

Lessons from Teaching a Cost Management Course via Interactive Television

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Abstract

Interactive television (ITV) is being used at the University of Pittsburgh's School of Engineering to increase the number of course offerings available to its graduate students located at branch campuses. Not only has this technology been paramount to extending course offerings not generally available at the branch campuses, but it has also directly benefited students who might not otherwise be able to travel the long distance to the main campus for the course. In the Summer of 1995, the author taught a newly developed graduate Industrial Engineering course entitled "Cost Management for Advanced Manufacturing" using ITV. This paper will begin with a general overview of distance education and specifically describe ITV, the components making up an ITV system and various advantages/disadvantages of the technology. It will discuss the necessary components for effective instruction and learning along with recommendations as to the frequency and type of student feedback required. Finally the paper will describe specifically how ITV was incorporated into the cost management course.

Introduction

The United States educational system is challenged to provide increased educational opportunities without the usual increases in budgets. Many educational institutions are turning to distance education to help address this challenge. The University of Pittsburgh's Department of Industrial Engineering, through its Manufacturing Systems Engineering Program, began using ITV (a form of distance education) in the Fall of 1994 to increase the number of course offerings available to its graduate students located at branch campuses. Not only has this technology been paramount to extending course offerings not generally available at the branch campuses, but it has also directly benefited students who might not otherwise be able to travel the long distance to the main campus for the course. It is an emerging technology which has thus far proven to be a viable means of providing continuous, two-way communication between the instructor and students - both visual and audio.

In the Summer of 1995, the author taught a newly developed graduate Industrial Engineering course entitled "Cost Management for Advanced Manufacturing". Due to an unusually large demand for the course, the class was offered locally, plus at two distant sites - representing the first time in the history of the program where there was more than one site operating simultaneously. The greatest challenges were to make the students located at the distant sites feel that they were a part of the class, and to make the technology un-intrusive or "transparent" to all students - local and distant. This paper will describe lessons from teaching this course via ITV. It will begin with a general overview of distance education and specifically describe ITV, the components making up an ITV system and various advantages/disadvantages of the technology. It will discuss



the necessary components for effective instruction and learning and conclude with recommendations as to the frequency and type of student feedback required. Finally the paper will describe specifically how ITV was incorporated into the cost management course.

Distance Education

Distance education includes instruction where the instructor and student are separated by location and/or time. Examples of distance education include video instruction (which generally involves a separation of time and distance), one-way broadcasts (which generally involves a separation of distance only) and ITV (the subject of this paper, where the students and instructor are separated by distance). Distance education has proven to be as effective as traditional face-to-face instruction when properly implemented. Critical success factors include utilizing the appropriate methods and technologies for the specific instructional task, facilitating student-to-student interaction and maintaining timely instructor-to-student feedback.

In the context of this paper, the term local site will refer to the class location where the instructor is teaching face-to-face. The distant site refers to the class location which is separated by distance from the instructor and hence the students watch the instructor via a video monitor.

Interactive Television

Components of an ITV System

ITV allows visual and audio data to be transmitted between multiple sites via telephone lines. In general, an ITV system consists of video cameras, video monitors, microphones, a graphics stand, a control panel and an operator who manages the control panel and the video cameras. Usually, the instructor uses a lapel microphone while the students share microphones which are placed in various locations throughout the classroom. At the local site, the students can watch the instructor directly and view graphics or the other class on the video monitor. The video monitor at the distant site generally toggles between viewing the instructor, students at the other location and graphics. The decision as to what is displayed on the video monitor is controlled by each site's operator. For example, when the instructor begins talking, the camera may be focused on him/her. Once attention shifts to a specific graphic, the video monitor would toggle over to the graphics stand. Display would then shift to a specific student in the class who is asking a question. It is helpful for the operator and instructor to practice working together so that the operator can smoothly transition the video display monitor to complement the instructor's specific style.

Advantages/Disadvantages

The primary advantage of ITV is its ability to reach students at distant locations - students whom otherwise might not be able to attend the class because of the distance barrier. It allows students at distant sites to be reached with local courses and presenters, while still providing the visual and social "presence" of the instructor and enabling two-way communication with real-time interactivity. Overall, the increased enrollment translates into increased tuition revenue.

The disadvantages of ITV are the system's cost, the advanced preparation time, the physical absence of the instructor and the limitations of the technology. ITV is more expensive than traditional instruction. There is



a non-recurring cost to purchase all of the capital equipment, plus a recurring cost to lease the telephone lines and to staff an operator at each location, Furthermore, the instructor will expend a significant amount of additional planning and preparation time as compared to a traditional class. The instructor should be aware of this ~~upfront~~ and be properly prepared, trained and motivated for the challenge. Because of the physical absence of the instructor, the instructor and the students at the distant site must both be more proactive and aggressive to maintain a satisfactory level of instructor-to-student interaction. And finally, because of the compression and decompression of data across the telephone lines, a few second delay occurs before the receiving site can see and hear the transmission. In other words, motions appear to be somewhat “jerky” and responses to questions appear to take longer. This limitation in the technology, although somewhat distracting at first, becomes less noticeable over time. In addition, continuous improvements in the technology are making ITV more attractive.

At the University of Pittsburgh, the advantages have proven to far outweigh the disadvantages. Thus, efforts are underway to increase the number of courses offered using ITV.

Components of Effective Instruction and Learning

Effective distance instruction and learning requires extra effort on the parts of the instructor and the students. The students located at the local site will naturally feel part of the class. Extra attention, however, should be placed on the students located at the distant site. The instructor should concentrate on making these students feel like part of the local class. For example practice referring to “we” and “our”, when speaking of the class rather than “we” and “them”, implying a separate class away from the local site.

Much of what will be described next in this section is a summary from a training program developed and conducted by the University of Pittsburgh’s Center for Instructional Development and Distance Education and made available to all distance educators

Tips for Being a Successful Distance Instructor

Many of the components for effective instruction in a traditional classroom setting where the instructor and students are both located at the same site, become even more critical when distance enters as another obstacle to the learning experience. Interactivity, which helps to promote active learning, should be incorporated into the class. This is especially important in order to draw the students at the distant site into active participation. Incorporating a mixture of individual and group activities will provide a welcome variety. Examples of activities which promote interactivity include structured notes, labeling a diagram, three point summaries, in class exercises, role playing, progress quizzes, case studies, brainstorming and class discussions.

Obtaining eye contact with the student is important for effective communication. This becomes more difficult for the students located at the distant site. Thus, a conscious effort should be made to make frequent eye contact with the video camera which is equivalent to obtaining eye contact with the students located at the distant site. Communications will be further enhanced if the instructor knows all of the students by name - especially the students located at the distant site. If possible, try to conduct at least one class at the distant site, preferably a class which occurs towards the beginning of the semester. The instructor should plan to arrive early so that he/she has a chance to meet with individual students.

Use body language that says “I am listening”. When a question is asked by a student, repeat the question , before answering it. This will do two things: (1) confirm that the question was understood; and (2) ensure that



other students were able to hear the question. Allow ample time for students to respond to questions. Remember, due to the compression factor, there is a few second delay in the receipt and the follow-up response of questions.

If possible, provide a copy of the lecture notes (overheads) to the students. The notes and any other handouts can be assembled into a packet for students. These packets can then be mailed in advance to a contact at the distant site who is responsible for distributing the handouts as well as collecting assignments, proctoring exams, etc. Another option would be to place the lecture notes directly onto the internet. Although the traditional chalkboard or whiteboard can be used instead of the graphics stand, these mediums are significantly inferior to computer generated overheads or a computer graphics presentation package such as Microsoft's® PowerPoint®. Graphics which are intended to be displayed on the graphics stand should not be less than 24 point font. A nonserif font, one that does not have feet on the base of the letters, will be most easily read. Two good choices would be Helvetica or Geneva. When using paper overheads, black on white is preferred. If using a computer graphics presentation package, bold or white on a dark background is preferred. The visual orientation should be landscape as opposed to portrait.

Establish easy ways for students to contact the instructor outside of class. Examples include email, voice mail, call-in office hours (as well as drop-in office hours) and fax. This will help to give the students located at the distant site a greater sense of equitability for opportunities to access the instructor.

It is important that the students leave the first class with a positive feeling about ITV. In particular, the first class will be the most awkward for everyone. For example, some of the students, especially those located at the local site, may be unaware that the course is being offered to students at a distant site. It will be helpful to initially orient students to the distance learning environment. For example, have the operator pan each site, let the students practice with the microphones, orient them to the video monitors, etc. Begin with a "get acquainted" exercise so that the students get to know the instructor as well as their classmates. Ask students to complete an information card so that the instructor can get to know them more quickly. Establish a procedure on how to communicate on the system. For example, raise your hand (interrupt if you are not immediately seen), and state "Dr. Needy.. this is David in Johnstown and I have a question".

It is advisable that the instructor practices the aforementioned techniques and with the ITV equipment until he/she becomes comfortable. Initially it may all seem somewhat awkward, but with continued use, it should become second-nature. And remember, regardless of how much advanced preparation has been completed, a back-up plan needs to be developed in the event of technical problems which occur outside of the instructor's control. For example, a severe thunderstorm can disconnect communications between the local and distant sites. If the operator is unable to get the communication link re-established within a reasonable amount of time, the instructor may wish to phone the distant site with a contingency plan, such as to continue on with a group activity or to dismiss the class.

Tips for Being a Successful Distance Student

Students need to remember that watching television at home is a very different activity from ITV in the classroom. Generally, when people watch television at home, they are also doing something else, such as reading, eating, etc. Effective classroom learning will require a much higher level of concentration. For example, the student may wish to arrive early to class so that he/she can get settled and find a seat near a microphone and a video monitor. This will help to reduce distractions and allow the student to pay closer attention.



Successful distance learners must be assertive. Questions, comments and especially problems should be brought to the instructor's attention immediately. At first students maybe uncomfortable with this - feeling that they are being rude or interrupting the class. However, if the students are having difficulty hearing the instructor or other students, or if they are unable to see the video monitor or read the graphics, notifying the instructor promptly will eliminate the need to repeat the material.

Students must be near a microphone in order to be heard at the other site. The student should speak in a normal tone of voice. Care must be made to avoid unintentional noises such as a tapping pencil or shuffling papers. These noises can be picked up by the microphones and can be quite distracting.

Finally, students should approach ITV with an open mind and patience. It actually takes longer to deliver instruction to a distant site than in the traditional classroom setting. This is due in part to the necessary confirmations of video and audio reception. Fortunately, the technology is becoming more sophisticated and with increased usage, it becomes easier to use and more "transparent".

Course Feedback

Course feedback should be obtained not only on the traditional factors of instructor effectiveness and course content, but also on the overall experience with ITV such as lighting, noise level, graphics, sound quality and visual. Feedback should be short and frequent, especially in the beginning. More detailed and less frequent feedback can be solicited as the course draws to a conclusion. Feedback should be shared with the students so that they know whether their experiences (positive and/or negative) are shared by other classmates. The instructor should respond to the feedback by incorporating appropriate changes into the class in a timely manner. Feedback on these newly implemented changes should help verify that by "fixing" one thing, something else was not inadvertently "broken".

ITV and the Cost Management Course

Preparation for teaching the cost management course began nearly three months prior to the start of the class with instructor training conducted by the University of Pittsburgh Center for Instructional Development and Distance Education. At this time, the components for effective instruction that were described previously were introduced and practiced. A description of specifically how these components were incorporated into the class follows.

The cost management course met once a week for 15 weeks during the Summer of 1995. A summary of the topics discussed included activity based costing, Japanese cost management techniques, life cycle costing, throughput accounting, cost of quality and financial versus operational performance measures. An interactive activity was designed for each class. For example at the first class every student stepped to the front of the class and introduced himself/herself. The instructor traveled to the distant site on the third class meeting to conduct the lecture. This helped her to get to know the distant students on a first name basis and gave the local site students an opportunity to find out what it felt like to be a distant student. A copy of all the lecture notes were distributed to each of the 51 students at the start of each class. The significant expense associated with this was outweighed by the time savings in note taking, improved clarity of visual aids and due to the large amount of , quantitative material covered in the course. The instructor communicated with the distant students most



regularly by phone and fax. Students had an opportunity to become familiar with the ITV technology through two group projects which each concluded with a final presentation, And finally, two brief surveys and three detailed surveys were conducted during the semester in order to obtain feedback, Results were shared with the students except for the final survey which was not given until the end of the course.

Summary and Conclusions

ITV is an emerging technology which is expected to be used increasingly throughout the educational system. It requires a greater commitment on the part of the instructor and the student. Taking time at the beginning of the course to train the parties, familiarize them with the technology and obtain regular feedback can help to ensure a positive classroom experience and ultimately effective instruction. Conclusions drawn from the author's personal experience of teaching a cost management course in an ITV environment were that it was challenging, yet quite rewarding. The technology provided an opportunity to work with distant students that otherwise may not have been possible.

ITV technology and its use needs to continue to improve. Teams of instructors, students, operators and support staff should critically evaluate courses taught in an ITV environment, document lessons learned and develop new policies, training and the like to facilitate the continuous refinement of this technology.

References

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Biographical Sketch

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Kim LaScola Needy is an Assistant Professor of Industrial Engineering at the University of Pittsburgh. She received her B.S. and M.S. degrees in Industrial Engineering from the University of Pittsburgh, and her Ph.D. in Industrial Engineering from Wichita State University. She has accumulated nine years of industrial experience while working at PPG Industries and The Boeing Company. Dr. Needy is a member of ASEE, ASEM, APICS, IEEE, IIE, SME and SWE. She is a registered Professional Engineer in Kansas.

