

Improving Student Satisfaction in Large-sized Classes Through a Computer Mediated Communications System

Thomas Janicki¹⁵

Production and Decision Sciences Department
University of North Carolina - Wilmington
Wilmington, NC 28403

Geoffrey Steinberg¹⁶

Administrative and Management Sciences Department
Kent State University
Kent, OH 44242

Abstract

Large size classes provide unique challenges to instructors. In classrooms of seventy-five or more students, these challenges include maintaining effective student contact and providing the student with a feeling of 'personalized' instruction. This paper details several of the unique problems found in teaching classes with large enrollments, and implements the use of a Computer Mediated Communications (CMC) system to meet these challenges. It ends with a student satisfaction survey where it was demonstrated that a CMC system improves student satisfaction in this environment

Keywords: Computer mediated communications (CMC), instructional technology, large size classes, student satisfaction class management

INTRODUCTION

Many faculty members are faced with the dilemma of teaching large scaled classes, which we define as classes with enrollments of over seventy-five learners. An overriding educational concern is providing 'personalized' contact with individual students. Prior studies have shown that students generally learn best in an environment of one-on-one instruction or in small groups [Hannafin & Peck, 1988]. In large classes it is impossible to provide this 'personalized' contact due to the sheer number of students.

Other concerns to a faculty member include providing timely feedback, personalized student

assistance, keeping the learners informed of changes to the syllabus or changes to the due dates for the requirements in the course. On the administrative side grading of tests and assignments can become a burden, in addition to just posting the grades.

This paper discusses several of the concerns and problems that surface in large-scale classes and potential solutions. It also discusses the implementation and outcomes of using a computer to facilitate enhanced communications or a computer mediated systems (CMC). Hiltz and Wellman [1997] defined using a computer to enhance communications as *computer-mediated communications*. The paper concludes with a survey that was completed to gauge the level of student satisfaction in utilizing a CMC

¹⁵ tjanicki@kent.edu

¹⁶ gsteinbe@bsa3.kent.edu

system in large sized classes to assist in the learning process.

At a large university (over 20,000 students) a computerized student / faculty communication system has been instituted in over 10 different classes, with subjects ranging from statistics to computer principles to management concepts. The primary goal of the system was to provide increased communication channels between faculty and students as well as peer to peer. Another goal was to reduce the administrative load for instructors.

A survey was completed which queried learners in four different sections, (taught by four different instructors) to measure the learner's satisfaction level with the information flow and feedback for these courses. All of the class enrollments were larger than seventy-five students (average size 179).

PROBLEM STATEMENTS

The fact that a student who is one out of 75 or one out of 200 participants in a class, may lead the student to a feeling of isolation and place a artificial barrier between themselves and the instructor. This barrier may lead to the student not asking questions when they don't understand a concept or a feeling that they are not getting the personalized feedback they need when they complete an exam or homework project.

It is assumed that most instructors want to provide as effective learning environment as possible. However large classes present many of the following challenges to the faculty member:

- Quickly getting course information and changes to the curricula to the students.
- Is the class on track and grasping the new material? As the semester progresses it can be difficult for the instructor to get an understanding if the members of the class are following and comprehending the material presented.
- Developing exams that can be graded efficiently. Provide tests that are challenging and become a learning tool. Can 'ScanTron' bubble sheet exams provide the learning experience necessary?
- Personalized contact with students, especially since time is precious and

administrative tasks consume valuable time. Students often have questions of an administrative nature.

- Attendance tracking.
- Administrative headaches, which comprise significant time that, could be used to develop more improved lesson plans.
- Implementing meaningful homework assignments which impact the learning of the student, while they are easy to grade. The other option is to provide a sea of graduate students to grade assignments, which results in feedback of mixed quality.

Correspondingly from the student perspective, a student in a larger scale class faces these concerns:

- Feeling of isolation (lost in a large sea of students).
- Fear of asking questions in large-scale classes; they don't want to be embarrassed even if others in the class also do not understand the same information.
- Getting individual help on assignments or projects or concepts when needed.
- Getting to the instructor's office hours, maybe they work, or the professor has a line out the office door.
- Personalized feedback on homework and projects.
- Finding peers to offer assistance.

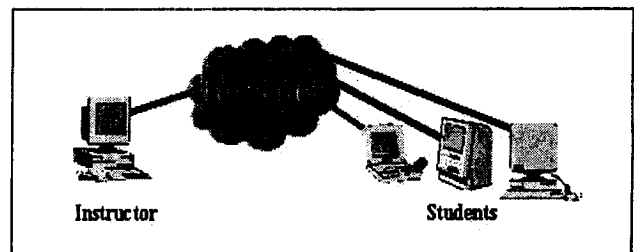


Figure 1
The Internet may increase student / faculty interaction in large classes

A research question is does a computer-mediated communication (CMC) system provide increased personalized contact with each student while reducing this 'contact' time burden for the instructor. Thus leaving time for the instructor to prepare lesson plans and other meaningful related activities.

LITERATURE OVERVIEW

A University of California at Santa Barbara [1995] study details problems found in large and small classes. They are: a) cheating - over 90% of students report that they will cheat at least once in their college career; b) easy grading standards; c) not using tests as learning experiences and d) misusing collaborative learning. Given these issues, this UCSB study does offer several recommendations for large classes:

1. personalize, personalize, personalize
2. ask students for feedback
3. give feedback to students early and often.

Studies have shown that large-scale classes can be just as effective as smaller classes when the instructional goals involve learning and comprehending *factual* goals. Smaller classes have been found more effective when the goals involve higher cognitive skills including application, analysis and synthesis. Smaller classes provide for greater contact between students and faculty, which appears to be needed for students with low motivation, or when the conceptual material is difficult, [McKeachie, 1994]. Therefore the same research question surfaces: does a computer system provide that missing personal contact, or at least reduce the distance between student and faculty?

Perrin and Rueter [1996] report that the Portland State University is facing the same dilemma, as their new lecture hall (300 seating) will accommodate 2100 to 2400 students per quarter in various classes. They are turning to technology in the forms of multimedia presentations, the Internet, electronic study guides and computer-based tutorials, simulation, email and threaded on-line discussion groups. This project is currently in its third year and is awaiting the results of significant data they have collected.

The University of Georgia at Athens [1997] offers some guidelines to improve the handling of large sized classes. These include not distributing materials during the class, instead distribute these materials via electronic means, using technology

to present material in and out of class, and establishing an electronic gradebook.

Finally, at James Cook University, Dyreson [1997] gives several keys to improving class performance. Included are using a combination of lectures with on-line learning materials, electronic quizzes, self-assessment quizzes (pre-tests) and student access to grades. They tracked student usage of the features of the system and found student usage highest of the grading system, followed by self-assessment test. The lowest usage was the on-line learning materials.

The literature can be summarized with the following student needs:

- Provide personalized feedback
- Provide timely feedback
- Provide exams that are learning tools
- Provide an environment where a student may easily ask a question
- Provide an environment that can communicate what is expected of the student and provide a means to update this expectation.

DEVELOPMENT OF THE COMPUTER MEDIATED COMMUNICATIONS SYSTEM (ORION)

In the fall of 1995, a computerized system named ORION was created with multiple goals. These were to: a) increase the communications and information flow to students, b) provide more effective learning and feedback, and c) decrease the administrative load for instructors. This paper will primarily focus on the communication and feedback arenas.

The literature USCBA [1995], Dyreson [1997], Hannafin & Peck [1988] indicates that efforts should be undertaken to provide timely information as well as a personalized feeling of feedback for the student. The ORION system was designed to provide increased communications and information flow. A review of the *main student menu* choices demonstrates the key communication features of the system

Status	Quizzes	Assignments	Communication
Status Report	Quiz List	Assignment List	FAQ
Syllabus	Study Guide	Submit Assignments	Class Powerpoints
	Practice Quizzes		Message Board Chat Center
			Professor Janicki's homepage email

Figure 2
Student Menu Choices

After a student enters a personalized ID and password, they may access a wealth of information about the class in general. These include course requirements, homework assignments, due dates, handouts, frequently asked questions, and even a class on-line bulletin board. Personal information concerning the student's current grades in class, and customized feedback on individual projects and individual exams is also available.

All of the information is web-based, and is available to the student 24 hours a day from any IP (Internet Protocol) address. This ubiquitous of the web makes it invaluable as a communications backbone. It renders geography irrelevant and allows students and instructors to participate and communicate from locations of convenience.

Goal One: Keep student informed of expectations

A look at one of the hyperlinks under the *Status* heading, takes a student to an on-line *syllabus*. As a course is set-up by an instructor a syllabus is built (the instructors are prompted by the ORION system

for the typical syllabus items). These include asking the instructor for class objectives, textbooks and other materials required, projects and assignments, tests, and the weight factor for each item. This is built without the instructor having to know HTML (the language of the web pages), but merely answering questions presented in the web browser. As the instructor builds this course syllabus a list of due dates is also built by the system which is communicated to the student in various system locations by the CMC system.

Homework 1 (due 2/3/1999)	Homework 2 (due 2/3/1999)
Homework 3 (due 2/15/1999)	Homework 4 (due 3/1/1999)
Homework 5 (due 3/1/1999)	Homework 6 (due 3/15/1999)
Homework 7 (due 4/12/1999)	Homework 8 (due 4/12/1999)
Homework 9 (due 5/3/1999)	Homework 10 (due 5/3/1999)
ExtraCredit 1 (due 2/28/1999)	ExtraCredit 2 (due 3/31/1999)
ExtraCredit 3 (due 3/31/1999)	ExtraCredit 4 (due 4/30/1999)
ExtraCredit 5 (due 4/30/1999)	Back

Figure 3
Assignment list with due dates

Item	Course Points	Your Score	% of Course	Points Earned	Comment
Quiz 1	9	85	9	8.55	View Quiz 1 Results
Quiz 2	13	92	13	11.96	View Quiz 2 Results
Quiz 3	13		13		Due 2/26/1999.
Quiz 4	13		13		Due 3/12/1999.
Quiz 5	13		13		Due 3/26/1999.
Quiz 6	13		13		Due 4/16/1999.
Quiz 7	13		13		Due 4/30/1999.
Quiz 8	13		13		Due 5/11/1999.
Homework 1	P/F	Passed	P/F		
Homework 2	P/F	Passed	P/F		
Homework 3	P/F	Passed	P/F		You were correct on 15 out of 20 questions for a score of 75.0%. 70% was required to pass.

Figure 4
A portion of the student status report

Figure 3 demonstrates a screen under the *Assignment List* link. Here students are provided a list of all the projects and assignments due for the class.

For each assignment, clicking on the 'GO' button will display an additional web page which details the requirements for that project and the grading criteria. To make the homework process easier the student may also submit their homework

via the web for grading. Notice that some of the links are 'lights' and not 'GO' buttons. These represent on-line homework assignments. The student may receive a test, problem set, or other

evaluative item, that they complete over the web (from any location) and submit for automatic homework grading.

Goal Two: Provide the student with timely data on their individual progress.

The *status report* (a portion shown at the left) link provides significant information to keep the learner up to date on their progress. It displays

At the bottom of the student status report (not shown), the student's grade average is calculated using the weight factors for each item, as well as a list of items not yet completed in the class. This is displayed as an average (i.e. 85%) in addition to an actual estimated grade (i.e. B) for that point in the semester. A student has the option to insert their email addresses as well as homepage URL (the web address for their page) on this page to foster additional communication. Clicking on the 'GO' button beside a completed exam is discussed in goal 3.

Goal Three: Provide personalized feedback on projects and exams

The student receives personalized feedback on all homework assignments via the status report. The ORION system has the capability to grade homeworks prepared using software products from the Microsoft Office Suite as well as other popular file formats (HTML, Image, Text). It then provides detailed feedback for improvement. Figure 5 demonstrates feedback for a particular Excel homework assignment.

Notice on the homework example in Figure 5 (which was a pass/fail assignment), that

the due dates for all projects and exams (this is provided many times to the student), as well as the weight factor for each component of their final average (figure 4).






the student 'Passed.' It also details the student score (95 out of 100), but provides additional feedback by telling the student they have the incorrect function in cell D2 of Sheet 3 for this particular spreadsheet. This feedback can be as long or short as the instructor desires. Most importantly, the assignment was submitted electronically (not on disk) and graded automatically by the CMC (ORION) system.

The instructor was only involved in created the assignment and defining the solution, not in the grading. Thus an instructor can increase the number and variety of assignments required of the students without increasing his/her grading effort. As an example at this large university, one course which has an enrollment of over 450 students, currently has ten homework assignments per student per semester now that the system is in operation, versus three in the old manner (teaching assistants manually grading computer diskettes).

Exams may be taken on-line (take-home or in a lab proctor environment). Once the exam period is complete the student receives a detailed analysis of their answers both correct and incorrect by clicking on the 'GO View Quiz Results' button shown in Figure 4.

Homework 4	P/F	Passed	P/F	<p>You earned 95 of 100 possible points for a score of 95%. The minimum for passing is 75.% so you passed, Good Job!! Did not use the TODAY function in D2 in Sheet 3</p>
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Figure 5
Personalized feedback on homework assignments.

 **Back**
 19 Right Answers  
 There are 25 questions. Your score = 76%
6 Wrong Answers  
 You earned 76 points of 100 points on Quiz 2.

#2 of 25. A file extension: (0 of 4 points earned)

- defines the kind of computer a program may run on
- identifies the type of file
- checks the content of a file
- is part of an email address
- processes data


Your answer is not correct. The correct answer is: identifies the type of file. 

Figure 6
Detailed analysis of one quiz question

Once the 'GO' button is clicked, the learner is provided the screen shown in Figure 6. The student may scroll through all of their correct answers as well as incorrect answers to provide a learning experience from the exams, not just a checkpoint of their progress. Exam questions may be true/false, multiple choice, short answer, matching and longer essay response. The essay responses are not graded by the CMC system, but saved for future on-line grading by instructor. For difficult questions, the instructor may provide additional feedback and reference links back to course material in the feedback area.

Goal Four: Provide on-line learning assistance

Under the *Quizzes* option as shown in Figure 2, students may retrieve a study guide for each exam as well as take a practice quiz. This practice quiz may be a combination of short answers, multiple choice, matching and true/false questions. The student may take the practice quiz and then is given immediate feedback on the their score as well as detailed analysis pertaining to the questions missed as shown in Figure 7.

Another resource is that course handouts, PowerPoint Slides, and other documents demonstrated in class can be added to the student's menu options via the web as shown under the *Communication* Option. These resources may be downloaded or linked to on-line documents.

Goal Five: - Provide increased communications between instructors and students and student to student.

Various options are available under the Communication option. The first is a FAQ (Frequently Asked Questions) area. Here instructors or proctors may post hints or answers to questions in which the students are having difficulty. It can be an exchange of tools and suggestions to solve an issue.

Communication

[FAQ](#)

[Class Powerpoints](#)

[Message Board Chat Center](#)

[Professor Janicki's homepage email](#)

Figure 7
Communication Options

The Message Board can be used for faculty to communicate general course information, or to communicate from one student to student. Figure 8 details the top layer of the message board. Students may reply to previous topics (threads) or add a new discussion point (thread). The faculty member has the ability to delete any inappropriate comments on the message board.

Message Board (use this to communicate with other students anonymously about anything)

Figure 8
Top Layer of message board

Close Messageboard Post New Message Search Clear

- 02/17/1999-18:22:27-Do you need help???
- 02/15/1999-23:21:25-Extra Credit 1
- 02/11/1999-20:18:22-Grading of Excel, Powerpoint, and Access Homeworks (4,5,8,9,10)
- 02/11/1999-14:26:40-Proctor Availability
- 01/29/1999- 14:10:17-The quality of the textbook.
- 01/20/1999- 09:21:16-Anyone who needs help with intro to comp. info systems, gimme a call

A final communication option is a on-line chat center, in which student can communicate with each other in real time or the instructor can schedule 'help sessions' on-line at certain times of the week.

The results are shown in relationship to the goals stated earlier. The total number of respondents was 768. The percentages below reflect Strong or High Agreement with the question that follows.

STUDENT SATISFACTION STUDY

The overall question we desired to answer is: does this CMC system decrease the feeling of isolation in large classes and increase student satisfaction and learning? During the spring semester of 1999, a survey is underway (in four different large sized classes) to determine student satisfaction with this CMC system. Survey questions included:

- Basic demographic information on the student (year, major, minor)
- How many computer courses they completed
- How many courses they have had with 75 or more students
- Are homework assignments more or less clear to understand
- Changes to the syllabus communicated clearly?
- On-line test taking (good or bad)
- Feedback on answers to tests
- Electronic grading of homeworks
- Feedback on homeworks
- Communication features as bulletin board, FAQ's and live chat
- Overall satisfaction rating of the system

Goal One: Keep the student informed of expectations.

- 68.0% Web-based materials have enhanced my learning in this class:
- 81.2% The fact that homework assignments were posted saved me time and effort (figure 3)

Goal Two: Provide the student with timely data on their individual progress

- 91.9% The status report has increased my satisfaction with this course (figure 4)

Goal Three: Provide personalized feedback on projects and exams

- 81.3% I like the on-line testing feature of this course
- 90.0% Feedback on exams is beneficial to my learning of the subject matter (figure 6)
- 95.2% Feedback on homework is beneficial (figure 5)

Goal Four: Provide on-line learning assistance

- 76.8% The on-line study guides assisted me to improve my scores
- 67.7% The on-line practice quizzes increased my test scores

Goal Five: Provide increased communication between instructors and students as well as student to student.

Communication Bulletin Board

Improved 37.6%
Never used 45.0%

FAQ (Frequently Asked Questions)

Improved 46.0%
Never Used 47.3%

DISCUSSION AND CONCLUSIONS

In summary, the CMS system incorporated the following electronic techniques to improve the satisfaction of students and reduce the feeling of isolation. These techniques are:

- 1) Personalized feedback on exams
- 2) Practice exams
- 3) Study guides
- 4) On line due dates and assignments
- 5) Communication bulletin boards
- 6) FAQ area for instructors/proctors to keep students up to date
- 7) Mass e-mail capabilities for rapid change
- 8) Individual status report for each student showing their progress to date

The first round of surveys (over 750 respondents) found that adding course information such as syllabi, homework assignment, and an updated status report of their grades and progress in the course to be beneficial. Over 90% of the students reported that knowing their grades as all times enhanced the communications and their level of understanding their progress.

More interesting was that the students reported the best feature to impact learning was the enhanced feedback on individual test questions and homework assignments that the ORION system provides. Without a computerized approach this would not have been feasible in large-scale classes. Learning theory states that feedback must be personalized, and must follow the question quickly. Questions related to feedback all achieved over a 90% strong or very high agreement level. The

impact of on-line study guides and practice quizzes were in the 60 to 70% range.

Finally the students took least advantage of the communications features of the system with over 40% stating they were unaware of the features (even though it was a hyperlink on their main menu screen). The FAQ's and bulletin board earned a 40% importance level.

Future research will involve contrasting the test results for the different subject matters. Is there a difference in student satisfaction between the statistics and computer principles courses?

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