Distance Education Tools for Engineering

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Abstract - **Frequently within distance education it appears that the only system of significance or interest to many administrators and faculty is how many classes are being offered, the course management system, and the technology of course production. Clearly there is a need for this information and the different types of training for faculty and staff, but the presentation of material for distance education courses has been largely ignored, especially within engineering. This paper looks at two tools used by most distance education engineering courses – interaction and PowerPoint presentations. Interaction is a strategy to engage learners in thoughtful responses to the instruction and aids in the transfer of knowledge. Interaction occurs naturally in a face-to-face classroom, but with distance education it needs to be planned. The second tool is the PowerPoint presentation. In the 1980's and 1990's the delivery of distance courses by engineers was characterized by the "hairy arm" picture. Today presentations are characterized by the ubiquitous and often poorly designed PowerPoint. Not only is it used by engineering professors but also PowerPoint has become a staple of corporate life. These tools are presented with thoughts on how to use them and meet the objectives of the course.**

Index Terms – Distance Education, Interaction, PowerPoint, Student Learning.

INTRODUCTION

Distance Education is not a new concept. In the late 1800s, at the University of Chicago, the first major correspondence program in the United States was established in which the teacher and learner were at different locations. As radio developed during the First World War and television in the 1950s, instruction outside of the traditional classroom had suddenly found new delivery systems. There are many examples of how early radio and television were used in schools to deliver instruction at a distance.

In 1982, the International Council for Correspondence Education changed its name to the International Council for Distance Education to reflect the developments in the field. With the rapid growth of new technologies and the evolution of systems for delivering information, distance education with its ideals of providing equality of access to education, became a reality.

Initially engineering graduate programs were at the forefront of offering courses at a distance that were video based. These programs began in the mid 1960's with the Genesis Program in Florida, which was initially designed for engineers at the Space Coast, and was phased out in the 1970's due to lack of funding. The Florida Engineering Education Delivery System (FEEDS) was established by the Florida Legislature in 1982, to deliver engineering education, primarily at the Masters level, to engineers throughout the state at their place of work. FEEDS, operating as a technology based delivery system, is a product of the cooperative efforts of the State University System, private universities, and private sector industries located within the State of Florida   In the 2003-2004 academic year 570 courses were offered at the graduate and undergraduate level.

The National Technological University (NTU) was founded through the sponsorship of IBM, Motorola, Hewlett-Packard, and Lockheed Martin at about the same time. Direct satellite broadcasts were produced by more than 20 of the country's major universities to provide at one time over 500 courses in engineering delivered live by satellite. NTU is now operated by Walden University.

"Both fully online and blended course offerings have grown dramatically in American higher education in recent years." [1] Blended (or hybrid) courses are defined as courses that combine online and face-to-face instruction. Online courses may combine streaming video in front of face-to-face students, streaming video with no students present, and written material. Course offerings in higher education show that in Fall 2004 at the undergraduate level 88.5% of the courses were delivered face-to-face and at the graduate level 39.7%. [2]

Even though engineering was at the forefront at what we know as distance education today, many professors have just adopted the same techniques used in face-to-face classes for their distance presentations. Although no ideal model of distance education exists, several models are innovative for very different reasons. Some researchers and practitioners feel that to be successful, distance education must replicate face to face classroom interaction. Others assert that learner characteristics diminish the need for real-time interaction. In delivering any course the faculty member is the key for the content presentation. Communication, interactivity with students, and removing obstacles to the student's learning may be the responsibility of the faculty member or of the

delivery system, which is the pipeline for presenting the instruction, and good instruction can be designed for any delivery system.

This paper looks at two tools used by most engineering courses – interaction and PowerPoint presentations. The first tool is interaction. Interaction is a strategy to engage learners in thoughtful responses to the instruction and aids in the transfer of knowledge. Interaction occurs naturally in a face-to-face classroom, but with distance education it needs to be planned. In the 1980's and 1990's the delivery of distance courses by engineers was characterized by the "hairy arm" picture. Today presentations are characterized by the ubiquitous and often poorly designed PowerPoint. Not only is it used by engineering professors but also PowerPoint has become a staple of corporate life. These tools are presented with thoughts on how to use them and meet the objectives of the course. This paper is not intended to be an exhaustive paper on interaction and PowerPoint, but is intended to give the reader tips for their use in engineering distance education courses.

INTERACTION

Research has shown that interaction is a major component of instructional design for distance education and for learning effectiveness [3] Interaction is divided into these areas:

- Teacher to student
- Student to Teacher
- Student to student
- Learner to instructional materials [4]

Each type of interaction plays a role in the educational process. Distance courses use self-directed learning activities that are designed to help the students understand the material better. Students are used to being passive viewers of instruction. To encourage learning, approaches to get students actively involved in the class must be designed into the instruction. This may be done by creating interactive class activities that can be used for both distance courses and traditional courses. In face-to-face classes this usually occurs naturally. In distance classes the interaction needs to be specifically designed for the class.

Within distance education many times it appears that the only system of significance or interest to many administrators and faculty is how many classes are being offered, the course management system, and the technology of course production. Ultimately, the primarily challenges facing today's instructors of distance courses are not technological, but involve the component of social interaction.

Students can learn and do learn irrespective of how they learned in the past and what they are accustomed to. The different modes of delivery work for the students once they are familiarized to it. Some delivery methods are better than others. Students do care about interactivity and interactivity may be built into a class regardless of the mode of delivery.

Professors need to ask questions that promote discussion whether in a face-to-face class or a distance class.

Students appreciate and enjoy the learning process to a greater degree when they have the opportunity to share with their instructors and peers. [5]

Milheim [6] cites the following benefits to interactive learning:

- Increased student interest
- Higher cognitive processing
- Development of cooperative learning skills
- Teacher involvement
- Curriculum intergration, and
- Teacher/student collaboration

It is up to the professor to play a key role for the interaction within the course. Distance engineering classes, both graduate and undergraduate, can incorporate some of the interaction techniques within their classes and this will create a sense of community within the course and enhance learning effectiveness. The following include different types of interaction techniques: [7],[8],[9]

- **Acknowledge student response**. Whenever a student writes any type of communication to the professor, it should be answered. In face-to-face communication there are physical acknowledgments as well as verbal responses. At a distance there needs to be some type of response by the professor as short as "thank you", "that is interesting" or many other simple statements. The key is to be sincere and share positive comments with each student.
- **Use the discussion boards** within the course management system. If there are not too many students in the class, these discussions may be required as class participation.
- **Integrate stories into class discussion**. Students need to be encouraged to express personal experiences that relate to the material studied. Relating on a personal basis assists the student in learning. This may be set within the course management discussion.
- **Adapt assignments with student work responsibilities**. Many graduate and undergraduate engineering students are working or have worked within the engineering field. Assignments related to their employment experience may be geared within the discussion page or as a free standing discussion by the professor.
- **Use of the Internet**. Additional materials for all types of courses are on the Internet. This might be a search or looking at papers or videos produced by another source.
- **Use of the Delphi Process**. Within this process the instructor becomes the Delphi coordinator and all the members of the class are the participants. The questionnaires are submitted via electronic mail to

the class as an expert panel, and each class member submits their response back to the instructor alone. Based on the results of the first questionnaire, a second questionnaire is sent to the students and then returned to the professor for analysis. Based on the two (or more) questionnaires a decision can usually be made. The key to this technique is the formulation of the original question.

- **Use of Virtual Teams**. All the students in the class are divided into virtual teams of approximately five students per team. The basic elements of the virtual team process include [10]
    1. *Communication*
        - Give the team a name.
        - Develop list of key players, and contact information.
        - Develop a clear statement of purpose. (Even when the team receives its purpose from the professor, a team must interpret and express it in its own terms.)
        - Set up delivery dates.
        - Select a leader for each phase of the project.

    This level of detail might be all that is needed within a semester course. It is not wise to burden a short and simple project with a few members with unnecessary planning.
    2. *Planning*
        - Agree on tasks.
        - Clarify responsibility within the group and identify leaders for the tasks.
        - Create a plan for what kind of technology you will be using within and without the group.
    3. *Managing*
        This is the action phase.
        - Review your process and create a model for the control of the various tasks.
        - Review technological tools, and organizational system.

POWERPOINT

The tool most often used by engineering professors in class, making conference presentations, or in the corporate world is the PowerPoint. To many professors this takes the place of an overhead transparency or writing with a document camera. PowerPoint is a wonderful tool, but often the slides are poorly designed. Engineering professors of today are rarely schooled in using PowerPoint as are the grammar school students of today.

One of the first things to consider is who is the audience? These tips are mainly directed to the engineering professor giving the lesson content for courses, but some of the same ideas may be applied to conference presentations. The audience in the distance class is usually seeing them on a laptop. The slides need to be clear and to the point. What counts is the content. There is no truly right or wrong way, but what is given here is what has worked for many people.

Here are some tips to remember regarding presentations: [11],[12],[13]

- As in all lectures there most be **a logical flow** to your presentation, not just a series of bulleted lists. Tell the students what you are going to tell them, tell them, then tell them what you told them. In doing this the slides must be readable within the classroom and on the laptop.
- Make your **presentation readable**. Title: 44 font bold and shadowed
Text: 36 font bold and shadowed
Arial or Times New Roman or Comic Sans MS font or another clear font
- **Avoid sentences, paragraphs, or long blocks of text.** If you must use a paragraph, use an excerpt or a couple of sentences.
- **Avoid "title capitalization"** unless it is a title. Sentence capitalization is much easier to read
- **Fancy slide transitions and fly-ins get old quickly**. Keep things simple. A basic dissolve from one slide to another is sufficient. Have all your bullets appear at once rather than one at a time. Avoid sound effects—they serve no other purpose than annoying the audience and distracting them from your presentation.
- **Expand one slide into two**. If your text does not fit well on one slide, split it into two slides. Click at the end of the last item you want on the first slide and press the ENTER key.
- **Use the slide master for consistency**. Start with the slide master to set up the layout for your slides and create a coherent consistent look. Format the background, specify the color scheme, select fonts and bullets, add text animation and logos, and insert slide numbers or other repeating text. (View, Master, Slide Master)
- **Choose your background based on the room's lighting.** While conventional wisdom is to design with a dark background when you plan to project your slideshow onto a screen, in reality, the best background has to do with the presentation location. Although light text on a dark background looks best in a dark or slightly darkened room, in a light room the dark background may look so faded that light text may not show up as well. For this kind of situation, it doesn't hurt to try a dark text on a lighter background.

- **Black or white out a screen.** If you stop to discuss a point and do not want people staring at the screen, black it out. Press <shift> and B key. In a light room, you can also white it out - press <shift> W. Press B or W again to continue your presentation.
- **Keep the format of the visual aids the same** throughout your presentation. Do not switch from horizontal to vertical layouts. Be consistent in your format, color, and style.
- **For optimum readability**, have the text of your visual aids set flush left, ragged right (that is, non-justified).
- **Avoid reading your slides**. Slides supplement your lesson, not the other way around. Remember you deliver the content, not the slides..

CONCLUSION

Although using interaction within a Distance Education course is more time consuming to prepare than in the traditional classroom, it is a worthwhile process. Students participating in these different interactions become active participants, rather than passive learners and using well constructed PowerPoints makes the lecture more compelling. These two tools discussed should increase the learning of the student and enable the students to better meet the learning objectives of the course.

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