

Distance Learning for Continuing Education – What Engineers Want

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Abstract

An educational needs assessment was distributed to practicing engineers to evaluate interest in continuing education offered through distance learning technologies. Responses to the assessment indicated preferences of practicing engineers for programs related to engineering management, computer science and engineering, and mechanical / manufacturing engineering. The assessment also indicated that engineers prefer technologies that are computer-mediated.

1 Introduction

The need for continuing education of practicing engineers has been documented and the barriers to wide spread participation in programs has been identified ^{1,2}. Many educational institutions see distance learning technologies and teaching strategies playing a significant role in overcoming barriers to participation ³. To help quantify practicing engineers' interest in continuing education offered through distance learning, an educational needs assessment was developed and distributed to approximately 1,000 engineers. The assessment evaluated: learner characteristics and resources, content areas, preferences for distance learning delivery technology, importance of credit-granting programs, and acceptance of distance learning.

2 What We Learned

60% of the engineers responding to the assessment indicated high or moderate interest in participating in continuing education over the next three years. 47% had participated in continuing education or graduate study in the past three years. The responses indicated that 95% of this population have access to a "Pentium PC" or equivalent and 88% had Internet access.

The survey asked individuals to indicate interest (none, slight, moderate, or high) in seventeen distinct content areas. The responses were filtered to only include those individuals with high or moderate interest in professional development programs over the next three years. This data was then analyzed to determine the most requested content areas. These are shown in Table 1.

Area	Interest
Engineering Management	62%
Computer Engineering	41%
Computer Science	40%
Mechanical Engineering	35%
Manufacturing Engineering	34%

Continuing education can take several forms including formal graduate coursework and non-credit professional development programs. The needs assessment sought to quantify interest in various options. Responses are shown in Table 2. As with other survey questions, an individual's response was not limited to one type of program, therefore total percentages indicated in the table are greater than 100%.

Table 2 Program Preferences

Program	Interest
Non-Credit Professional Development	88%
Individual Course for Credit	59%
MS Degree	45%
Graduate Certificate (for credit)	43%
PhD Degree	18%

Universities use a variety of technologies to deliver courses via distance learning. The needs assessment measured interest in a number of these technologies. Table 3 lists the preferences indicated for distance learning technologies.

Table 3 Technology Preferences

Technology	Interest
Internet	92%
CD ROM	92%
Videotape	76%
2-way Video	62%
Audio + Computer	59%
Satellite	50%
Two Way Audio	38%

The nature of distance education is such that the instructor and students are physically separated possibly resulting in barriers to effective interaction^{4,5}. The needs assessment provided a qualitative evaluation of the relative importance of various factors germane to distance learning. Table 4 lists factors that deserve special consideration in delivering continuing education through distance learning.

Table 4 Distance Learning Factors

Very Important	Not Important
Flexible course and program time and location	Interaction with other students during course presentation
Scheduled opportunities for interaction with instructors	Interaction with instructor during course presentation
Flexible completion time	Traditional university calendar
Technical support	

This table illustrates that while it was very important to have scheduled opportunities to interact with the instructor the practicing engineers did not feel this interaction needed to coincide with the class presentation.

3 Changing the Culture in Engineering Education

To have effective continuing education programs, engineering colleges will have to be responsive to the needs of practicing engineers both in content areas and delivery of the content⁶. Engineering colleges need to offer more non-credit professional development programs designed to provide pragmatic job skills as opposed to only offering graduate course work². Based on results of the needs assessment, delivery via the Internet provides the greatest potential opportunity. Certain media-rich programs will likely require CD-ROM delivery until sufficient bandwidth is commonly available to support video or until new technologies emerge^{7,8}.

Identifying content areas of interest is straightforward, however, recruiting faculty to participate in these programs is more of a challenge³. Presenting content via distance learning technologies is new to most instructors and developing materials to be presented via technology requires significant effort^{9, 10}. Once the presentation materials are in an appropriate (electronic) form however, these materials can be formatted and packaged for delivery via computer-mediated delivery or video-based delivery.

The needs assessment clearly demonstrated the desire of practicing engineers to have continuing education available without many of the constraints of the traditional university system. The study found that these potential students did not want to be constrained to the academic calendar, nor did they want to be constrained in time or place that a course is offered^{11,12}. Colleges face a significant, internal change in culture to make programs available using a non-traditional educational structure. While it is appropriate to impose some constraints to encourage timely completion of a course, these constraints should not be those associated with the traditional on-campus students¹⁰.

Practicing engineers felt that scheduled interaction with the instructor was very important but not necessarily during the presentation of the course. Rather than interact with students during class, instructors can establish “virtual” office hours when they can be contacted via phone or email. Technology allows instructors to collect email from students and provide a common response to all participating in the course. To encourage active participation, it is often necessary to purposefully design elements into the distance learning course that promote and prompt interaction^{4,13}.

The needs assessment highlighted the need for technology support for distance learners. This will be particularly important for courses delivered via computer-mediated technologies. Distance learners will need technical support in a variety of areas, including: email, Internet access, downloading computer files, software problems, access to resources, etc. Given the previously stated importance of anytime, anyplace access, this support will have to be available seven days a week, twenty-four hours a day.

4 Conclusions

Practicing engineers need and desire continuing education that allows them to contribute to the technical workforce and to the success of their organizations. Engineering management and computer science are two areas of particularly significant interest. Well-designed distance learning programs, especially those that are delivered via computer-mediated technologies, provide the opportunity to increase the number of engineers participating in continuing education.

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