

A Mouse Click Away: Information to Help Engineering and ET Educators

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Abstract

The SC ATE center of Excellence, with funding from the National Science Foundation (NSF), is serving as a National Resource Center for Engineering Technology (ET) education. SC ATE focuses on success of students in ET programs using "tried and true" strategies, products, and services that have originated with SC ATE. SC ATE resources are now just a mouse-click away at www.SCATE.org for review, downloading, or purchase. These resources include pre-engineering technology and first-year engineering technology curricula, faculty development, research results related to student retention, peer mentoring, and assistance with grant-funded project development and evaluation. The Center also serves as a link to assist educators in identifying useful products and services from other projects funded through the NSF's Advanced Technological Education (NSF/ATE) program. A cost-effective way for two-year college engineering technology faculty to move their programs forward is to learn about and leverage these resources.

Introduction

The National Science Foundation's Advanced Technological Education (ATE) program has an emphasis on two-year colleges and on the education of technicians for the high-technology fields that drive our nation's economy. Among those who have been funded as ATE Centers of Excellence, a few have recently received additional funding to serve as National Resource Centers. As a resource center, an organization is expected to be a highly visible source of materials, ideas, contacts, and mentoring in a particular field of technological education. In all cases, National Resource Centers are built on substantial, high-quality contributions that have been made by the organization in an area of technological education¹.

The creation of these new National Resource Centers presents a unique opportunity for the engineering technology community to tap the "best of the best" resources and expertise in engineering technician preparation at very reasonable cost or, in some cases, no cost at all. All of these resources are just a mouse click away.

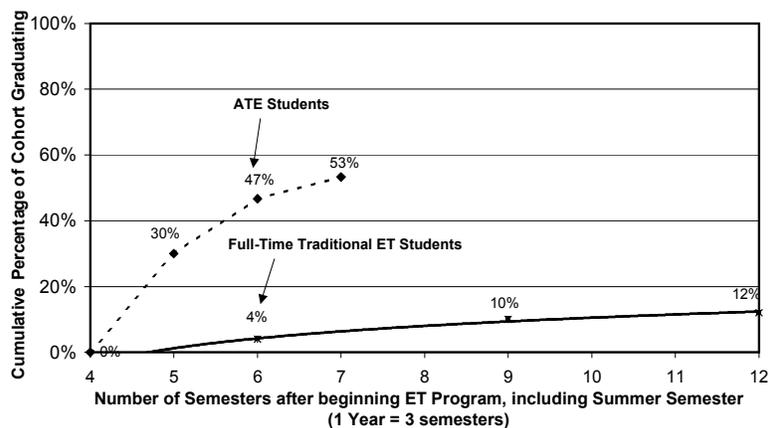
The SC ATE Center of Excellence and National Resource Center for Engineering Technology Education offers many resources that are available to assist colleges with the improvement of associate degree engineering technology programs. Resources include curriculum products, recruitment strategies, a workplace research model, peer mentoring for project or curriculum

implementation, assistance with soliciting grants, and project evaluation. A project website also posts an up-to-date listing of professional development events being provided by other ATE-funded projects. These activities are generally subsidized by the grantee and thus are very affordable. Check www.scate.org routinely for new listings on the bulletin board.

Curriculum

SC ATE has taken a research-based, faculty-lead approach to curriculum development. The result is the Technology Gateway, a pre-engineering technology curriculum, and an ET Core curriculum, a general education/introduction-to-technology curriculum for all engineering technology majors. By embedding improved teaching methodologies and retention strategies into the structure and delivery of the SC ATE curriculum, retention rates have improved. Significantly improved retention and student success have, in turn, decreased time to graduation and increased graduation rates by ten fold.

Figure 1. Graduation Rates of ATE and Traditional ET Students



Source: Traditional students include all students enrolled in (1) an associate degree program (2) in the engineering program cluster, and (3) in the 1992, 1993, or 1994 cohorts and recorded in the State Board for Technical and Comprehensive Education database (N=1614). ATE student data include all those who enrolled in EGR 181, the first semester of the ET core, in Fall semester 1998 as reported by faculty (N= 30).

Colleges across South Carolina and in Texas, Kentucky, and North Carolina are implementing the SC ATE curriculum or adaptations thereof. The cornerstone of SC ATE's successful strategy and nationally-acclaimed model for recruiting, retaining, and graduating more students in engineering technology programs is an integrated, problem-based curriculum, collaborative teaching strategies, and extensive active learning techniques using both faculty and student teams. SC ATE has two curriculum components available, the Technology Gateway and the ET Core. The Technology Gateway is a pre-engineering technology curriculum for slightly under-prepared students who want to major in engineering technology. The ET Core is a series of general education courses taught in the context of technology applications for the first year of study in any engineering technology major.

The Technology Gateway has six scenarios covering career exploration, simple machines, basic electricity, optics, thermal, and hydraulics. This pre-ET curriculum was designed primarily to address weaknesses in mathematics in the slightly under-prepared student seeking entry in to engineering technology. The curriculum is nine semester credit hours made up of three courses taken simultaneously: mathematics (3 cr.), communications (3 cr.), and technology (3 cr.). The

exit competencies for the Technology Gateway have been aligned with the entrance competencies for engineering technology to enable it to serve as a seamless on-ramp for the ET Core and all engineering technology curricula.

The ET Core has 16 scenarios covering the six major physics/technical areas (electrical, mechanical, materials, thermal, fluids, and optics) to provide students foundational technical skills that they will need in their engineering technology majors. Students are individually accountable for discipline content knowledge and thus are assessed both as individuals and as teams. The ET Core is generally taught over three terms (semesters), with 10 credit hours in each of the first two semesters and 7 credits in the third. The first two semesters have four courses: physics (3 cr.), mathematics (3 cr.), communications (3 cr.), and technology (1 cr.). The third semester has no English course since six hours credit in English meets graduation requirements; however, students in the third semester of the ET Core are expected to routinely use their communications skills.

The SC ATE ET Core curriculum has been the subject of two national peer reviews by a team of nationally-recognized experts in discipline content areas, industry standards, and curriculum development.ⁱⁱ One of the reviewers, Dr. Arnold Packer of Johns Hopkins University and former Chair of the SCANS Commission, said, "The SC ATE approach will, I hope, be the future of ET education."ⁱⁱⁱ In fall 2003, the SC ATE ET Core curriculum was identified as one of the top four curriculum products produced by the National Science Foundation Advanced Technological Education program. In an independent study, Western Michigan University rated curriculum products in the categories of "industry standards and practice", "real world curriculum", "workplace competencies", and "access to in-depth understanding." The SC ATE ET Core curriculum received perfect scores of "4" in the areas of real world curriculum and access to in-depth understanding.

Both curriculum products may be viewed and printed from the web site. In addition, the Technology Gateway is sold in an attractive box that holds a classroom set of instructor manuals and student handouts. The ET Core is sold as an instructor guide. For both curriculum components, instructor guides contain information such as competencies, scope and sequence charts, equipment lists, suggestions for instructional activities and assessment, and problem scenarios. Text books for each discipline are to be selected by the instructor, and instructors are responsible for designing lesson plans.

Special training is available for ATE Teaching Teams to prepare these instructors to deliver the SC ATE curriculum components. Classes can be provided on site when multiple teams are to be trained. In addition, a training CD is available to assist instructors one-on-one if a training class is not available or a team member needs to be replaced. To inquire about training, contact the Center Director, Elaine Craft, Elaine.Craft@fdtc.edu.

Recruitment Strategies

SC ATE has published research on student retention in engineering technology. *Monograph: Recruitment & Retention of Engineering Technology Students* (2000) is available on the web site (www.scate.org for viewing and purchase). In addition, two special recruitment strategies have been developed by SC ATE.

The ATE Scholars initiative was begun to engage industry in sharing responsibility for recruiting students for engineering technology programs. Employers join the consortium, pay an annual fee to the college Foundation, and then assist with students in a number of ways. The most involved employers hire one or more current ATE ET Core students as interns and provide each student intern with a scholarship that covers all tuition, books, and supplies not paid for by other financial aid awarded to the student. Through the ATE scholarship/internship program, members of the ATE Industry consortium are helping "grow" technicians to meet their needs. Because students are required to immediately put their knowledge to work in the ATE ET Core curriculum, they are marketable and are placed with employers as early as their second semester in the program. The student works for the sponsoring employer up to 20 hours each week while school is in session. The consortium sets a beginning wage for all ATE Scholars. A company may increase the pay of an intern after the first 90 days. An ATE Scholars liaison coordinates student placement and evaluation. There is no obligation on the part of the employer or the student for employment after graduation, but most ATE Scholars accept permanent employment with their sponsoring industry. Other consortium members participate in recruitment visits to schools, host groups of ATE ET Core students for plant tours, or help in other ways. A video clip of a current ATE Scholar may be accessed on the student link of the SC ATE web site.

Another innovative recruitment strategy is a new ET Career Ambassador program. This program selects two to four outstanding current ET students to serve as recruiters and career awareness ambassadors. ATE industry consortium donations are used to purchase matching dress clothes for ET Career Ambassadors that are worn when they make appearances as ET Career Ambassadors. Ambassadors get to keep the clothes when they graduate and they are paid a stipend of \$100 per semester to cover travel costs. ET Career Ambassadors are chosen based on achievement and diversity to serve as role models for others.

Information about how to set up and run an ATE Scholars or ET Career Ambassador program is available from SC ATE along with access to an ETE (Engineering Technology Education) marketing website developed by Sinclair Community College and now hosted by the American Society for Engineering Education.

Workplace Research

The topic of content coverage is a major issue with implementation of the SC ATE ET Core curriculum. Problem-based learning focuses learning differently, and instructors new to the curriculum worry that all of the content they would cover in a comparable course is not included. The SC ATE-designed workplace research activity helps instructors, particularly those from general education, understand what students really need to know and be able to do in the workplace. The activity is designed to be done by interdisciplinary teams and is useful for helping instructors prioritize instruction. Faculty report that after completing this research activity, they can focus on the more valuable skills and knowledge and spend less time on content that is not critical for student success. The workplace research model is available on the SC ATE web site.

Peer Mentoring, Adapt & Implement Grants, and Project Evaluation

Colleges wanting to adapt and implement any component of the work done by SC ATE can take advantage of peer mentoring at every level: college president-to-college president, chief academic officer-to-chief academic officer, or faculty-to-faculty. In addition, the SC ATE staff will provide guidance in soliciting grants from the ATE program (for adaptation and implementation of SC ATE models) and can even provide assistance with project evaluation if the project is funded. Contact SC ATE Director, Elaine Craft at Elaine.Craft@fdtc.edu to get started.

Summary

SC ATE has benefited from the work of other NSF/ATE-funded projects and can assist others in finding similar rich resources. Innovative marketing materials, total quality improvement and program assessment strategies, and high-quality media products for student recruitment are samples of work initiated by other NSF/ATE projects that have been used by SC ATE's host colleges. NSF/ATE projects have a duty to share outcomes/products, and National Resource Centers such as SC ATE now provide an efficient way to identify and link to this wealth of innovation.

The resources of the South Carolina Advanced Technological Education Center of Excellence (SC ATE) and National Resource Center for Engineering Technology Education are just a mouse click away. Information and resources are located on the SC ATE website (www.scate.org) or by e-mailing the Center. Other National Resource Centers focusing on manufacturing and engineering technology are located at Sinclair Community College, Dayton, Ohio and at Middlesex County College, Edison, New Jersey. All exist to serve the two-year college community and look forward to serving you.

Bibliography

ⁱ *Advanced Technological Education (ATE) Program Solicitation*, NSF 03-523, National Science Foundation, 2003.

ⁱⁱ *Peer Review '01*, Evaluation, SC ATE Center of Excellence, www.scate.org.

ⁱⁱⁱ *SC ATE Center of Excellence Briefs*, Winter 2000, vol. 2, Issue 2.

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