Distance Education Options for Engineering Education

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ABSTRACT

The world of education is changing just as every other area of our world today is changing due to the increasingly technically driven, fast-paced world around us. People today are busier and more technologically proficient than they were twenty, fifteen, or just one year ago, causing increasingly new demands for beginning, continuing, and advance education from engineering and technology instructors and schools.

In today’s cyber-based society, student demands for engineering and technology education is not only increasing, but evolving from the traditional face-to-face classroom instruction, to an up-to-date, just-in-time, on-demand distance education style of instruction. More and more individuals are seeking alternatives to traditional classroom instruction in order to meet various professional and personal demands such as currency with technology and family.

In order to keep pace with the changing educational demands of today’s society, the professional education community needs to respond with innovative, comprehensive, content-focused distance learning alternatives for the courses we offer to the students in engineering and technology.

Until recently, distance education was viewed as a viable option by a small percentage of engineering and technology instructors due to the strict guidelines that must be adhered to in order to meet accreditation and other regulatory requirements that are an intricate component of engineering and technology education. Currently however, distance education is being used successfully not only by trainers in industry, but by many professional educators in the engineering and technology fields. These educators are providing new opportunities for individuals to expand their knowledge in their field of interest, while providing programs and coursework that satisfies accreditation, certification, and other regulatory requirements for students and professionals in the fields of engineering and technology.

This is a time of phenomenal opportunity for engineering and technology educators to take a leadership role concerning the implementation and usage of distance education in our fields. As educators, this venue provides us with the opportunity to develop courses and programs that will allow a variety of individuals enroll in engineering and technology education programs using a convenient, but comprehensive format that differs from the traditional classroom. This new and innovative educational format allows a person to receive the benefits of interacting with professional educators, but without the burden of tradition classroom education that usually causes one to tremendously re-arrange their lives and career to achieve their educational goals.
The author shares her knowledge and various techniques in distance education for engineering and technology instructors to use in order to establish distance education formats for their courses and programs. It is the goal of the author to encourage engineering and technology instructors and schools to become a leader in engineering and technology education by implementing distance education in their curriculum in an effort to meet the changing demands and needs of today’s student, plus enhance enrollment and student diversity in the programs their institution offers.

INTRODUCTION

Currently, the majority of instruction is provided using the traditional classroom style. This means that for every course offered the student and instructor must meet at a scheduled time, at a specific location, for a specified time period, for a certain finite length of time. There is limited flexibility for the student and instructor in this situation, causing a tremendous amount of pressure on both parties to re-arrange other obligations around the rigid schedule of classes provided.

In addition, engineering and technology programs cannot ignore the accreditation and regulatory standards pertaining to their curriculum. It is a common belief that due to this external oversight, distance education programs are not a viable option for engineering and technology educators. However, successful alternatives have been, and are being developed that remove the current in-class only instruction method, allowing engineering and technology programs to take advantage of the flexibility that distance education models provide.

This paper addresses the issue that distance education is a viable instructional method for engineering and technology instructors, not just an elite few programs. While every institution and every instructor has different abilities and resources, the key issue is to view distance education as a valid educational method that provides an opportunity to promote the fields of engineering and technology through an educational method that makes education more accessible to individuals in our world today.

CURRENT SITUATION

When most people think of distance education today, the first images that come to mind are traditional correspondence courses, and the ever-so-popular Internet courses, where the student has the sole responsibility for success or failure concerning the material being taught. There is no interaction (or very minimal interaction) between the instructor and student.

While these methods are effective for a portion of the student population today, most individuals desire more in-depth learning, which includes interaction with an instructor and other students, but in a format that works in their hectic schedules due to the fact that individuals increasingly have more and more personal and societal responsibilities. Today, students want the education they would receive by attending the traditional classroom, but in a format that makes it more feasible for them to achieve their goals without causing undue hardship as it relates to responsibilities and challenges they face both personally and professionally.

The challenge engineering and technology educators face is how do we keep the academic integrity of our course work, while at the same time meeting the prescribed criteria accreditation and regulatory requirements that overshadow our entire curriculum, through distance education programs. The answer is to view distance education as an opportunity to enhance our students’ ability to learn in a format that differs from the traditional classroom setting we all know and use so well.

CURRENT DISTANCE EDUCATION METHODS

A recently conducted needs assessment of current and potential aviation students at the Indianapolis
location indicated high interest in distance education courses. This assessment also showed that majority of students do not want the traditional correspondence courses with minimal instructor contact, but courses where frequent interaction is available between the student and the instructor, and whenever possible between students themselves. Additionally, a majority of these individuals favor the ability to receive training to successfully complete the required criteria in order to test for FAA (Federal Aviation Administration) certifications, without the burden of daily or weekly in-class attendance. While this may seem somewhat far-fetched, the FAA has approved various certification, renewal, and currency educational/training programs that have a distance education format.

Distance education programs give engineering and technology instructors and schools the opportunity to provide academic courses, certification/renewal training, and degree programs to individuals who are geographically separated from the school’s location. This is an important issue for a large number of individuals, since they want to receive specific coursework from a specified institution due to the institutions reputation in a select field by industry, and the academic excellence of the course work provided. The newest distance education programs have incorporated designs that are learner-centered. This means that not only is the instruction provided to the student at a distance, but other educational and student support activities are focused on facilitating learning among students at a location other than an on-site classroom or laboratory.

The distance education designs that are found to be the most effective in today’s learning environment are ones that have integrated systems. These programs have numerous varieties of information exchange and communication between the student and the instructor, the student and other students, and the student and the institution. The distance education curriculum currently offered have been carefully developed in order to meet all traditional curriculum goals and objectives, while at the same time expanding the reach of each institution to populations of students that were previously unable to pursue an education with their institution or department due to the time and geographic requirement of in-class, on-site lecture attendance.

The most advantageous design for distance education is referred to as “on-line instruction” (one of the four common distance education modes of delivery). This is considered the truest distance education format, due to interaction that occurs between students and instructors. With today’s technology numerous engineering and technology courses are able to reach individuals in far-off geographic locations at times convenient to each student, and are less restrictive on the instructor. Each course is designed as a package that allows students to complete the material at their own pace. Most schools put an overall time limit, (such as one year from the course enrollment date) for the course to be completed, but do not dictate any other deadlines such as exam dates, assignment due dates, or semester dates. Instructor and student communicate electronically, and may or may not meet face-to-face. The student must have access to a computer and have adequate computer skills to effectively take and complete this type of course.

The other on-line instruction format that has received positive feedback from participating students, has the same design as above, however there is a time limit imposed on the students. For a large population of students, this is a preferred limitation due to the difficulty for a majority of individuals to perform coursework at a set pace on their own.

AN EDUCATORS’ RESPONSE

The world of distance education is not on the far-off horizon of the future, but is here, and as educators we need to embrace these new modes of learning delivery and make them available to our students and the general population of individuals interested in enhancing their engineering and technology
knowledge, or wanting to enter one of these exciting fields. However, the task of developing, funding, and coordinating a distance education program may seem too monumental for one instructor or institution to undertake in addition to one’s already intense workload and limited funding. Even though this is a true statement of our current conditions, we cannot afford to ignore the future of the field of education that is distance learning.

An effective way for engineering and technology instructors and institutions to take advantage of distance education delivery modes is to join together and develop courses / curriculum as a unified consortium with others at their institution and/or department. Each member offering their expertise in their area, while drawing on the strength of other member instructors and institutions that have other resources to support a distance education program.

Various engineering and technology instructors and institutions have successful distance education programs in place. These entities can be used as advisors and mentors to those instructors just entering into the development of comprehensive distance education programs. In addition, these instructors and institutions can serve in the leadership role for developing and promoting distance education in the field of engineering and technology.

Concerning specific courses and curriculum related to accreditation and regulatory oversight, it is the author’s contention that distance education can be used effectively as a component of the curriculum. The challenge is to select the appropriate knowledge areas of the curriculum that can effectively be taught through a distance education delivery system. It is also recognized that due to the hands-on nature of a portion of many engineering and technology courses there is a need to be delivered in the traditional format initially, while partnerships with industry and other educational institutions are pursued to extend the distance education system into the entire engineering and technology curriculum.

As educators we cannot ignore distance education, we must embrace it and work with those who are pioneers in the field to meet the educational needs of our students and industry.

**CONCLUSION**

Contrary to the opinion of many educators today, distance education is not a fad, but a mode of delivery that is here to stay. However, distance education programs must be designed and monitored to maintain the academic integrity the field of engineering and technology education has established in our educational curriculum. We cannot sacrifice this integrity, just to “hop-aboard” the distance education bandwagon. In contrast, we cannot afford to wait for the pioneers of distance education to establish a flawless delivery system; we must join them in their efforts in order to become the distance education leaders of engineering and technology education.

As we move to distance education, it must be understood that this is no a simple undertaking. As instructors, we will require funding and time to develop and implement distance education courses and curriculum. This cannot be viewed as an additional assignment to an already hectic and heavy course load of full-time instructors, but must be viewed as an option worth extensive time and effort to develop. What this requires is support from the departments and institutions not only in financial resources, but also in development and implementation time for the instructors involved.

We do need to be understand that distance education will not replace the traditional classroom, instructor – student mode of delivery. Distance education needs to be viewed as another education delivery model, that is not the one and only answer to the changing, technologically enhanced world of education toady. Some of engineering and technology courses and laboratory work will need
to be developed in partnership with several institutions and/or with industry partners to provide the hands-on training and processing necessary. These are not concepts of the future, but are actual programs that are up and running successfully today.

Today’s students are demanding a change to traditional educational delivery methods, and we must respond. The time for action is now, and even with the unique challenges we face, the engineering and technology community will be successful in the distance education arena as we respond with the same depth and expertise we always have when we have been faced with new technological advances.
Appendix A

Distance Education Delivery Matrix
## Modes of Distance Education Delivery

<table>
<thead>
<tr>
<th>Delivery Mode</th>
<th>Description</th>
<th>Items Required</th>
<th>Comments</th>
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<tbody>
<tr>
<td>On-line Instruction</td>
<td>In-home delivery of course information to individual via computer; no scheduled class time interaction; student driven and motivated; normal time-frame is one year from time of course enrollment; minimum instructor – student interaction, student – student interaction, or student – institution interaction</td>
<td>Personal computer access Basic computer / Internet skills Internet access</td>
<td>Optimum distance delivery design. Allows autonomy for students, while still providing the needed connection to the instructor and other students. Best designs impose a time limitation of one semester or less. Diversity of student population has highest potential.</td>
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<tr>
<td>Electronic Courses</td>
<td>Curriculum is student-paced; student receives pre-packaged course materials and computer software; minimum instructor – student interaction, student – student interaction, or student – institution interaction</td>
<td>Personal computer access Basic computer skills</td>
<td>Allows for autonomy, but removes the interaction element which is an important factor in the learning process, whether in person or through technology. Diversity of student population has enhanced potential.</td>
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<tr>
<td>Interactive Audio – Video Classrooms</td>
<td>Multiple locations of same class; students required to be in physical attendance (same as in-class learning); instructor is physically in one location and is broadcast to other locations simultaneously; students interact with instructor through audio set-up (telephone)</td>
<td>Technologically equipped live instructor site (originator) and receiving locations Two-way communication</td>
<td>Mode requires student attendance. Promotes some diversity in location or population, however physical attendance is still required for success. Diversity of student population has potential, due to various physical locations.</td>
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<tr>
<td>In-Class Learning Technology Assisted</td>
<td>In-class lecture (and laboratory) is the primary delivery system; some type of electric interaction is done between instructor and student outside of normal class / laboratory time (usually email).</td>
<td>Computer with email capabilities Fax machine Telephone</td>
<td>Mode requires student attendance. Physical attendance is required for success. Not a true method of distance education.</td>
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References


