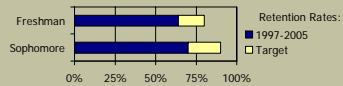


Engineering 101: A First-Year Experience for Engineering & Technology Majors



STEP Project Overview

Southern Illinois University's Type I STEP project aims to increase the College of Engineering's five-year graduation rate from 37% to 67% by focusing on first- and second-year retention rates.



A holistic freshmen-sophomore program was implemented effective summer 2007 that consists of (1) a new Engineering Residential College that serves as the foundation of a new living-learning community; (2) a new approach to teaching mathematics that includes supplemental instruction and a new developmental math course designed to ready engineering students for Calculus; (3) an innovative and hands-on Introduction to Engineering course that is common to all first-year students in the College; (4) common sections of cohort groups for Mathematics, English, and Speech Communications courses, many of which are offered inside the Engineering Residential College; (5) a six-week, summer math program for underprepared students; (6) a peer-mentoring program; and (7) mentoring by faculty and practicing engineers. This presentation highlights our new introductory course known as Engineering 101.



Project Personnel

PI: John Nicklow, Associate Dean, College of Engineering

Co-PIs:

Lalit Gupta, Professor, Electrical and Computer Engineering
 Rhonda Kowalchuk, Asst. Professor, Educational Psychology
 James Mathias, Asst. Professor, Mechanical Engineering
 Kathleen Pericak-Spector, Professor, Mathematics
 Robert Tezcan, Asst. Professor, Civil and Environmental Engineering

Senior Personnel:

Bruce Chrisman, Engineering Recruitment and Retention
 Julie Eisenhauer, Special Projects and Marketing
 Loen Gracason-Martin, Engineering Advisement
 Robert Sims, Minority Engineering Program

Find out more at www.engr.siu.edu/ETTEP/ETTEP.html



This material is based upon work supported by the National Science Foundation under Grant No. 0622483



Engineering and Technology Talent Expansion Program at Southern Illinois University at Carbondale



ENGR 101 Implementation

Engineering 101 was introduced to the College of Engineering curriculum in fall 2007. It is required of all engineering freshmen and replaces a list of discipline-specific, introductory courses that lacked consistency and failed to recognize the benefits of active learning techniques and construction of learning communities. The new course is intended to reinforce efforts to improve student retention by addressing several key issues that hamper student success: difficulty in adjusting to college life; lack of a community atmosphere; disappointment and loss of motivation from the lack of engagement in focused engineering topics during the first and second years.

ENGR 101 radically departs from traditional methods of instruction; it adopts a holistic approach that integrates active and problem-based learning techniques in a variety of settings in order to better inform students and to stimulate interest and excitement about the engineering profession.



The course is taught by faculty co-PIs of the STEP project, with assistance from industrial partners (e.g., representatives from Caterpillar, Boeing, and others). The course is designed around the six primary objectives:

- ◆ Provide a challenging, yet low threat, venue for students to become familiar with the broader engineering profession and possible career opportunities;
- ◆ Inform students of the various technical specializations within each of the engineering disciplines;
- ◆ Guide students in choosing an engineering curriculum and promote informed decision-making when mapping their coursework to career goals;
- ◆ Introduce students to the role and importance of engineering ethics;
- ◆ Acquaint students with existing, academically-focused support groups and resources and promote development of additional groups that build community, and;
- ◆ Develop confidence and an appreciation for the importance of mathematics, communication skills, and teamwork through a series of hands-on, laboratory projects in each of the engineering disciplines;

During the 2007-08 academic year, 255 students enrolled in the new course. The far majority of these were first-year students involved in other retention-focused efforts (e.g., the Engineering Residential College and mentoring by upperclass, peer-mentors). The text for the course is *Studying Engineering: A Road Map to a Rewarding Career* by Discovery Press. Specific topics covered during the semester-long course include:

- ◆ Previews of engineering majors
- ◆ Goal setting
- ◆ Internships and career opportunities
- ◆ Time management
- ◆ Effective study skills
- ◆ Resume writing
- ◆ College resources
- ◆ Academic planning
- ◆ Engineering ethics

Laboratory projects were conducted both individually and in small groups and were designed to subtly integrate basic mathematics and physics, as well as various engineering software tools. Sample projects include:

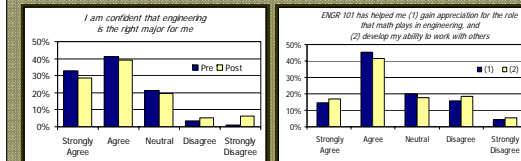
- ◆ Design and construction of a digital half adder
- ◆ AC/DC converter simulation and construction
- ◆ Catapult design, construction and analysis
- ◆ Bridge design and optimization
- ◆ Truss design and analysis
- ◆ Spring constant determination

Assessing Impact

Activities pursued under the scope of the STEP project are being revised based on our formative assessment and evaluation. For ENGR 101, assessment strategies consist of:

- ◆ Pre- and post-semester student attitudes survey
- ◆ Standardized instructor-course evaluations
- ◆ Open forums with mentors of 101 students
- ◆ Assignments aligned with course objectives

Although room for improvement is clearly indicated, these strategies generally reveal positive attitudes about engineering and a cohesive and aware community of learners.



- ◆ 88% of students completing the post-attitude survey indicated that they would be returning to the SIUC College of Engineering the following semester
- ◆ 79% of students indicated that ENGR 101 increased their familiarity with different engineering professions and careers in engineering; 72% indicated that their appreciation for engineers and the profession was increased
- ◆ 83% of students believed that stated course objectives had been met
- ◆ "I really liked the hands-on projects; the informative lectures were interesting, but the projects were much more exciting"
- ◆ "I liked that there were so many engineering freshmen in one class. It almost forced us to establish help networks"
- ◆ "They made engineering seem right for me; they explained engineering very well and explained what we could do with an engineering degree"
- ◆ Aspects students liked the most were (1) learning about the different disciplines, (2) learning about ethics, (3) hands-on projects, and (4) giveaway prizes
- ◆ Recommendations for improvement include (1) "more hands-on projects," (2) "move projects to an earlier point in the semester," (3) less of the basic/University 101-type information.

Challenges & Opportunities

Creating a college-wide, first-year experience course is conceptually simple enough. However, the PIs note some major logistical challenges.

Scheduling

Creating a new course for all first-year students requires identifying a common, available meeting time. Subsequently, major adjustments to the College's master course schedule were inevitable.

Course Content

Based on student feedback from the first semester, projects are now started earlier in the term; lectures & discussions are scattered between projects, and more guest seminars are offered, all to build and maintain interest.

Class Size

Implementing a College-wide, required course implies a large class. In this project, concerted effort was required to balance course enrollment between fall and spring terms and to keep project groups small.

Laboratory Space

Keeping project groups small and manageable when the overall class size is large requires significant lab space. As many as 6 labs, each with a faculty member or teaching assistant, were simultaneously required at SIUC.

Several significant opportunities have also been recognized early on in the project. In particular, the ENGR 101 concept was strongly appealing to prospective students and parents. Project personnel took advantage of the interest by highlighting the course and other STEP activities in marketing materials and campus visits. Doing so is partly responsible for the College's increase in new student enrollment:

- ◆ 26% increase in new freshmen
- ◆ New student enrollment at 15+ year high



Southern Illinois University Carbondale

College of Engineering