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Abstract: Higher education in this country must evolve in order to meet the learning needs of students that have difficulty acquiring degrees due to the scheduling and geographical constraints of the traditional classroom. Current approaches to this challenge are known collectively as "distance learning" and include web based education which often consists of reading assignments and online discussion groups and/or compressed video ("talking heads.") Many sacrifices have been made to traditional instructional techniques in order to adapt to the constraints of current hardware, software, and bandwidth. With the availability of higher bandwidth and faster computers we have the potential to restore many of the positive attributes of the traditional classroom environment to "distance learning." We believe that the natural evolution for delivery of instruction is to a hybrid mode in which the regular classroom experience is made available to distant students as well as those in the classroom and a combination of synchronous and asynchronous methods are used. Students can "attend" class synchronously when schedules permit, and receive instruction asynchronously otherwise. Our experience indicates that many of these same tools improve the learning experience for traditional classroom students. This paper reports on a number of software and hardware tools that we acquired and developed under a grant. We gained experience with these tools and assessed their potential for improvement of the instructional environment.

Keywords: distance learning, synchronous learning tools, asynchronous learning tools, recorded lectures

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Tools for Hybrid Instruction – Classroom and Distance Instruction in Synchronous and Asynchronous Modes

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Abstract

Higher education in this country must evolve in order to meet the learning needs of students that have difficulty acquiring degrees due to the scheduling and geographical constraints of the traditional classroom. Current approaches to this challenge are known collectively as "distance learning" and include web based education which often consists of reading assignments and online discussion groups and/or compressed video ("talking heads.") Many sacrifices have been made to traditional instructional techniques in order to adapt to the constraints of current hardware, software, and bandwidth.

With the availability of higher bandwidth and faster computers we have the potential to restore many of the positive attributes of the traditional classroom environment to "distance learning." We believe that the natural evolution for delivery of instruction is to a hybrid mode in which the regular classroom experience is made available to distant students as well as those in the classroom and a combination of synchronous and asynchronous methods are used. Students can "attend" class synchronously when schedules permit, and receive instruction asynchronously otherwise. Our experience indicates that many of these same tools improve the learning experience for traditional classroom students.

This paper reports on a number of software and hardware tools that we acquired and developed under a grant. We gained experience with these tools and assessed their potential for improvement of the instructional environment.

Keywords: distance learning, synchronous learning tools, asynchronous learning tools, recorded lectures

1. INTRODUCTION

Higher education in this country is currently in the early stages of a major evolutionary change. Social, economic and technological factors are converging to shape the system of higher education to a new form, one providing a much more flexible form of delivery of instruction to an expanding clientele. We need to find ways to meet the needs of students who have difficulty with the scheduling and location constraints of traditional classroom delivery of instruction. However, our solutions should preserve, as much as possible, the strengths of traditional classroom instruction, especially the interactive experience and the dynamics of the lecture. Currently popular approaches to "distance learning" include "asynchronous learning" which often sacrifices important ingredients of traditional classroom delivery and "synchronous learning" which usually consists of video conferencing with the video consisting of "talking heads." Current practices of distance learning make many sacrifices in instructional techniques to adapt teaching to the constraints of current hardware, soft-

ware and bandwidth (Hara 1999, Latchman 2001).

We believe that the natural evolution for delivery of instruction is a hybrid mode in which the regular classroom experience is simply augmented and made available to distant students as well as those in the classroom. Students who are able to, and prefer to attend physically can do so. Others who are location bound should be able to get most of the classroom experience from a distance. In addition, recordings of the classroom lecture and other materials can be made available electronically so that students can receive instruction asynchronously when they cannot attend class synchronously. Our experience indicates that many of these same tools improve the learning experience for traditional classroom students.

Computer Science (as well as many other subjects) typically makes good use of the dynamics of the lecture. Activities like teaching programming feature the design and development of a solution to a problem presented in logical steps with consideration of alternatives and consequences. Frequently much of the lecture does, or at least can, revolve around activities on the computer screen. A problem is stated, solutions are designed, implemented, and tested – all visible activities with narration and sometimes including animation. Processes and algorithms are demonstrated. Procedures are carried out. These instructional modes are not usually available under the "asynchronous learning" approach most commonly associated with "distance learning."

"Synchronous learning" refers to instruction in which the students are together in time, but not necessarily in location, with the instructor. This allows for real-time interaction as part of the dynamics of the lecture/discussion. Unfortunately, as currently practiced, this usually consists of video conferencing with the video consisting of the "talking head" of the professor. A better visual focus would be on the computer screen. Electronically presented polls / quizzes can be used to frequently assess comprehension and maintain focus.

Emerging electronic presentation and communications technologies can be used to capture the dynamics of the lecture for both asynchronous and synchronous modes of instruction. A number of recently available systems are designed to closely simulate the classroom experience via a browser over the Internet.

On the asynchronous side, while the ability of the student to ask the teacher a question in real time is lost, much of the dynamic nature of the lecture can be captured and provided asynchronously. This can include some interactivity such as polls and quizzes. This would provide a great improvement over today's current practices of asynchronous learning.

Many questions need to be answered concerning both modes of instruction delivery before these technologies can be used to their full potential (Zhang 2004). Some are technical, some are logistical, and some are pedagogical.

We received a grant from the Louisiana Board of Regents (LEQSF(2003-04)-ENH-TR-32 - Research and Application of High Bandwidth Synchronous/ Asynchronous Instruction -$60,000.) Under this grant, during the 2003-4 academic year, we explored specific technologies and methodologies for improving the delivery of synchronous and asynchronous instruction, under the assumption that high bandwidth Internet connectivity will soon be widely available. We have created facilities for the development of instructional materials and faculty training, and for improving the skills of our current faculty in these instruction delivery methods.

The Computer Science department has thus far relied primarily on traditional classroom delivery of instruction. For several years almost all of our courses have been taught in teaching classrooms/labs which have student workstations in addition to well equipped teaching workstations with displays projected on large wall screens. We have used Smartboards, Elmos and VCR's in our classrooms. All faculty members are regular users of these teaching workstations and make heavy use of the computer display as their primary instruction medium. All faculty members have demonstrated that they are willing to make use of new technology to improve their instruction. During the summer of 2003 the department moved into newly renovated facilities which include three well equipped large classrooms. During the design of the teaching workstations for these classrooms we focused on using

the teacher's computer display as the visual focus of instruction. We were also able to establish a student lab with individual work areas and a well-equipped conference room.

The department's current involvement in distance learning is minimal. A few experimental instances of synchronous learning via video conferencing using Internet protocols have occurred. The entire faculty does use the Blackboard Web based student-instructor communication system to augment their classroom instruction. The primary uses are to post course materials and announcements, to receive and return assignments, and to communicate via email. There is great potential for the department to improve its service and extend its offerings and enrollments via distance learning. With the availability of inexpensive high bandwidth Internet connections, delivery of instruction via the Internet provides a low cost approach.

However, the product (the instruction) must be of high quality in order to fully realize this potential. Experimentation and experience with distance learning technologies and teaching methods are needed to produce a high quality product. Well designed preparation and delivery facilities will enable the department's faculty to become proficient in the delivery of instruction both remotely and non-remotely.

The objectives of our grant were:

1. Develop a framework, facilities and tools for experimenting on the delivery of synchronous and asynchronous instruction of highly technical material in both the traditional and distance education environments.
2. Train instructors in delivering instruction that can be utilized in both traditional and distance education environments in which the students may participate either synchronously or asynchronously.
3. Deliver classes using the framework, develop facilities and tools, and measure student and instructor experience.

2. RESULTS

During the course of this grant we acquired and evaluated a number of technologies and methodologies for synchronous and asynchronous instruction. While our initial focus was on the use of these technologies and methodologies for distance instruction, we quickly discovered that many of them could be incorporated into our traditional classrooms to great advantage. We therefore shifted our focus very slightly to a hybrid approach – instruction generally delivered in a classroom but also available to distant students synchronously and/or asynchronously.

One of the most useful tools for asynchronous instruction was Camtasia Studio. With it we were able to record our regular classroom presentations – audio and computer screen display – for playback at a later time. This was augmented by two other very useful technologies. We used an inexpensive EBeam whiteboard capture device to capture, on the computer screen (for recording), the instructors "chalk-talk" on the classroom whiteboard. We also used Wacom Cintiq interactive pen LCD displays on each teaching workstation, which enabled the instructor to annotate the screen display with an electronic pen. In addition, we developed a program and a procedure to compress the digital video file that was created by Camtasia by almost 90%, which made it much more feasible for students to download these videos over the Internet and to pack a whole semester's worth of lecture videos onto a single CD for distribution. These files are available locally within the department's labs where they could be played or burned onto CD's. They were available as well over the Internet via FTP and a streaming server. Except when played in streaming mode, using Windows Media Play, the student could navigate to any point in the video, and replay a section as often as desired. Some students even burned audio CD's and listened to the lectures as they commuted.

While it is possible to edit these classroom lecture videos, this adds a whole new layer of production to the project and was not deemed worthwhile for our purposes. One faculty member did produce a few short non-classroom lecture videos.

This technology has had an immediate and widespread impact within the university. The use of this technology has become standard operating procedure for several instructors in the Computer Science department. It has become feasible to implement an attendance policy that requires all students to

"attend" any missed classes (whether excused absences or not) by viewing the lecture video. We have some early indications that this policy has improved our level of student success, as measured by a slightly higher retention rate. In addition, this approach has spread to a number of faculty members from other departments with continuing interest from others.

Another primary area of our investigation has been the availability of software to conveniently teach synchronously over the Internet. While IP (Internet Protocol) based video conferencing has been available for a few years (with varying levels of reliability), at the beginning of the grant period we had not found any products that were particularly suitable for instruction of students via widely available Internet connections. This was a two-fold problem. First, the products that existed were not structured towards classroom instruction. For example, WebEx is widely used and fairly usable for online meetings, but does not work well for the classroom paradigm. The second problem was bandwidth related. The video conferencing products required more bandwidth than was available over ubiquitous Internet connections.

By the last few months of the grant period things had changed considerably. Broadband connections (cable and DSL) had become much more prevalent in our area as well as nationwide. In addition, we were able to find and thoroughly evaluate a number of products/services specifically designed for classroom use. The primary four products that we evaluated were Centra Symposium, Elluminate Live! Academic Edition, LearnLinc, and Macromedia Breeze. All of these provided multi-way audio, application sharing, shared whiteboard and presentation area, text chat, electronic hand-raising, and polls/quizzes. All except Elluminate provided multi-way camera input video as an option. In our field, the use of camera input video was generally not needed (we may experiment with using it for the Elmo function in the future) and not using it greatly reduced bandwidth requirements. This was of some importance since our campus connection to the Internet is fairly limited and would generally have to support all outgoing connections.

These synchronous instruction products listed above all have a recording feature which enables a lecture to be recorded for future playback. This actually provides an asynchronous aspect to their use. The recordings are in some cases fairly interactive. That is, instead of simply watching and listening to the lecture video as is the case with Camtasia recordings, with these recordings the student playing them back can navigate the recording using the automatically created chapters, can take the polls/quizzes presented during the lecture, and can follow Web links presented. These recording are in a very compressed form. We are experimenting with using this technology in place of the Camtasia recording capability.

These products are available as either a service hosted by the vendor or as a license to host the software on the customer's server. We have acquired a license to host the Centra Symposium software on our own servers for a year. We plan to use this system to teach hybrid courses over the next year in order to gain experience with this mode of teaching. We hope to also acquire and use Macromedia Breeze. We will continue to seek and evaluate additional tools in this area. We expect that this experimentation will have an impact on how not only our department, but the entire university, moves ahead with distance (and classroom) instruction.

3. ASSESSMENT

We feel that we have met our objectives in that:

1. We have an outstanding set of facilities for delivery of synchronous and asynchronous instruction which are in use regularly by an expanding set of instructors. We are continuing to expand this set of facilities by evaluating new tools and techniques as we learn of them.
2. We have held a number of sessions to introduce faculty and staff from around campus on the use of some of these technologies. This has often been at the request of those departments. Other departments are acquiring the facilities to use these technologies. We will continue to play this role.

3. Currently three members of the department use many of these technologies as standard operating procedure. About a dozen full courses have been delivered using the asynchronous tools. They are much appreciated by the students and the instructors find them to provide clear and substantial benefits as measured by improved student's success rates in the courses. Due to the recent appearance of the synchronous products, our experience with them has been limited to evaluation only. They have not been used on a regular basis in classroom environments. These evaluations included (in 3 of 4 cases) the installation of the software on our servers. For two of the products we were able to hold 4 or 5 regular classes or extra class sessions using the software. In the other two cases the evaluation was carried out with faculty on our campus and on other campuses.

This project was very successful from the point of view of improving the quality of our classroom instruction (as measured on informal student feedback.) It has changed the way faculty members, in our department and beyond, use technology for improving the classroom experience and providing high quality lecture recordings for asynchronous use. Our evaluation and use of synchronous distance instruction systems, such as Centra and Breeze, is likely to have a major impact on the university's evolution as a provider of distance instruction.

In addition, it has raised our standing with the companies in our area which use computer technology and which hire our graduates. Over 30 companies were brought to LSUS in groups of 5 or 6 to introduce them to the technology developed with this grant. This was done to show them how the technology could be used to improve their businesses. Several of the companies have used the LSUS facilities to grow their business. Several have purchased their own equipment in order to improve the training of their employees and their customers.

Our state has a program called Incumbent Worker Training Program. (IWTP). This program provides funding to train employees in order to improve the economic viability of our state's companies and their employees. Our university is one of the primary grant writers for this program in the state with over $20 million in program dollars. The distance education technology developed with this grant is planned to be used to solve several of the problems with training employees and the way the IWTP is funded. This especially addresses the issue where a student has to miss a class and needs some way to make the class up. Facilities set up based upon what we learned will be located all over the state and will be used to train hundreds of employees.

4. CONCLUSIONS

We believe that the natural evolution for delivery of instruction is a hybrid mode in which the regular classroom experience is simply augmented and made available to distant students as well as those in the classroom. Students who are able to, and prefer to, attend physically can do so. Others who are location bound should be able to get most of the classroom experience from a distance. In addition, recordings of the classroom lecture and other materials can be made available electronically so that students can receive instruction asynchronously when they cannot attend class synchronously. Our experience indicates that many of these same tools improve the learning experience for traditional classroom students. Currently available tools can be used to implement this approach.

5. REFERENCES

Hara, N., Kling, R. (1999). "Students' Frustration with a Web-based Distance Education Course: a Taboo Topic in the Discourse," available online at http://www.slis.indiana.edu/CSI/wp99_01.html.

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

Zhang, D., Zhao, J., Zhou, L., and Nunamaker, J., 2004, "Can E-Learning Replace Classroom Learning?", CACM May 2004, pp 75-79.

6. ACKNOWLEDGEMENTS

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