# Distance Learning Experience

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## Abstract

As Internet communications and technology continue to improve at an alarming rate, more and more applications are emerging, which make the Internet an exciting medium for numerous types of interaction. One such use is in the classroom. This paper discusses one experience with using the Internet in a college classroom setting.

There are many communications programs available that appear to be simple to configure and use on a daily basis. The instructor and student involved take a look at using Microsoft's Net Meeting for their connection. This experiment, while it proved to be troublesome, is successful and produces interesting findings.

## Introduction

This paper reports on the authors' experience with a distance learning activity. During the Spring 2000 semester, we were involved in offering and attending a course that was partially delivered at a distance. The student was in the last term of school and needed two courses to graduate. She was presented with an opportunity for a good job near her hometown, which is located about 100 miles from the university. She accepted the job and proceeded to make arrangements for ways to complete her course work. The student was able to independently complete one course by reading the textbook, doing problems and meeting with the instructor once a week.

The second course was an upper division computer science course on networks focusing on the TCP/IP protocol. The course was offered for 2 semester credits and it met twice a week on Tuesdays and Thursdays for 15 weeks. The student completed the course by coming to class (i.e commuting 200 miles) on Tuesdays, accessing the lectures at a distance on Thursdays and sending periodic e-mail messages to the instructor. The student was present in the classroom for all of the exams. There were some group assignments, but the student was able to complete those either remotely or on the days that she was on campus.

Pedagogically, the situation was nearly ideal. The instructor was interested in trying video conferencing as a way to deliver lectures in an advanced computer science course. The student was interested in not having to commute another 200 miles a week. She was very responsible and capable of doing independent work. The adopted textbook for the course, *Computer Networks and Internets* by Douglas W. Comer is well written and closely matches the instructor's perception of what should be taught in this course. Also the instructor and student had experience working together on a project for a previous class.

From a technology stand point, we wanted to use as much off-the-shelf technology as possible. We used Microsoft Net Meeting 2.11 at the transmitting end because that matched the hardware that was available to the instructor. The student's version of Net Meeting was 2.1, but worked with the version hosting the session.

## Technology

We had to find a solution that would allow the student to get the experience of being in the classroom while actually being 100 miles away. Given that the University had experience with Microsoft's NetMeeting product, this software program became the obvious vehicle for our communication during class time. It allowed the student to be able to hear the audio real-time and also to see a picture of what was going on in the classroom. A high speed Internet connection was necessary to support the bandwidth needed for such a connection and to prevent undesirable delays in the audio and video stream of NetMeeting. At the student's site, one such connection was available in the

form of a cable modem with a 3MB download and 0.5MB upload maximum speed. This type of “Internet classroom” would not have been as ideal just a few years ago as high speed Internet connections were less readily available.

The university has very adequate access to the Internet as our campus is fed by a DS-3 (45 Mbps) circuit from the Twin Cities campus and the University of Minnesota system is fed by at least dual OC-3 (155 Mbps) connections to the Internet. Nevertheless, the Internet, being a 'best effort' type of service, led us to experience several periods of congestion.

Every Thursday the instructor had to roll a mobile desktop computer, video camera and wireless microphone into the classroom and plug the whole works onto the Internet. The computer had a special V-tel video board and Apps View proprietary software installed to control the handling of the video and audio signals. The version of the Apps View software that the university has is only compatible with Microsoft's NetMeeting version 2.11 software. Since there are only 10 minutes in between classes at the University of Minnesota, Morris and there is no staff to assist with the weekly setting up of this equipment, it was always a race against time to try to get everything set up before the student would attempt to connect with the classroom computer. Particularly troublesome was the fact that we could not preset the Apps View/Net Meeting software to remember what the audio and video levels should be.

We also experienced other limitations such as the fact that we did not have a camera operator, so the classroom camera remained fixed for the duration of the lecture. Also, if the student and the instructor needed to communicate and the video conferencing equipment was not working correctly, their only choice was to use the Whiteboard built into Net Meeting, as the classrooms are not equipped with telephones.

Each week, instead of having to drive 100 miles to attend class, the student was able to setup her own classroom in the corporate data center. That classroom consisted of a company laptop connected to the high speed Internet connection of a cable modem. To connect, all the student had to do was make sure the laptop had a valid Internet connection, open up Microsoft’s NetMeeting and connect to the static Internet address of the classroom host NetMeeting computer. The only other stipulation was that the classroom computer had to be set up and ready to accept connections. If anything went wrong, the student was unable to connect and would miss class. However, the student was able to keep in communication with the instructor via e-mail and catch up by reading the text.

## Experiences

As the student was entering the field of networking, this experience gave her a chance at a first-hand look at an application that is used frequently as a communication tool in business. The student was also introduced to some of the ways companies secure their networks. Due to her company’s security policy and makeup of the Internet connection,

the student was unable to use the company's primary Internet connection. This was her first look at how increasing security in a network also increases the difficulties in communication. The student was also able to directly apply the material covered in class to her job as a network administrator. The student had a very unique experience by being able to finish her college education while working at her future job.

We had to overcome a number of difficulties in order to get everything set up and running. First of all, we had to test the cable modem connection at the student's location and discover the actual communication speeds to the University across the Internet. We then had to test the compatibility of the systems. Once we were convinced the student's setup was adequate, we had to find a computer that was available, portable, and make sure the appropriate hardware and software was installed to make it able to host the Net Meeting connection. The instructor had previous experience with this type of connection, which proved to be very helpful, and it turned out to be a very useful networking challenge for the student as well.

Although we were able to find a suitable setup, we encountered other problems with our setup. The process was a manual one. Every week, the instructor had to bring the computer into the classroom and get it set up by connecting it to the Internet and power source, booting up the system, and making sure it was set to accept connections before the student could connect. If anything out of the ordinary would occur, the instructor would have to stop his lecture and attend to the idiosyncrasies of the system. The student's laptop did not have a camera and the classroom was not equipped with a telephone line, so when things went wrong, the student and faculty member had to communicate using the whiteboard built into Net Meeting. This allowed for communications, but it also disrupted class as the instructor had to take time to read the messages and respond to the problem.

Even under the best of circumstances, the results were less than ideal. The wireless microphone system failed on two different occasions and the student was unable to hear anything during those two class periods. This made it impossible for the student to follow what was going on in class, so her time was better spent reading the text instead of watching the class period with no sound. On another occasion, the instructor forgot to turn the workstation into 'server' mode, and the student was not able to connect, as the classroom computer would not accept incoming connections. On still other occasions, the bandwidth available appeared to be so restricted, that voice communication was nearly impossible, despite the high speed Internet connections on both ends of the data stream. The video available was also limited. In order to get a wide enough shot to include the entire blackboard in the front of the class, the picture was so small that even if the picture was clear, the writing on the board could not be read by the student. The video feed also was almost always lagging far behind realtime. However, the picture did help by giving the student a point of reference for what was going on in the classroom.

Despite all these problems, the student was able to successfully complete the course through her perseverance and the use of alternate modes of communication such as phone

calls and e-mails. The one class period a week that she did spend in the classroom also proved very valuable as well. It gave her a sense of the direction the class was going, and really made the NetMeeting via the Internet learning experience possible for the other class period. The student saved at least 50 hours of commute time over the semester, and we learned that the technology is not as plug-and-play as vendors would like us to believe. It seems that in order for video conferencing to be successful over the Internet, the technology of videoconference software and hardware will need to become more robust or technical help will be needed continuously in the classroom while a class is in session. Another factor is the variability of services available over the Internet. It seems that unless quality of service (QoS) issues are addressed, we will have to resort to dedicated lines of communication to reliably deliver synchronous classes at a distance. As more Internet service providers make use of the great technological strides that are being made in the field of quality of service, more applications such as this one will become beneficial communications tools, especially in the field of education.

## Conclusion

As more and more people connect to the Internet and use it as a communications tool, they gain access to many resources they never had at their fingertips before. This is especially important for those living in rural areas and wanting to improve their education. Our experience indicates that while it is theoretically possible to receive an education over the Internet, it is not without its difficulties.

A large problem in rural areas is the fact that populations are declining at an alarming rate. People move to more urban areas for greater occupational, lifestyle, and educational opportunities. The Internet brings with it the possibility that people living in even the most remote rural areas can have access to the same opportunities and resources. The inherent benefits for rural and urban residents alike are obvious. Less population movement to urban centers will help to assuage the growing problems of congestion and sprawl, and rural communities may begin to reverse their decades-long decline in population and economic health. Lawmakers from rural areas are keenly aware of the importance of high-speed Internet availability for their constituents in order to maintain the same standard of living as their counterparts in more populous areas. The use of the Internet to access educational opportunities is a logical first step and points to even greater benefits in the future.