two of the top three viewers are females. This means that further data is needed before we can establish if there is any difference between the genders in OMB activity. Most importantly, for a course like the one used for the study and where females are a minority, it would be interesting to compare female activity in regular face-to-face discussion to female activity on the OMB.

Analysis of the OMB activity across semesters suggests a difference in ACTHW. However, since enrollment and schedule for the Spring 2003 semester were quite different from those of the other semesters no inferences can be made from the differences in OMB activity. More data is needed to check for semester variability.

Analysis of the activity of the ten students that were omitted from the statistical analysis shows that students for the most part understood OMB activity as an integral component of the course. Students who did not participate in OMB activities are for

the most part students who did not participate in other class activities. The fact that none of the top posters and top viewers has earned an A in the course is in agreement with the grade correlation data discussed earlier. Further analysis is needed to determine whether the OMB use have affected the grade that the students have earned in the course. Analysis also suggests that top users have integrated the use of the OMB into their daily activities. They check it for messages several times a day during most school days. Except for John, the only male users among these top users, use of the message board for most of these students is greater then the use of other online course activities. John is the only one among these top users who has not earned a passing grade in the course. The data suggests that this use pattern is unique to these top users. Further analysis is needed before we can draw any conclusion.

In summary, the results suggest that students taking this introductory calculus-based physics class have benefited from using the online message board. Both homework related message board activities and non-learning message board activities were found to be correlated significantly to the grades the students earned in the course. The data did not show a discernable difference in use by female and male students and between uses in different semesters. Additional study is needed to investigate whether the OMB contributes to significant improvements in student performance in the course.

REFERENCES

[1] Siat-Moy Chong, Models of Asynchronous Computer Conferencing for Collaborative Learning in Large College Classes Electronic Collaborators Edited by Curtis Jay Bonk & Kira S. King pp.157-182

[2] William A. Drave, Learning On the Net (2001), Published by LERN Books, Wisconsin

[3] Zirkle, Meredith L, "The Effects of SMART Board™ Interactive Whiteboard on High School Students with Special Needs in a Functional Mathematics Class." http://edcompass.smarttech.com/en/learning/research/pdf/mennoniteUniversityResearch.pdf. Eastern Mennonite University. 2003 (accessed March 23, 2004.)

[4] Imre Horváth, Ernest van Breemen, Debasish Dutta, Derek Yip-Hoi, Jongwon Kim, Kunwoo Lee, Educating for Global Product Realization On a Global Scale Proceedings of DETC'01 2001 ASME Design Engineering Technical Conferences September 9-12, 2001, Pittsburgh, Pennsylvania

[5] Eric Mazur, Peer Instruction – A User's Manual, 1997, Published by Prentice Hall, INC, Simon & Schuster, New Jersey

[6] Berge, Z.L. & Collins, M. (1996), Computer Mediated Communication and The Online Classroom. vol. 2: Higher Education. Cresskill: Hampton Press, Inc.

[7] Moore, G.S., Winograd, K., Lange, D. (2001), You Can Teach Online, Building a Creative Learning Environment, New York: McGraw-Hill.

[8] Sebastian H.D. Fiedler, The Studio Experience: Challenges and Opportunities for Self-Organized Learning, Spring, 1999... http://it.coe.uga.edu/studio/fiedler.html

[9] American Association of Physics Teachers Retrieved June. 2005 from http://www.aapt.org/

[10] Charles C. Bonwell and James A. Eison, 1991, Active Learning: Creating Excitement in the Classroom, ASHE-ERIC Higher Education Report, No. 1. Washington, D.C.: The George Washington University

[11] Hewett, B. L. (1998), The characteristics and effects of oral and computer-mediated peer group talk on the argumentative writing process, Dissertation Abstracts International, 59(09), 3435.

[12] Norm Friesen, Interoperability in Asynchronous Collaborative Learning Forums, Proceedings of the IEEE International Conference on Advanced Learning Technologies (ICALT '04)

[13] Thomas R. Guskey, Communicating Student Learning, 1996 Yearbook of the. Association for Supervision and Curriculum Development (ASCD).

[14] Treleaven L. Cecez-Kecmanovic , D Wright, S 2000, 'Communicative practices in web-enhanced collaborative learning: A view from within', in working knowledge: Productive learning at work, Conference proceedings, 10-13 December 2000, Sydney Australia, University of Technology Sydney, Sydney New South Wales, pp.445-452. Download PDF.

[15] Mayu Kadowaki Will e-learning ever replace face-to-face learning? From http://www.harmani.com/mkadowaki_essay.pdf

[16] S. Allie, A. Buffler, L. Kaunda, B. Campbell, and F. Lubben, "First- year physics students' perceptions of the quality of experimental measurements," Int. J. Sci. Educ. 20, 447- 459 (1998)

[17] R. J. Beichner, "Testing student interpretation of kinematics graphs," Am. J. Phys. 62, 750- 762 (1994).

[18] R. Beichner, L. Bernold, E. Burniston, P. Dail, R. Felder, J. Gastineau, M. Gjertsen, and J. Risley, "Case study of the physics component of an integrated curriculum," Am. J. Phys., PER Suppl., 67: 7, S16- S24 (1999).

[19] Steven R. Aragon, Scott D. Jphnson, and Najmuddin Shaik , The Influence of Learning Style Preferences on Student success in Online Versus Face-to-Face Environments, The American Journal of Distance Education, 16(4), pp.227-244

[20] Learn Anytime Anywhere Physics, Retrieved in June 2005, from http://www.laaphysics.org/

[21] John T. Foely et al. Retrieved in June 2005, from http://webtop.msstate.edu/

[22] Alex Koohang & Angela Durante, Learners' Perceptions toward the Web-based Distance Learning Activities/Assignments Portion of an Undergraduate Hybrid Instructional Model, Journal of Information Technology Education Volume 2,2003 pp.106-113

[23] Thomas Gould, Hybrid Classes: Maximizing Institutional Resources and Student Learning, Proceedings of the 2003 ASCUE Conference, www.ascue.org June8-12,2003,Mytle Beach, South Carolina pp.54-59

[24] Mohd. Taha Ijab & Rina Anwar , Teaching And Learning of E-commerce Courses Via Hybrid E-learning Model in Unitar, Journal of Electronic Commerce in Organizations, 2(2), 82-98, April-June 2004

[25] Virginia MacEntee & Barbara Lewis, Web-enhanced Course , Issues in Informing Science and Information Technology pp.592-595

[26] Taha Mzoughi, PERC-A Collaboration Between Engineering and Arts and Science Faculty to Help Insure Better Students Preparation, 30th ASEE/IEEE Frontiers in Education Conference Session F2B October 18-21, 2000 Kansas City, MO

[27] Dr. Klaus Schmidt , The Web-Enhanced Classroom ,Industrial Technology, volume 18, number 2, Feb. 2002 to Apr. 2002 www.nait.org

[28] Latchman, H., Salzmann C., Gillet, D., and Kim, J., Learning On Demand - A Hybrid Synchronous/Asynchronous Approach, IEEE Transactions on Education, May 2001 Vol. 44, NO.2

[29] Huffaker, D., Spinning Yarns Around the Digital Fire: Storytelling and Dialogue Among Youth on the Internet, Information Technology in Childhood Education Annual (2004), pp. 63-75.

[30] Retrieved in June 2005, from http://www.webct.com/; http://www.blackboard.com/

[31] Eugenia MW Ng, Enhancing Collaborative Learning through Online Discussion

and Peer Assessment., Proceedings of the International Conference on Computers in Education(ICCE 2002), pp. 262-263.

[32] Larson, BE. & Keiper, T.A. (2002). Classroom discussion and thread electronic discussion: Learning in two areas. Contemporary Issues in Technology and Teacher Education, 2(1).

[33] David D. Curtis, Michael J. Lawson, Exploring Collaborative Online Learning JALN Volume 5, Issue 1-February 2001, pp.21-34

[34]] Kevin Carr, Francis Gardner ,Michael Odell, Ted Munsch ,Brent Wilson, The Role of Online: Asynchronous Interaction in Development of Light and Color Concepts, Journal of Interactive Online learning, Volume 2, Number 2, Fall 2003 pp.1-17

[35] Carr Kevin, Ginny Birky, High Talkers, Low Talkers, and Internet Message Boards ED-MEDIA World Conference On Educational Multimedia, Hypermedia & Telecommunications

[36] Dutt-Doner, Powers, The Use of Electronic Communication to Develop Alternative Avenues for Classroom Discussion, Jl. Of Technology and Teacher Education (2000) 8(2), 153-172

[37] Mzoughi, T., PERC - A Departmental Solution For Web-Enhanced Courses. proceedings for the Sixth International Conference on Computer-based Learning in Science (CBLIS 2003), ed. by Constantinos P. Constantinou and Zacharias C. Zacharia, 596-626060 (2003)

[38] Mzoughi, T., Using Locally Developed Tools for Providing Web-Enhanced Courses: Advantages and Limitations. proceedings for the Tenth Syllabus Conference (Syllabus 03),. July, 2003.

[39] David Craig. Saif ul-Haq, Sabir Khan and Craig Zimring , Using An Unstructured Collaboration Tool to Support Peer Interaction in Large College Classes Fourth International Conference of the Learning Sciences pp.178-184

[40] Retrieved in June 2005, from http://physics.msstate.edu/faculty/

[41] David C. Howell, Statistical Methods for Psychology Fifth Edition, published by

Wadsworth, pp. 320-367

[42] David C. Howell, Statistical Methods for Psychology Fifth Edition, published by Wadsworth, pp.183-222

APPENDIX

IRB APPROVAL FORM

Mississippi State University

CERTIFICATION OF HUMAN SUBJECTS EDUCATION

Wenjuan Song
1120 E. Lee Blvd Apt 174
Starkville, MS 39759

Date Training Completed: 2/1/2004

Certification Expires: 2/1/2007

DESCRIPTION OF INVESTIGATOR EDUCATION

Beginning July 2000, Mississippi State University Office of Research and the Institutional Review Board (IRB) implemented a required training program for all investigators who use or plan to use human subjects in research. This two hour program provided investigators with information regarding federal regulations governing the use of human subjects in research, an overview of the Research Compliance Components at MSU, a detailed presentation regarding the Informed Consent Process, the use of Special Populations, Data Safety concerns and specific information regarding the IRB review process. In addition, investigators viewed the NIH Video, "Evolving Concerns - Protection for Human Subjects".

The Office of Research and the IRB also provided each investigator with a copy of the following documents:
The Belmont Report
MSU Human Subjects Policy
MSU IRB Handbook
Human Subject Web Sites of Interest

Investigators that were not able to attend one of these numerous live training sessions were allowed to complete the training via an online tutorial.

Every three years, investigators will be required to participate in training sessions and a new certification will be issued at that time.

AUTHORIZED IRB REPRESENTATIVE

2/11/04
Date

Office for Regulatory Compliance
P.O. Box 6223 • 84 Morgan Street • Mailstop 9563 • Mississippi State, MS 39762 • (662) 325-3294 • FAX (662) 325-8776

Mississippi State University

June 24, 2005

Wenjuan Song
Physics
Mailstop 9538

Re: IRB Docket #05-171: A Study of Student Use of an Online Message Board in an Introductory Physics Class

Dear Mr. Song:

The above referenced project was reviewed and approved via administrative review on June 24, 2005 in accordance with 45 CFR 46.101 b(4). Continuing review is not necessary for this project. However, any modification to the project must be reviewed and approved by the IRB prior to implementation. Any failure to adhere to the approved protocol could result in suspension or termination of your project. The IRB reserves the right, at anytime during the project period, to observe you and the additional researchers on this project.

Please refer to your IRB number (#05-171) when contacting our office regarding this application.

Thank you for your cooperation and good luck to you in conducting this research project. If you have questions or concerns, please contact me at jmiller@research.msstate.edu or 325-5220.

Sincerely,

Jonathan E. Miller
IRB Coordinator

cc: Taha Mzoughi