

Distance Education Moves into the 21st Century: A Comparison of Delivery Methods

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Abstract

The good news is that distance education provides access to educational opportunities that would otherwise be denied to remotely located students. Even better is that this study shows that the choice of media does not affect the quality of the knowledge transfer. This study compares not only traditional distance education with classroom performance, but also includes an evaluation of courses taught using the Internet and CU-SeeMe® as a means of delivery. We show that the delivery medium does not negatively impact the transfer of knowledge. In fact, the use of virtual groups can enhance the student's experience.

With an effort on the part of the teacher, the disadvantages of the lack of face-to-face interaction can be overcome using new technologies. Is it more work and more difficult for the instructor? Yes. Is it worth it? Yes. As faculty interact with the enthusiasm of most students it becomes obvious that the exuberance is contagious.

Introduction

Many educators have expressed concern regarding the comparative quality of courses delivered through distance education as opposed to traditional means. This paper reports on a set of studies comparing the performance of students and faculty in graduate engineering courses.

The state of Florida currently supports a collaborative initiative among the colleges of engineering to provide graduate engineering education to engineers throughout the state. The University of South Florida offers masters degrees in six disciplines (Civil and Environmental, Chemical, Computer Science and Engineering, Electrical, Industrial and Management Systems, and Mechanical). This is **FEEDS** (Florida Engineering Education Delivery System) and since its inception at USF, over 575 degrees have been awarded to distance education students at the University of South Florida. Three-hundred-seventy-five of these degrees have been awarded by the Department of Industrial and Management Systems Engineering.

To ease concerns that distance education results in a lowering of the quality of education, the graduate degree that is conferred upon completion of requirements is the same degree awarded by the Department to all students regardless of location. Admission and performance criteria are the same for those on- and off- campus. We have found that without direct access to the student's transcript and an in-depth knowledge of the course numbering system, there is no way to distinguish between courses taken using traditional means and courses using a distance education medium.

Many researchers have studied the impact of distance education and the performance difference between distance education students and traditional students. To allay our concerns with quality, the Department of Industrial and Management Systems Engineering at the University of South Florida compared both student and faculty performance. The initial study looked at faculty evaluations and students grades, comparing studio and television audiences. Because the state mandated evaluation system does not discriminate among types of distance education sites, it was impossible to separate faculty evaluations between remote live and remote delay sections. As a result, distance education student faculty evaluations were combined into one group for comparison with traditional student evaluations.

Current Studies

Since the original study comparing studio, live remote and delayed remote, we have begun to experiment with live broadcast using the Internet and CU-SeeMe® (CU-SeeMe® is White Pine's desktop Videoconferencing software for real time person-to-person or group conferencing). University of South Florida, and specifically the Industrial and Management Systems Engineering Department, has been designated as a Beta Test Site and Reflector point for CU-SeeMe®. To participate in the experimental alternative broadcast students at participating sites must agree to the following:

1. The student agrees to use the following minimum equipment (or higher) and not to deviate from it.
 - Hardware: IBM PC or clone - Pentium/100 MHz (or higher)
Sound Card
Video Capture Device listed on the White Pine compatibility list
28.8 Modem (or faster)
 - Software: Enhanced CU-SeeMe® (White Pine version)
Windows 95
2. The student will take the class at the designated site **and** at the designated time unless approved by the faculty member for legitimate business reasons.
3. All course submissions and exams will be supervised and documented by an approved proctor.
4. The student and the designated site will insure Internet access which allows the receipt and transfer of required course material including broadcast and class notes. This may mean alternative access to eliminate difficulties with Firewalls (a security precaution implemented by many companies to keep out certain transmissions) or specific Internet providers.
5. Students must obtain the password and conference number before each broadcast. Without this information, the student is unable to view the class. Such measures are taken to ensure the integrity and security of the course offerings.

Courses were offered in this fashion for the first time Summer of 1997. Forty-one students were enrolled in the first course broadcast over the Internet. Student performances are shown in Tables 1 and 2. Using the X^2 test we are unable to reject the null hypothesis that there is no difference in the grades among the different types of media. Even with the small sample,

we are encouraged to find support for the premise that the media does not impact the quality of the educational experience from a transfer of knowledge perspective.

Table 1
Student Evaluations by Faculty *

	Studio N=10		Remote N=20		Delay N=6		Internet N=5
	Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)
Grade	3.5 (.53)		3.6 (.50)		3.7 (.51)		3.4 (.55)

* Based on 4 point scale: 1=D, 4=A

Table 2
Comparison of Grades
By Site Type

	Studio		Remote		Delay		Internet
Grade	Actual Expected		Actual Expected		Actual Expected		Actual Expected
A	5 6		12 11		4 3		2 3
B	5 4		8 9		2 3		3 2

Observed $X^2 = 7.00$

Critical $X^2 = 15.507$

Note: Actual grades reflect the number of each letter grade actually awarded by the faculty member. Expected grades reflect the number of letter grades that would be awarded if the distributions of letter grades among the various media are the same.

Although the transfer of knowledge is not affected by the media used, we know from previous faculty evaluations and anecdotal information that the media selected does significantly alter the student's perception of the experience (1). As faculty, we agree. The very best learning experience for the student takes place in a face-to-face environment. Both formal and informal interactions enhance the transfer of knowledge. Unfortunately, this is not always possible. Full motion video (i.e., television quality) transmission with real-time two-way audio of the class room is next best. Third, the next best is live Internet with some means of live student participation (i.e., telephone, computer with microphone, or chat board). While the informal interactions may be lessened, students who would otherwise not be able to have access to the material are

able to continue their education. High quality transmissions are an asset in distance education. The less distractions, the better the environment for learning.

However, high quality live transmissions are not always available. The options then are between Internet and tape delay. The advantages of tape delay are that students still have high quality video and are able to schedule the classes to fit in with the other demands of their lives. However, tape delay reduces the amount of interaction between faculty and student, thereby reducing the effectiveness of knowledge transfer. The other alternative, the Internet, provides for the real time interaction at a price (currently) of the quality of the transmission. With the current rate of technology changes, this problem will disappear with the next several years. Internet is an inexpensive alternative to television broadcast.

Students appear to be very receptive of this type of innovation on the part of the Industrial Engineering faculty. Comments received about the course include:

This class was a great experience on virtual group work. My team mates put extraordinary efforts in it.

After taking this course, I see the real benefit of virtual teams. I am presently working on setting up several teams with members throughout Florida. I am presently working on obtaining desktop telecommuting software like CU-SeeMe® for our Departmental use. With some cooperation from our IM group, this may work out. If it does work out, this mode of work design would increase productivity and efficiency and reduce costs.

I added the OP Label (Tampa VA) link last night after class. I am going to attempt to use the Internet to coordinate a project between three VA's (1500 miles apart). I have to admit I got the idea from your class...I will be modifying this as the class continues. Just thought you might like to know that your students are applying what they learn.

Although resources are limited and time to develop courses of this nature can be hard to find, the rewards are compounded when comments from students go beyond the class to "when are you going to do it again?" We plan on continuing the experiment this coming semester. Future plans include broadcasting to dual-enrollment courses at local high schools and providing remote access to various manufacturing labs to both primary and secondary students around the world.

Conclusions

The good news is that distance education provides access to educational opportunities that would otherwise be denied to remotely located students. Even better is that the choice of media does not affect the quality of the knowledge transfer. With an effort on the part of the teacher, the disadvantages of the lack of face-to-face interaction can be overcome. Is it more work and more difficult for the instructor? Yes. Is it worth it?

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References

- (1) Callahan, A.L., Givens, P.E., Weaver, L.A., and Barrett, A.J. 1992. Quality and distance education in engineering. Towards 2000: Facing the Future in Engineering Education. Frontiers in Education Proceedings. November 1992.

Biographical Information

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