Work in Progress - Distance Learning: The Path To Lifelong Education

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Abstract - At the University of Virginia, the School of Engineering and Applied Science established a formal distance-learning program in 1983. Both of us have been teaching in this program for nearly 20 years. Between us we have taught five distinct types of courses, most through multiple iterations. In this paper, we describe our uses of information technology to enhance the learning environment for our students (including solids modeling, finite element analysis, computational fluid dynamics, and statistics and data visualization. We then reflect on the Distance Learning experience from both the professor's and student perspectives.

Index Terms - Distance Education, Asynchronous Learning, Teaching on Television, Academic Outreach

INTRODUCTION

The Commonwealth of Virginia’s Graduate Engineering Program (CGEP) is a cooperative venture among several state universities: the University of Virginia, Virginia Tech, Old Dominion University, Virginia Commonwealth University, and George Mason University. Other schools and industries provide multiple receive sites around the Commonwealth, the Mid-Atlantic region, and now the entire nation.

Through CGEP, we broadcast our regular graduate courses and each class has a local audience of full time graduate students, as well as those students enrolled through the School of Continuing and Professional Studies. This collaboration with other schools, especially Virginia Tech, allows our students (and theirs) access to upper level graduate course that we couldn't otherwise offer.

There are many varieties of distance education, and formal distance learning programs have been around for over 200 years [1]. Our experience has been mostly with televised classes, and recently with asynchronous learning in which classes are available as streaming video on the Internet. But we have both developed computer–based instructional materials, and integrated technology into all our classes [2]. The ideas presented below are the result of our experiences over a twenty-year period teaching five distinct courses (each multiple times), and hundreds of students. The eventual merging of these two technologies (distance education and computer–based instructional materials) will have major benefits for teaching and learning. [3, 4]

ASYNCHRONOUS LEARNING

After many years of teaching in the traditional televised course mode, we decided to try an alternative mode of teaching. Last year the two of us split a time slot: one class each week was done asynchronously; we would record it and post it as streaming video on the Internet. The other class met at the scheduled time: Bob had Mondays and Larry, Wednesdays. Each asynchronous lecture contained material essential to subsequent live classes, and some had embedded (graded) assignments to ensure that they were viewed in a timely manner. For material that is merely lecture or demonstration, the asynchronous mode is perfectly acceptable to the students. Indeed, it may be preferable – they can watch when and where they choose, and repeat some or all of the class on demand.

One of the courses was Creativity and New Product Development. In this course, student teams come up with new product ideas, select one to pursue, design their concept, prototype it, conduct a patent search, write a business plan, and appeal for venture capital. Most of the teams involved members at several sites, functioning as a Virtual Team. For the instructor, a complete change in mindset from the ‘normal’ distance learning’ situation was necessary. The purpose of class meetings was to facilitate interaction, not to cover material.

PROFESSOR AND STUDENT VIEWS

For the professor (at least in our environment), there are two distinct audiences – the local class consists of full time graduate students, and the students at remote sites are generally practicing engineers employed full time in industry or government. They are taking one or two graduate courses each semester – often pursuing a Masters degree.

Teaching a course in the distance-learning mode is an intense experience. For the professor, a single distance-learning course is equivalent to teaching 2 or 3 traditional courses. Those who do it regularly report that they enjoy the experience of teaching in this mode, but when asked how they feel at the end of the semester all report being “tired and drained” This mode of teaching is demanding –especially for those instructors who attract large numbers of students.

Differences between on- and off-grounds students are apparent in motivation, attitude, and interests, but not in academic performance [6]. On-ground students are better at

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analytic skills; they like problems with well-defined solutions, and are uncomfortable with open-ended design tasks. After all, we have been rewarding them for their math skills throughout their education, and they have never had to deal with the ambiguities and uncertainties of real world engineering. In those situations requiring creative thinking, the off-grounds students tend to be better than on-grounds graduate students. They are more aware of the business implications of design decisions.

There is also a difference in what students expect us to know. Regular graduate students expect courses filled with theory and equations. Adult, working students expect that we in the academic world ought to be at the forefront of developments in our fields, particularly with respect to the uses of information technology to solve real problems. Off-grounds students are much more enthusiastic about using software tools. Real working engineers know that computers are important productivity tools and want to understand how to use them more intelligently in their jobs.

In general, off-grounds students like the distance-learning environment more than those on-grounds. CGEP allows them to pursue graduate courses and an advanced degree from the major schools in Virginia without having to enroll as full time students. Charlottesville students have to take an evening class, the class moves at a faster pace, and they have to share their teacher with folks at other sites. Of course they would rather have a traditional class – for the most part. But even some of the local students are taking advantage of the unique capabilities offered by this medium.

LESSONS LEARNED

1. **The teacher matters.** Not everyone can master the medium. Someone who cannot excite a traditional class probably won’t do well in the distance-learning mode. Re-writing your old notes on the screen for a new generation of students is even more deadly than doing it on a blackboard. Motivation and interest are essential. A teacher must have enthusiasm for the medium and an appreciation of the audience. The student really is the customer in this environment, and requires a competent and caring teacher.

2. **Preparation is essential.** The more you can give students in advance the better. We post all of our PowerPoint slides to the class website before each class. When needed, we provide corrections and elaborations after each class. The lecture notes distributed in advance have unsolved problems, incomplete derivations, and exercises to be done during the class.

3. **Watching yourself teach is an enlightening experience.** It can help you improve how you teach. When I teach on TV, I try to watch my tapes on a regular basis – both to see how the class looks to the students and also to update my notes to reflect what actually happened in the classroom. Questions and comments from the students often lead a class in interesting directions. With videotapes, I can follow such paths, and reflect on their impact and significance. No matter where you start from, seeing how you teach will lead to improvements; even a great teacher can get better.

4. **Teaching through a program like this provides a reason and mechanism for continuous quality upgrades of one’s courses** - especially with regard to computers, visualization and communications. This inevitably rubs off on other courses - even those are not taught on TV, including undergraduate courses. You can get away with chalk-and-talk classes with traditional students and assure them you are teaching "fundamentals." But non-traditional adult learners quickly figure out that your notes are 20 years out of date!

5. **Technology makes great things possible,** but a great amount of planning and effort is necessary to realize its potential. In principle, we have the ability to do all the things we know we should be doing. Every principle of good pedagogy can now be achieved in this mode! In practice, we usually don’t have the time and resources to realize all that the medium has to offer. Achieving the full educational potential of information technology will require extensive materials development aided by instructional designers, assessment specialists, and subject matter experts. Such efforts are underway, but the real revolution may occur outside the traditional educational system.

6. **Constant feedback is essential.** The students must be able to voice their problems and concerns. We encourage our students to send us e-mails about the course. We also have an anonymous feedback option available to our students. Finally we both request periodic feedback through formal evaluations and assessments. The students are usually quite clear about what works for them, and what doesn’t.

7. **To offer completely asynchronous classes, we must provide an adequate infrastructure, and a reward structure that encourages faculty involvement.**

REFERENCES


