

FEEDS: An Innovative Approach to Continuing Education and Professional Development

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One-third of this nation's professional engineers in state, county, and city transportation agencies will retire during the next decade. To counter this problem, innovative approaches to transportation engineering continuing education and professional development must be developed. The use of tutored videotape instruction technology such as the Florida engineering education delivery systems (FEEDS) is a low-cost and effective approach for a continuing education and professional development program. FEEDS has demonstrated the success of one relatively inexpensive state system that allows access to the combined strength of seven engineering colleges in this area of scarce resource.

The Florida engineering education delivery system (FEEDS) is a cooperative effort of the following six colleges of engineering: Florida International University (FIU), Florida Atlantic University (FAU), University of Central Florida (UCF), University of Florida (UF), University of South Florida (USF), and Florida State University/Florida A&M University (FSU/FAMU). The other two state universities, the University of North Florida (UNF), and the University of West Florida (UWF), are participating in the delivery of the engineering programs.

FEEDS has been developed in response to the needs of engineers working in industry and government for access to quality graduate continuing education and professional development programs. It is recognized that ready access to the highest quality engineering education by people all over Florida will play an important role in the growth of the economy in the state. FEEDS is to provide this access. The innovative use of television, live and recorded, and computer-aided communication brings students and teachers together intellectually regardless of location (1).

Because of recent trends reflecting an alarming decline in the number of transportation engineering students entering and graduating from our colleges and universities (2), it is critical to find new and innovative approaches to transportation engineering continuing education and professional development programs. FIU's experience in using FEEDS to successfully reach practicing transportation engineers all over Florida is examined.

BACKGROUND

FEEDS was developed as a result of efforts by leaders from industry and government, working closely with the State University System (SUS). The people who produced FEEDS are committed to effective university-industry interaction to foster lifelong learning for engineers and scientists all over Florida. They are involved in the development of a "new pattern of engineering education intended to meet the needs of a world characterized by rapid technological change and by engineering systems of growing complexity. In such a world, creative, responsive, and broadly knowledgeable engineers are a most precious resource whose quality cannot be replaced by quantity" (the MIT plan, *Lifelong Cooperative Education*, presented at the MIT Centennial, October 1982).

The state universities with graduate programs in engineering (FIU, FAU, UCF, UF, USF, and FSU/FAMU) are known as primary centers and other universities (UNF and UWF) as cooperating centers. The organization of FEEDS is shown in Figure 1. Figure 2 shows the geographical location of the various FEEDS primary and cooperating centers throughout Florida (1).

In 1985, the FIU College of Engineering began its graduate engineering degree program and was able to join FEEDS as a primary center. Complete master's degree programs are offered in Civil/Environmental, Electrical, Mechanical, and Industrial Engineering. FIU is currently delivering courses by tutored videotape instruction (TVI). Regular (live) class sessions are videotaped on 3/4-in. videocassettes at FIU University Park Campus in Miami. These cassettes are then shipped to the TVI classes at the industrial site (3).

A FEEDS class usually consist of four to eight students and a tutor/facilitator. The main purpose of the facilitator is to lead the class discussion. It is best if the facilitator not be an authority on the subject being reviewed, but rather someone who has taken a FEEDS course before, or who works in the disciplinary area of the class subject. This during-class discussion does lengthen the class time. A typical 50-min class should be allowed at least 75 min. FIU live classes are 75 min long and should be allowed at least 105 min for review and discussion.

Another important task for the facilitator is to be the professor-TV class liaison. The facilitator keeps the professor up to date on the class progress. If there is a problem on campus, it is usually easier to contact the facilitator rather than each individual student (3). The facilitator and FEEDS

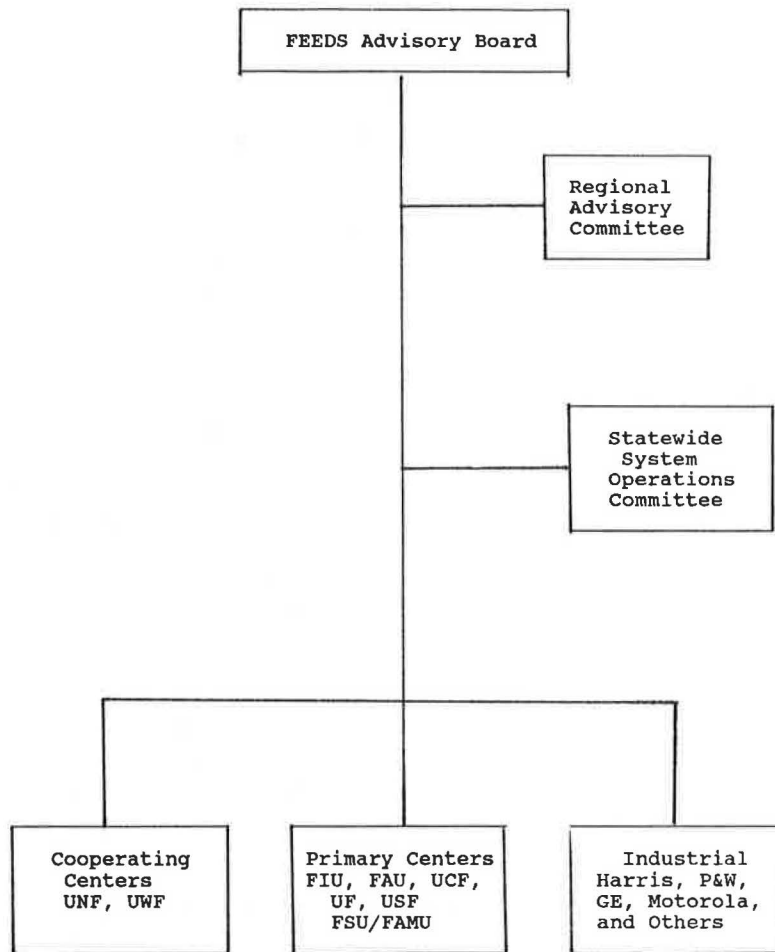


FIGURE 1 Organization of the Florida engineering education delivery systems (FEEDS).



FIGURE 2 Location of FEEDS primary and cooperating centers (1990).

students both have access to the professor on campus by the telephone and FAX.

FEEDS FACILITIES

FIU FEEDS classes are taped in two studio classrooms controlled by the Division of Instructional Media Services. One studio has three Ikegami ITC-730A cameras. The second, and newer studio, is equipped with three Sony DXC 3000 AK cameras. One camera is used to cover textbook references, samples, illustrations, etc., and the other two cameras cover the action. There are three Sony VO-5600 U-Matic video tape recorders (VTRs). All FIU courses are taped on 3/4-in. U-matic videocassette tapes; however, in special circumstances a course can be taped on the 1/2-in. VHS Panasonic VTR.

FIU, as well as most of the other primary centers, delivers all tapes and materials by United Parcel Service. This procedure has greatly improved the TVI delivery by reducing the time gap between the professor's live class and the industrial site. The use of videotapes allows maximum flexibility for students and the FEEDS center. In addition, videotapes are available for students to review or to view missed class sessions caused by meetings, travel, illness, etc.

THE PROBLEM

A recent National Science Foundation study found that over the next 5 years, the college-age population will decline and the supply of engineers graduating from college will also decline, perhaps quite markedly. This decline is occurring in the face of a growing need for transportation engineers in state, county, and city transportation agencies. In state highway agencies alone, the need for civil or transportation engineers, who make up almost 75 percent of the professionals hired, is projected to grow at the rate of about 4.5 percent per year (4).

In addition to this growing demand, one-third of this nation's professional engineers in state, county, and city transportation agencies will retire over the next decade (5). In 1976, about 47 percent of all engineers were over age 40 (6). By 1986, that age group had increased to 59 percent. Young people are not being attracted into the profession. To complicate this already tight situation, the rate of retirement will be much greater than in past years. During the 1950s and 1960s, government agencies hired rapidly as the nation's highway programs expanded; those same professionals are now at retiring age (6).

Most transportation engineering professionals are a product of a civil engineering education. Although some have a transportation minor at the undergraduate level, many have little transportation education. In a study of the current shortage of graduates interested in transportation engineering, it was found that the shortage occurs at all levels of education, from the B.S. and M.S. degree level at the transportation industry level of interest and with Ph.D. at the university faculty level (6). It is critical that engineering educators address this important transportation engineering education problem. FEEDS seems to be an ideal approach to educate M.S. degree level engineers and to provide continuing education and profes-

sional development to those engineers who normally will not have this chance.

THE FEEDS SOLUTION

An engineering student or a practicing engineer can register for a FEEDS-delivered course at all major cities or towns in Florida. All students registering for one or more courses offered on FEEDS must be admitted to one of the primary universities as a degree or nondegree student. Application may be made directly to the registrar or through the Division of Continuing Education.

In general, there are three student classifications supported by FEEDS: (a) graduate, (b) postbaccalaureate, and (c) transient. Within the graduate status, an admitted student may be further classified as regular or provisional (or conditional). Student classifications (b) and (c) are considered to be non-degree-seeking status. Figure 3 shows the flow chart of how FEEDS works for a prospective student interested in the program.

FIU's master of science in civil engineering (transportation) program requires 36 credits and a thesis or research report. Between 2 1/2 and 5 years are required for completion of all requirements by the average FEEDS student. More than 100 students have taken FEEDS transportation engineering courses since FIU started to offer them in 1985. Those FEEDS stu-

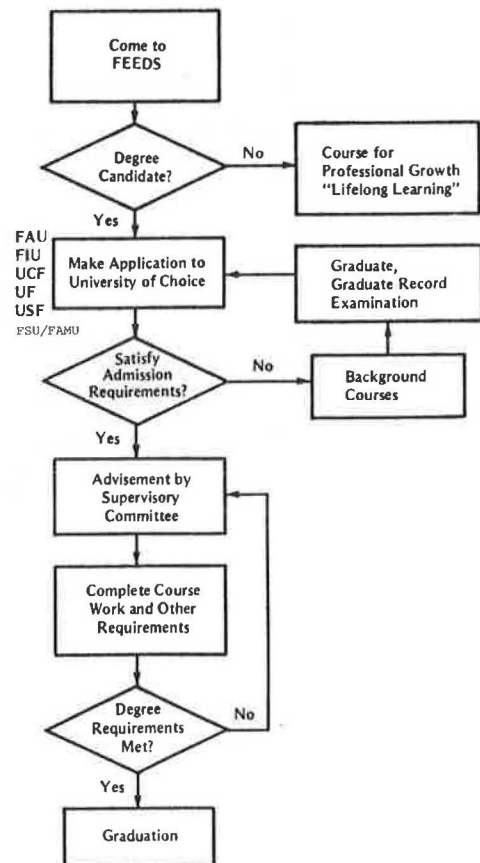


FIGURE 3 Flowchart of the FEEDS program.

dents are spread all over the state, from Jacksonville to the Florida Keys, from Pensacola to West Palm Beach. Table 1 presents the transportation engineering courses and their enrollments offered by FIU over the years.

A survey conducted in 1990 indicates that over 90 percent of the FIU FEEDS (transportation engineering) students are non-degree-seeking students. Their primary interest in taking the course is to advance their job skills and professional development. This again confirms the success of using FEEDS as an innovative approach to the continuing education and professional development program. Table 2 presents the average age, education, professional registration, and place of employment for FEEDS students and their counterparts on campus. A typical FIU FEEDS (transportation engineering) student is a white male, 34 years old, with a professional engineer (PE) or engineer-in-training (EIT) certificate, and previous work in a middle-sized engineering consulting company.

Table 2 indicates that FEEDS students are generally older and have more professional experience than regular on-campus students. However, as the Stanford University experience demonstrated, and the results at FIU confirm, that with the help of TVI, off-campus FEEDS students perform as well or better than students on campus taking the same course, especially in those design-oriented courses. Through TVI, the FEEDS students have access to the same high-quality graduate engineering courses that are available on campus. The experience in Florida clearly indicates that FEEDS provides an effective means of delivery, tolerant of the problems associated with fulltime employment such as travel and

project deadlines. There is no doubt for anyone who is involved in FEEDS that it is an extremely effective and efficient approach to the transportation engineering continuing education and professional development program.

THE FUTURE

Transportation engineering education in 2010 will be highly technology oriented. The computer-video technology classroom will be the standard classroom used for transportation engineering courses. FIU is exploring the use of microwave relay delivery or instructional television fixed service (ITFS). This low-power microwave television broadcasting system would send audio and video signals to the class site during real time or as the class is actually being taught. The class would have an audio signal sent back to the professor at the live class. This gives the ITFS class the feeling of being in the live class and is well suited for larger classes (3). This delivery method would minimize travel and shipping expenses and would reduce the need for a tutor or facilitator. FIU would work directly with the human resource person at the company to coordinate administrative business.

The goal of the engineering college at FIU is to meet the needs of the South Florida area by making the graduate degree programs more accessible to industry and different government agencies within the area. The response has been overwhelmingly positive. With the help of FEEDS, FIU's transportation program is one of the most successful programs in the state. From 0 to more than 100 students in just 5 years—

TABLE 1 TRANSPORTATION ENGINEERING FEEDS COURSE ENROLLMENT AT FIU

| Year | Semester | Course Name | Enrollment |
|------|----------|---------------------------------------|------------|
| 1986 | Spring | Pavement Design | 11 |
| 1986 | Summer | Advanced Highway Geometric Design | 5 |
| 1986 | Fall | Advanced Highway Capacity Analysis | 12 |
| 1987 | Spring | Urban Mass Transit & Transp. Planning | 2 |
| 1987 | Summer | Pavement Design | 8 |
| 1987 | Fall | Advanced Highway Geometric Design | 12 |
| 1988 | Summer | Urban Mass Transit & Transp. Planning | 4 |
| 1989 | Spring | Airport Planning & Design | 5 |
| 1989 | Summer | Advanced Highway Capacity Analysis | 13 |
| 1989 | Fall | Urban Traffic Characteristics | 12 |
| 1990 | Spring | Advanced Highway Geometric Design | 3 |
| 1990 | Summer | Advanced Highway Capacity Analysis | 8 |
| 1990 | Summer | Traffic Control Systems | 6 |
| 1990 | Summer | Urban Mass Transit & Transp. Planning | 6 |

TABLE 2 STATISTICS OF STUDENTS TAKING TRANSPORTATION ENGINEERING GRADUATE COURSES AT FIU

| Average Age | Education | | Professional Registration | | | Place of Employment | |
|---------------------------|-----------|-------|---------------------------|-----|-------|---------------------|----------|
| | BSCE | Other | PE | EIT | Other | Gov't | Industry |
| FEEDS Students | | | | | | | |
| 34 | 71% | 29% | 42% | 14% | 44% | 20% | 80% |
| On-Campus Students | | | | | | | |
| 32 | 79% | 21% | 8% | 46% | 46% | 25% | 75% |

from Miami to Jacksonville, from Naples to Pensacola—the diversity of the students speaks for itself.

In order to prepare for the 21st century, new and innovative technologies will be installed in our FEEDS classroom in the future. FIU is currently exploring use of the following hardware (2):

1. Large-screen projection system (VGA),
2. Super VHS editing VCR,
3. Video disc player,
4. Live color overhead projector display system,
5. Amplifier and speaker system,
6. Overhead projector with software,
7. Large VGA color monitor, and
8. Computer networks in the classroom.

The benefits of a dedicated computer-video FEEDS classroom for transportation engineering education are as follows:

1. Emphasis placed on computer use by demonstrated commitment of the engineering college.
2. Demonstration to include state-of-the-art instructional technology.
3. Increased efficiency in instruction of transportation engineering courses that are oriented to computer applications.
4. A much larger target area can be reached through the use of FEEDS, thus making the investment more efficient and cost effective.

The application of instructional endeavor will embrace and support this technology, demonstrating increased use as the industrial demand and expectations for computer literacy continue to increase. In addition, computer-aided design and drafting (CADD) applications in highways, airports, ports, and mass transit systems can only be demonstrated in such an environment.

SUMMARY

The use of FEEDS for transportation engineering continuing education and professional development program is promis-

ing, as FIU's success has clearly indicated. However, the transportation engineering profession faces serious personnel and training problems in the coming decade. The use of TVI technology such as FEEDS is a low-cost and effective approach for a continuing education and professional development program. Florida's experience with FEEDS can definitely be duplicated in other states. FEEDS has demonstrated the success of one relatively inexpensive state system that allows access to the combined strength of seven engineering colleges in this area of scarce resource.

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