

Real Time Interaction Via the Web

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This paper describes my teaching efforts at CSU-Sacramento in large enrollment classes, "Introduction to Computers"-15 sections, and "Exploring the Internet"- 4 sections. The lectures are transmitted via cable TV to the Sacramento community and recorded for later playback on the campus closed circuit television system. In addition, a software package from @Home called Portable Home Learning is used to allow real time participation of students via the internet during the lecture. The interaction allows for two-way video, whiteboard, chat and real time demonstrations via a web page during the lecture. Students can respond to questions created ahead of time or during the lecture in the form of Power Point slides. The instructor has a constant visual display of the status of students participating via the web. The instructor can actually "capture" any part of his/her computer screen and "push" it to a web page for viewing by distance students. A significant feature of the software is that students and faculty can participate from anywhere on the internet to anywhere on the internet. Of course better results are obtained when high speed communication lines are available; but, reasonable results are possible with standard modem speeds. The author has been using this software for two semesters and will describe the successes, difficulties and failures of the approach.

I. Introduction

After 30 years of teaching large enrollment classes via TV, I still find it difficult to define the essential elements of "Distance Education". In fact I find that we all have different definitions of what constitutes "Distance Education". Administrators want to define "Distance Education" classes separately from "Regular" classes; but, in today's world I suggest that all, or at least most university classes have some element of "Distance Education". It is hard to imagine any student studying any subject today without making some use of technology to enhance the classroom environment. So, since all, or at least most, classes involve some elements of "Distance Education", we can forget the classification problem and concentrate on what tools can be used successfully to help provide a positive learning experience.

Another observation; "Some of the students will learn no matter the teacher and the available technology", and "Some students will not learn no matter the teacher and the available technology". So as teachers, we must concentrate on providing the best learning environment and the widest range of teaching tools to accommodate the majority of students who fall in the middle group. I provide students with assignments via email, via a web page and by old fashioned "Hard copy". I hold office hours, I hire teaching assistants to work with students and hold office hours, I have audio and video chat sessions on the internet, I periodically visit all the remote class TV playbacks and I am available by telephone. Students can watch the lecture in the live TV studio, in a classroom by TV playback, at home from cable TV, anyplace on the internet by streaming video, in the library by pre-recorded VHS tapes or even at home with a personnel VHS copy mailed to their home. Or if they do not need the lectures they can read the text book and my lecture notes from the web and complete the course at their own pace. Do all these approaches work for all students? NO. Many factors like family, work and personal problems affect a student's success and we teachers cannot control the entire environment. But, I do believe that we owe it to our students to use technology and provide material in a wide variety of formats, to try and match the needs of most students.

The following sections will describe the teaching environment and the successes and problems for two classes I teach at California State University-Sacramento, namely "Introduction to Computer Science" and "Exploring the Internet". Both are large enrollment, multiple section classes taught via TV and via the Internet with the assistance of a team of student assistants.

II. Teaching Environment

The two classes to be described in this paper are similar in nature, except that "Introduction to Computers" is a 3 credit hour course with two lectures and two labs, and "Exploring the Internet" is a 2 credit hour course with one lecture and two labs. Neither course is required for computer Science majors but both classes attract large numbers of students. (The "Introduction to Computers" class can be used to complete one of the University's GE requirements). Typical enrollments in CSC1, "Introduction to Computers", is 350 per semester and is 150/semester in CSC8, "Exploring the Internet". The lectures for both classes are recorded in a live class of about 30 students in a campus studio. Lectures are broadcast over campus TV and via cable TV to the Sacramento community. In addition, all lectures are recorded on VHS tape and are available in the Library for later use by students. I post all class material on my web page at: <http://gaia.ecs.csus.edu/~lecureux>, and use a listserv to distribute assignments and announcements. I use Power Point slides to emphasize points during the lecture and make these slides available to students via my web page also. An example slide is shown in Figure 1.

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Figure 1. Typical Power Point Slide used to teach HTML

Besides the live lecture section of 30 students, lectures are played back to other sections of about 20 to 35 students each during the week. These sections are monitored by a teaching assistant who answers questions, helps in the labs etc. (More on this aspect of the class in the next section). Students are graded on the basis of points assigned for assignments, quizzes, tests, and presentations. Multiple sections are scheduled to provide a range of time options for the students.

In addition to the "live" section and the multiple "replay" sections, both classes also have what is called an "off campus" section. Students in the "off campus" section are only required to come on campus for an initial orientation session, the mid term test, the final exam, and for one presentation session. For this "off campus" section, all assignments are submitted via email, grading is by email and questions are answered by email, chat or telephone. This approach provides a much more flexible schedule for the students with obvious advantages and some disadvantages.

III. Teaching Assistants

Since the careful selection and training of the teaching assistants is the most important factor in the success/failure of this teaching approach, it is worthwhile to describe the process in more detail. Over the years I have found the following to be generally true.

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- a. The best teaching assistants are found in the class. I pick several new potential TAs from each class, as the semester progresses. (Graduate or Undergraduate status has little impact on the success of the TA; although, it has been difficult to convince the administration that undergraduate TAs can be successful.)
- b. Dependability and personality are the most important factors when picking a TA. Of course the student must know the basic material, but I find that dedication to the course and the teaching approach is the most important factor.
- c. Weekly meetings are essential to success. We discuss the coming weeks lectures, assignments and quizzes.
- d. TAs are paid for 8 hours work per week which includes hours in lecture and lab, an office hour, an hour for meetings and two hours for grading and preparation.
- e. We tend to develop a close association and I frequently bring donuts or pizza to meetings. We usually have an end of the semester party and I often help TAs find positions when they graduate.
- f. I find that most TAs do their best work their first semester and that many TAs become a bit jaded and provide short answers after two or three semesters. (It is a trying job to answer the same questions over and over, and there are always a few obnoxious students who try to disrupt the class.)
- g. Most TA's find the experience rewarding as they learn the material thoroughly and gain confidence in talking to a group.
- h. TA's meet with the class during the TV replays, answering questions, handing out papers and conducting small discussions during intended breaks in the lectures. In addition they assist the students during the lab periods, grade all homework, help develop the homework assignments, quizzes and tests, record grades and work with me at the end of the semester to determine final grades.
- i. Much of my time is spent organizing, training and helping the TAs. And most of the success of this teaching approach is dependent on the careful selection and training of this dedicated group of students.

IV. Real Time Interaction

The latest addition to my mode of teaching is the recent incorporation of a software package developed by @Home called "Portable Home Learning". Using this software I am able to deliver instruction to students on the web at the same time the class is being broadcast via TV and recorded via VHS tape. I have used the software for three semesters and find it to be user friendly, easy for instructors and students to use and it provides a valuable "additional" teaching tool. The significant disadvantage to using the software is bandwidth. To be successful with the streaming video and audio requires a high speed connection. Of course most students do not currently have high speed connections such as ISDN or DSL, but I suspect they will in the future. Also, the software is still very useful at slower modem speeds if the student simply turns off the streaming audio and video. So what does the student see and hear? All the slides, questions and chat are still available over the web. And for students within the

Sacramento area they can turn on the TV at the same time to both hear and see the lecture. The computer connection provides the additional advantage of being able to easily interact with the lecturer and other students in the class during the lecture. Obviously this approach to providing instruction is in the formative stage, but as we all acquire high speed internet connections, we should see more and better use of this mode of delivery.

a. Features of "Portable Home Learning"

1. The instructor can define classes, class size, and specify time periods when students can login.
2. The software can require an ID and PW for students and faculty and provide a log of student time and participation.
3. All interaction is via a user friendly web page such as the one shown in Figure 2.

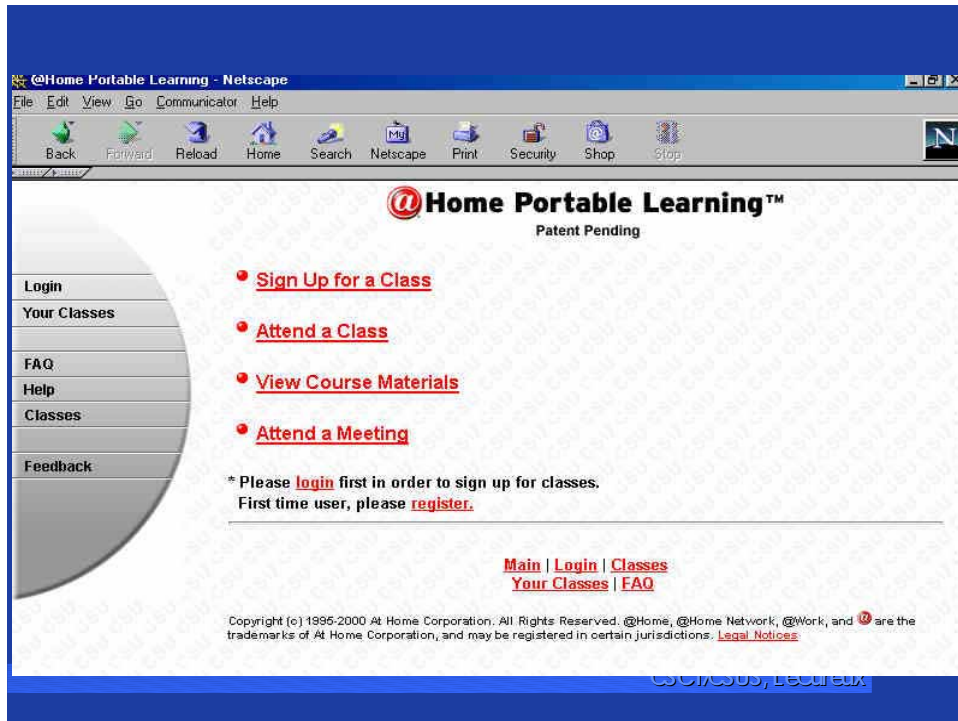


Figure 2. Initial web page for Portable Home Learning

4. The server, located in the San Francisco area can handle simultaneous use by a large number of students and faculty at the same time participating in one or several different classes.
5. Response to students and faculty is very fast and was never a deterrent.
6. Instructors have a variety of options for preparing slides and setting up their teaching environment as shown in Figure 3.

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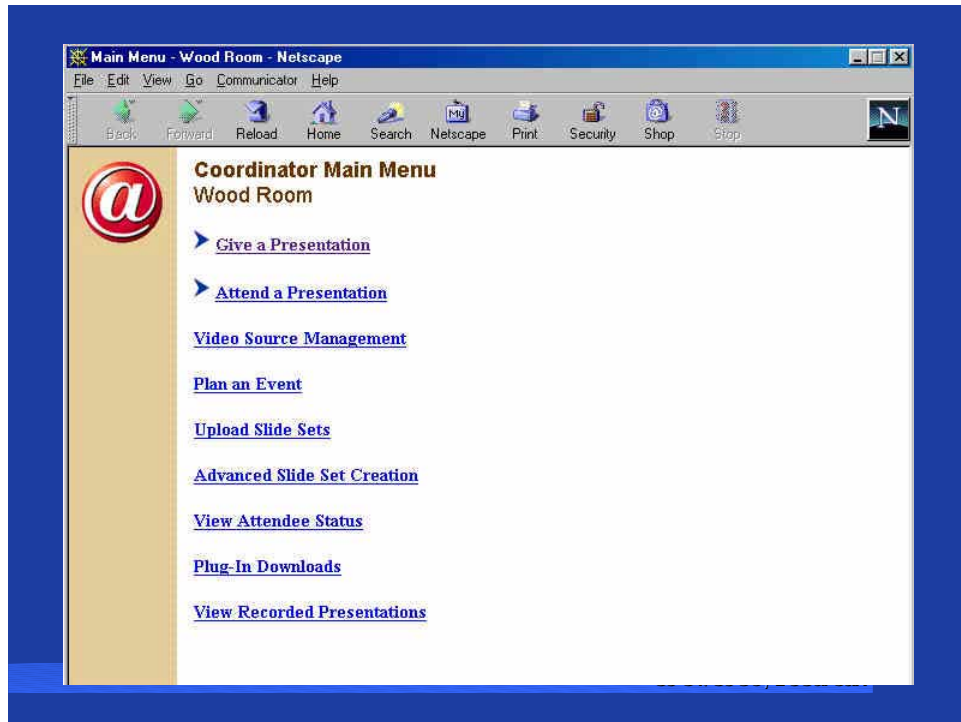


Figure 3. Portable Home Learning Options for the Instructor

7. The classroom can have several instructors connected from different places.
8. An instructor uses a "friendly" interface to control the slides, the interaction and the progress of the class. The typical environment for the instructor is shown in Figure 4.



Figure 4. Portable Home Learning Screen for the Instructor

9. Each student and instructor appears as a colored dot on the seating chart. The color of the dot indicates whether the student understands and wants to proceed, whether the student is confused, etc. So the instructor has a constant visual representation of the class and their current comprehension. (Assuming the students periodically update the color of their "dot".)
10. The instructor can use drawing aids on the slides.
11. The instructor can show web pages which are active within the window of the "Portable Home learning" screen.
12. The instructor can see and respond to questions to individual students or turn over the screen to any student with a question.
13. The instructor can show his/her own picture on the streaming video, or show any of the students picture if they have an attached camera.
14. The instructor can use a live screen within the Portable Home Learning screen so that applications can be demonstrated live. Students will see the actual application execute in real time as it is demonstrated by the instructor.
15. The instructor can use pre-recorded quiz questions or create quiz question on the fly. Students will respond to the questions via their computers. A typical test screen is shown in Figure 5. Student responses are compiled and can be shown as a bar graph to the right of the test screen.

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Figure 5. Typical Test Question Screen

16. The instructor has a control panel to switch between slide sets, switch to chat mode, control separate chat sessions with individual students. etc. This control panel is shown in Figure 6.

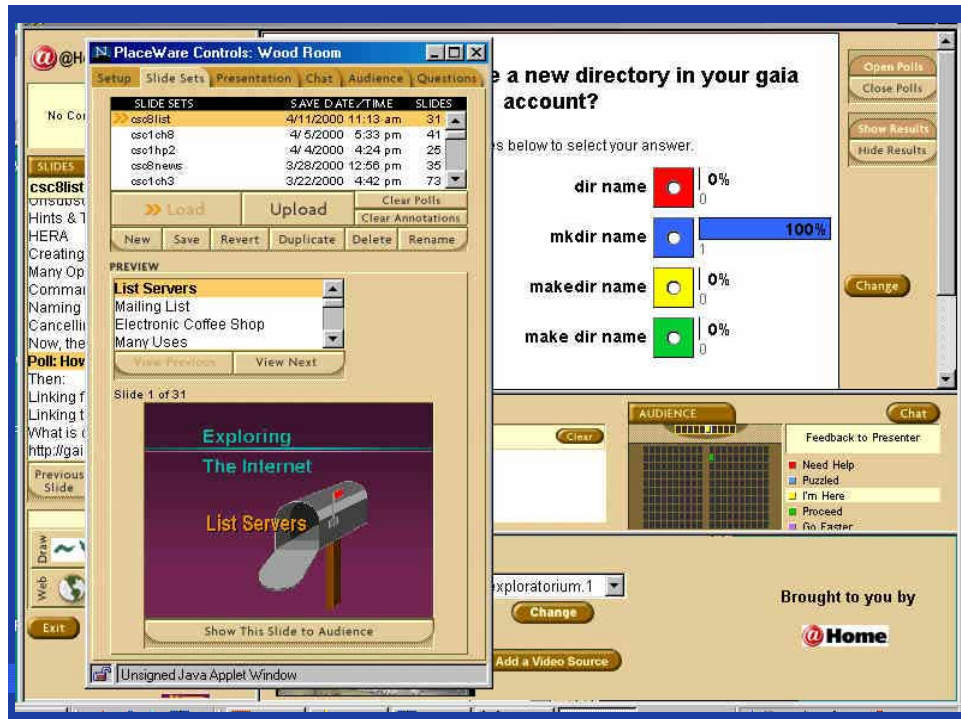


Figure 6. Control Panel Used by Instructor to Switch Modes

17. The instructor can check on students enrolled in the class and their participation from the available data base. A typical screen is shown in Figure 7.

Login	First Name	Last Name	Email	Access Level
1602Kenny	Kenneth	Adair	cincyr1@ibm.net	Audience
6625	Sarah	Thomas	sac27450@saclink.csus.edu	Audience
BenW	Ben	Walzberg	BMDub22@aol	Audience
Bigtyrz	Ted	Caple	Bigtyrz@aol.com	Audience
Bill	William	Taitano	taitano7@yahoo.com	Audience
Cruise	Chris	Cruise	mr_mcmahon@yahoo.com	Audience
Hammerhead63	Joshua	Murdock	murdock_75@hotmail.com	Audience
Helen	Helen	Phan	HelenNicole@hotmail.com	Audience
Jake	jake	beenie	lecureux@csus.edu	Audience
Jim	Jimmy	Yi	chinyono@aol.com	Audience
Jimmy	Jimmy	Yi	chinyono@aol.com	Audience
Kashi	Takasha	Edmond	Choclety@aol.com	Audience
Korane	Jin	Park	jnpark@ucdavis.edu	Audience
Kyster	Kylin	Chow	kchow@csus.edu	Audience
MGravatt	Marshall	Gravatt	sac83274@saclink.csus.edu	Audience
NANCY	NANCY	B	SKETCH6969	Audience
PierretteLuamba	Pierrette	Luamba	sac26415@saclink.csuc.edu	Audience
Rochelle	Rochelle	Williams	rpwilliams@softcom.net	Audience
SCRICHTON	Stephanie	Crichton	scricto@aol.com	Audience

Figure 7. Portable Home Learning Listing of Students enrolled in a Class

b. Success/Failures Using Portable Home Learning

Adding Portable Home Learning software to teaching CSC1 and CSC8 was easy and required very little additional effort. The primary work involved modifying existing slide sets by incorporating interactive questions, live demonstrations and picking useful web pages to illustrate specific topics. Students had good response time from the server and participated regularly by answering questions, asking questions and by modifying the "color" of their respective dots on the seating chart to reflect their understanding of the current topic. Due to the developmental nature of the software, I did encounter about one "system crash" per semester, where the server went down with no warning. I was always able to start over by logging in to the server again, but of course it takes a bit of time for all students to re-activate and the disruption was significant. Also, students with "Modem" type connections were not able to use the streaming audio or video and had to rely on a Cable TV connection to receive. (A standard telephone with a scheduled conference call would also accomplish the same objective.) But, the main advantages of the software are that the students stay involved with the instructor and that the instructor gets immediate feedback on Quiz questions from students no matter where they are located on the Web. These advantages alone justify the little extra time necessary to set up the material on the @Home server. I did not use the software to take attendance or to store results to quiz questions.

However, these are available features and may be used in the future as more students prefer to enroll and participate from off campus.

V. Off Campus Sections

The students in the "Off-Campus" sections of CSC1 and CSC8 are somewhat unique. They only have to come on campus for an initial orientation session to explain the rules, for a class presentation (just for CSC8) and the for the mid term and final exams. It is assumed that these students watch the lecture via cable TV, or see the copy in the library, and/or follow the lecture on the Web via Portable Home Learning. In fact experience show that some students are very conscientious about watching and keeping up, but many easily fall behind, since they do not have the daily prodding of a lab session with a TA taking attendance. We do require that all students in the "Off Campus" section check in weekly, with at least an email. But, the failure rate for this section is still higher than for the live or reply TV sections. I try to adequately warn students of the dangers of studying off-line, but work, family and study schedules sometimes force the "off Campus" approach. On the other hand, many students do well in this section and benefit from the extra flexibility. We do give weekly quizzes that are posted on the web. The questions are a bit more involved than the quick questions given to on-campus sections. We do not try to verify, who answers the quiz questions on their own, but the associated points are relatively small and cheating on the quizzes has not appeared to be a problem.

VI. Conclusions and Recommendations

Teaching large enrollment classes can be a challenge and one that most faculty prefer to avoid. However, I have found that with a carefully planned approach and the selection of good student assistants, large enrollment classes can be successful and provide a valuable service to the University and to the students. Obviously a large enrollment class taught by one instructor insures uniform coverage and consistent grading. But the key to any program like this is to have good support from the administration, good technical support and the ability to be flexible in setting up and running the class. Students consistently rate these classes among the highest in our undergraduate curriculum and have provided good feedback to constantly improve the courses.

Teaching in an environment of rapidly changing technology is a challenge. But, I feel that we will only get better if we accept the challenge and incorporate the new tools as they seem to fit our mode of instruction. Then evaluate the results and adjust accordingly. I have definitely noticed a broader acceptance at CSU-Sacramento to the use of TV for delivering instruction. Many students appreciate the extra options offered by this mode of instruction. A significant number of students now ask if lectures are available via the web. A large percentage of my students now come into the class knowing how to use email, and chat on the web, so these tools are taken for granted. In addition, most students come in with experience surfing the web and many already have

experience building web pages, so they expect us to post class material on our home pages. They are used to Yahoo, Napster, interactive games and Etrade and they expect us to be equally adept at using tools on the Internet. Newer tools that allow us to easily provide streaming audio and video on the web are becoming available and it behooves us to try these tools. There are no universal answers and not even a best answer. Each class is different, depends of the class content, the student, the instructor and the available technology. But, only by trying new technology and sharing the results will we have a chance to be most effective.

Floyd LeCureux

Floyd LeCureux is a professor at California state University-Sacramento where he teaches in the Computer Science Department. He received his BS in Mechanical Engineering from General Motors Institute, and his MS and PhD in Mechanical engineering from Michigan State University. Floyd has been teaching large enrollment classes via TV since the early 1970s when he taught classes of over 1000 students how to do Fortran at Michigan State University. He is very active in CSU system wide committees involved with improving and sharing teaching techniques.