Implementing Collaborative Learning in a Distance Education Setting

Mukasa E. Ssemakula

Division of Engineering Technology, Wayne State University, Detroit, MI 48202

Abstract

This paper describes the process that was followed in transforming a course in Statics, previously delivered in the traditional chalk-and-board format, for delivery using live 2-way interactive television. The issues discussed include the instructor’s familiarization with the technology, preparation of new teaching materials and visual aids for the course, and development and incorporation of computer-based animations to enhance student understanding. The paper also describes the use of internet tools to promote peer-to-peer interaction as well as collaborative learning and teamwork in the class. Strategies for adapting standard collaborative learning techniques to web-based and web-enhanced courses and the instructor's role in their successful implementation in a distance education setting are discussed as well. Finally, the paper discusses the administrative procedures that were put in place to ensure smooth running of the class and foster a positive learning experience for both the on-campus and off-campus students.

1. Introduction

A variety of social, economic and technological factors are converging to create increased demand for long distance education. This increasing demand for distance education is in turn transforming how knowledge is delivered to students. Many technologies including videoconferencing, interactive computer-based instruction and web-based delivery are emerging to help address this need. From the instructor’s perspective however, this presents a new challenge. Not only does the instructor need to learn how to use the new technologies, the nature and style of delivery of the course content has to be adapted to the new medium of delivery.

The traditional approach to higher education involves a cohort of students coming together at a specified time in a formal classroom setting to meet with an instructor. In many cases; time, location or cost constraints mean that this traditional approach is not viable and alternative methods have to be applied. Indeed the profile of a typical college student is changing rapidly. As observed by James Duderstadt, President Emeritus of the University of Michigan - Ann Arbor, today’s undergraduate student body is no longer dominated by 18-22 year-old high school graduates from affluent backgrounds. It is composed also of increasing numbers of adults from diverse socioeconomic backgrounds, already in the workplace, perhaps with families, seeking the education and skills necessary for their careers. The challenge for today’s universities is to
provide such students with accessible yet relevant educational programs. WSU has embraced the idea of distance education and has put together a network of interactive television systems using 2-way compressed video, and is also offering a variety of web-based and web-enhanced courses.

This paper describes the process that was followed in transforming a traditional course in Statics, formerly delivered with the traditional chalk-and-board method, for delivery as a web-enhanced live broadcast using live 2-way interactive television. The issues discussed include the instructor’s familiarization with the new technology, preparation of new teaching materials and visual aids for the course, and incorporation of computer-based animations to enhance student learning. The paper also discusses the administrative procedures that were put in place to ensure smooth running of the class and create a positive learning experience for both the on-campus and off-campus students.

2. Learning the Technology

It is imperative that if distance education tools are going to be used, the instructor designing and delivering the course be completely comfortable with the technology. To help accomplish this, WSU makes creation of distance education courses voluntary. I volunteered to develop the our Division's first distance class in Winter 1998. Our Statics course was chosen for this experiment because it is a required course for all students in the Division and hence needs to be offered frequently both at the main campus and at the extension centers.

The university offers training programs to help interested faculty understand the basic mechanics of preparing and delivering a distance learning course. To get myself ready, I participated in a two-day workshop for WSU faculty that was taught by Virginia Ostendorf. This proved to be very helpful. It was particularly eye-opening to realize that the experience of a student taking a distance class needs to be deliberately designed to be different from that of a person watching a scheduled television broadcast. The following characteristics in particular need to be avoided:

- TV is entertainment
- TV requires no action on the viewer's part
- TV is something we can 'tune out' at will
- TV abhors silence

3. Design of Instructional Materials

Most students and instructors are used to the traditional lecture format, which introduces important principles along with examples of applications, with the textbook serving to provide the details and reference material. An instructor can answer questions on the spot and change course if he senses the students are not grasping a particular point. For a distance learning course, especially one using interactive television, the danger is that the instructor can become an entertainer with everything that happens in the classroom revolving around the instructor. If the student is to learn effectively at a distance, the course has to provide a comparable experience for students at both the originating site and the remote site. In particular, learning materials should be designed to capture and retain the attention of students at both locations. The successful distance course should be a multimedia presentation including a mix of the following features:
• Active involvement by students at all participating sites
• Multiple presentation media with planned change elements to help retain student interest
• Planned silences to allow students to think
• Animations and simulations where appropriate
• Actual physical models of reasonable size if possible
• Examples of practical applications

For the particular Statics course under discussion, PowerPoint slides were used extensively. These allow the instructor to plan out the main points of the presentation so that less time is spent in writing and more on explanation. In particular, PowerPoint’s animation capabilities proved to be of great value as they allowed the instructor to present procedural steps in problem solving in a succinct yet fully engaging manner. Consider for example Figure 1, which shows a slide illustrating the relationship between a 3-dimensional force vector and its rectangular components. By presenting the individual elements of the slide in an animated sequence, it was possible to simulate the resolution of the force vector into its x, y and z components. This presents the concept much more effectively than any textbook can. By taking advantage of the capabilities of the medium being used, student interest in, and understanding of the material being presented, is enhanced considerably.

Figure 1: Animation of 3-D Vector Components

Resolving a vector into its components can be viewed as a reversal of vector addition. With the use of animated presentations, this point becomes easy to make. A slide similar to the one above, but using a different sequence in presenting the elements of the figure, would demonstrate this clearly. By contrasting the two procedures on the computer, their essential equivalence is more readily demonstrated than would otherwise be possible in a traditional classroom.

Using computer animations is helpful in making important concepts easily understandable to the students. One disadvantage of this however, is that the students find it more difficult to take notes as the pace of the class tends to be faster. For the more involved animations, I normally give the students a stripped down version of the diagram as a handout. They can annotate the handout as needed while keeping track of the key points of the lecture. This increases the
students’ comfort level and they can pay more attention to the points being made in the lecture. They remain actively involved in the class, while the time required to cover the material is reduced. Figure 2 shows the handout used during discussion of 3-d force components.

![Figure 2: Classroom Handout for 3-D Vector Components](image)

4. Incorporating Cooperative Features

In this section, consideration is given to how collaborative features were introduced into the course, and how these were subsequently incorporated into the long distance version of the course. From early on, I embraced the use of cooperative learning groups in this course. I require students to work in groups for all their homework assignments. This started even before the course was adapted for long distance delivery. I assign the students to their groups taking care to balance membership based on various factors including GPA and gender. There was some resistance to this idea when first introduced but I persevered and at the end of the first semester, most students realized the value of the innovation and said that it helped them learn. One factor that came to light along the way was the difficulty that many of our students had in getting together for their group study sessions. This was an especially important issue for a commuter school like WSU. To help alleviate this problem, I decided to start including 'place of residence' as a factor in assigning group membership. This helped the groups to work more effectively.

In the Fall 1998 semester, we started offering this course as a distance education class with a live section at the main campus one remote site. As the class was transformed from a traditional class to one that included a distance section, implementation of cooperative learning became a major factor in the success of the class. Students at the remote sites usually take fewer classes per semester and consequently have fewer opportunities for interacting with other students. For these students, cooperative groups were helpful in strengthening a sense of community that would have otherwise been more difficult to build. Nevertheless, operation of the groups at the remote site proved to be a challenge because there were fewer natural opportunities in the students' schedules for interaction. Therefore, despite its benefits, working in groups became a considerable burden due to the difficulty involved in getting the group members together.

In Fall 1999, the university adopted a new university-wide web-based instructional conferencing system. The system selected by the university was SiteScape Forum, a product of SiteScape Inc.
For this course, the timing proved to be opportune. I decided to experiment with the use of this new system in the course to help improve the workings of the study groups. Among SiteScape’s features, the one that is most relevant for this purpose is the ability to create sub-groups or teams within a general discussion area. Once a team is created, only team members have access to the team’s discussion area. There are a variety of features within the team discussion area that facilitate teamwork. Specifically, team members can carry out asynchronous threaded online discussions, post documents, edit posted documents (all team members have edit/modify access to posted documents), conduct live chat, set up a team calendar, and even create a team mailing list and a team newspaper. These capabilities are shown in Figure 3. Appropriate utilization of these features helps promote cooperative learning. Experience in this course has shown asynchronous discussion to be the most widely used feature of the system. This was in line with expectations because online asynchronous discussion helps alleviate the need for face-to-face meetings, and this was the main reason for adopting the system to begin with.

![Figure 3: Cooperative Features of SiteScape Forum](image)

Within the course forum, a list of discussion topics is presented. A drop-down "Tools Menu" controls the actions that members can take at each level within the Forum. Each discussion topic is hot linked to the actual content of the discussion together with a cascaded display of the replies to that topic (if any).

5. Implementation Issues

A number of implementation issues arose and these are instructive for implementation of cooperative learning in both traditional and long distance education courses. It is a common temptation for some students to not participate fully in the work of the group. In such instances the problem is that students can get credit for work to which they have not contributed. This is not only unfair to those group members who end up doing the bulk of the work, but it is also detrimental to the lax students themselves since they do not get to comprehend the material as fully as they otherwise might have. With groups based on homework assignments, another temptation is to simply divide up the work, with each member doing just a small portion, and not paying attention to what other members have done. This is possible because unlike an integrated
project, the homework problems are independent of one another. In this case, students can miss out on important nuances contained in the various problems that constitute the totality of the homework assignment.

I have instituted several policies to address these problems. In the first instance, I require the group members to police themselves. Specifically, when a group assignment is turned in, I ask that only the names of members who have actually contributed to that particular assignment be included on the assignment. In other words, one is not entitled to group credit simply by virtue of membership in the group; the credit has to be earned. This simple step has helped to alleviate problems on a number of occasions.

Secondly, I have allocated a significant portion of the final grade (25%) to the performance on the group assignments. This ensures that the students indeed take the assignments seriously since anyone not participating in the group work (and hence not getting credit for the assignments) is guaranteed to get no better than a grade of C in the course. This builds in a major incentive to contribute to the group. What is more, the tests which have to be done individually, are set to be similar to the homework assignments. Consequently, the homework assignments serve as preparation for the tests.

Finally, I have also instituted a bonus system designed to encourage true teamwork. The bonus is presented in the form of a challenge prior to each test. If all members of a team score above a specified threshold level, then, each team member is awarded a set number of bonus points to apply towards that test, over and above their individual score. This encourages team members to cooperate beyond the homework and to help each other in preparation for the tests. My experience so far has been that when some groups receive this bonus while others have not, then for subsequent tests, it gives extra motivation for the group(s) that missed out. Of course this is good news for the instructor.

The incorporation of the online discussion in any class offers many potential advantages including increased access to course information, greater student engagement with course material, more thoughtful discussions by students and increased interaction between students\(^5\). Getting students to participate meaningfully in the online discussions can be a challenge however. A number of strategies have been proposed to overcome this "lurking student" phenomenon\(^6\).

6. Logistical Support

If the class is to progress smoothly, it is important to have good logistical support. For our purposes, we have used various levels of logistical and technical support to ensure smooth running of the course. For example, class handouts are sent to the administrator of the remote site in advance of the class in which they are going to be needed using either fax or email. A similar approach is used for handling homework assignments and examinations. This has been found to work quite satisfactorily.

Additional technical support is available at both the originating site and the remote site to take care of equipment related issues. The ability to videotape the class during transmission is highly
recommended in case the connection to the remote site is lost. This serves as an effective backup. Things indeed do go wrong from time to time. In the same vein, when a presentation relies heavily on the use of a computer, backup materials that can be used with the simple overhead camera should always be available. It is not unknown for a computer to malfunction and, as happened to us on one occasion, for the technician to be absent on just the day that the malfunction happens to occur. The advice here is to be prepared for the unexpected.

A final issue that specifically applies to the use of online discussions is to ensure that the product used works well across a variety of platforms. The instructor has little or no control over the capabilities of the equipment that students use. On one occasion for example, we had a frustrated student saying that the SiteScape Forum was not functioning correctly. On close investigation, it turned out that the problem was due to the configuration of the student’s computer.

7. Conclusion

The experience gained in adapting the Statics class for distance delivery was quite valuable. The nature of the materials used in the classroom had to be changed to meet the needs of distance education. The move to a largely PowerPoint based delivery made possible the use of slides, handouts and animations in a manner that had not been tried before in this course and students were able to learn more effectively as a result. Incorporating collaborative learning features proved more challenging with the distance section. However, the use of online tools helped to alleviate the major issue of students having difficulty meeting in face-to-face study sessions. Our experience indicates that implementation of collaborative learning has to be monitored carefully for both traditional and long distance courses to avoid potential abuse.

References


Biographical Sketch

Dr. Ssemakula graduated from the University of Manchester Institute of Science and Technology, UK, with a Ph.D. in Mechanical Engineering in 1984. He joined the Wayne State University in 1993 and is currently teaching courses in Manufacturing/Industrial Engineering Technology. His has research interests and has published widely in the areas of Manufacturing Systems and Computer Aided Instruction.