AC 2009-1309: ET^2 PROGRAM FOR TRANSFER STUDENTS FROM TWO-YEAR COLLEGES

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ET^2 Program for Transfer Students from Two-Year Colleges

Abstract

This paper describes the Engineering and Technology Transfer Scholars' (ET^2) program recently funded by the National Science Foundation (NSF) that focuses on students who transfer at the 3rd year level from 2-year schools to our university. With scholarship support from NSF, we aim to recruit, retain and graduate 25 *additional* transfer scholars *per year* in our engineering and engineering technology (EET) BS degree programs. The NSF scholarship is in addition to grants and aid awarded by our university. In support of this project, the university will contribute $50,000 to ensure that ET^2 scholars have continuing financial support after the grant expires and help them graduate on time. This support indicates the university's enthusiasm, a firm commitment of service to our EET students, and an endorsement of the goals and objectives of the ET^2 program.

The paper describes how the ET^2 program: (i) addresses a national concern by helping to expand and diversify the engineering/technology workforce of the future, (ii) will develop linkages and articulations with 2-year schools and their S-STEM programs, (iii) identifies a clear potential to increase the participation and graduation of female and minority students from engineering and technology degree programs, (iv) serves as a model for other selective universities to provide transfer students the access to the baccalaureate, (v) gives scholars hands-on experience in the latest tools and technologies, and (vi) provides increased career opportunities and job placement rates through mandatory co-op experiences.

Designing the ET^2 Program

U.S. Department of Education defines 2-year institutions as postsecondary institutions that offer programs of at least 2 but less than 4 years duration. Two-year institutions include community colleges, vocational and occupational schools, and serve almost half of all the undergraduate students (~17.5 million in 2005) in the USA by offering noncredit programs, providing workforce development and skills training as well as preparing students for transfer to 4-year colleges[1]. Each year, approximately 45% of all full-time freshmen enroll in 2-year schools. Of these, approximately half declare attaining a bachelor's degree as their goal, yet only an estimated quarter manage to transfer to 4-year colleges. The Department of Education research indicates that once these students transfer, they graduate at the same rate as do students who start their baccalaureate education at a 4-year college (see tables 4 and 5 for data on our university). Furthermore, of the 564,964 associate's degrees awarded by 2-year schools in 2005-6, 63% were to women, 11% *each* to African Americans and Latin Americans, 5% to Asian Americans, and 1% to Native Americans. The proportion of students with associate's degree interested in engineering or engineering technology varies between 7 to 9%. Thus, transfers from 2-year schools form an extremely attractive pool to *both* expand and diversify the engineering and technology workforce of the future.

Transfer students from 2-year schools, both full-time and part-time, are important stakeholders in academic programs at our university. Transfer students are especially important to the *five* engineering and engineering technology (EET) departments identified in Table 1 that also lists the number of BS degree programs offered in each department.

Table 1: Participating Academic Departments, Abbreviations, and Programs		
Academic Department	**Code**	**# of Programs**
Civil Engineering Technology, Environmental Management & Safety	CETEMS	1
Electrical, Computer & Telecommunications Engineering Technology	ECTET	3
Manufacturing & Mechanical Engineering Technology /Packaging Science	MMET/PS	4
Mechanical Engineering	ME	1
Electrical Engineering	EE	1

All ten of the BS degree programs in these five departments are ABET-accredited. Our academic calendar is based on 4 quarters of 11-week duration in a year. *All* BS degree programs *except Packaging Science* listed in Table 1 are *five-year* programs with a *mandatory* cooperative education component wherein students attend classes in Fall, Winter and Spring quarters in their first two years. In the third, fourth and fifth years, students *alternate* each quarter between on-campus study and off-campus co-op employment in industry. Thus, each student who enters as a first-term freshman has 12 quarters of on-campus study, and 4 (or 5) quarters of paid co-op employment thus spending a total of five years before graduation. A student transferring from a 2-year school at 3rd year-level may spend only 6 quarters for on-campus study but still needs at least 4 quarters of co-op employment to graduate with a BS degree. Therefore, a transfer student typically spends a total of three years at the university before graduating.

Table 2 shows freshmen enrollments and full-time upper-division transfers to our university, and within the five EET departments listed in Table 1. For 2004-6, it shows that full-time transfers comprise 10% of incoming students in all departments at our university whereas the proportion of EET transfers ranges from 12 to 19%.

Table 2: Freshmen & Upper-Division Transfer Enrollments										
Entry: Fall Quarter of→		**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
All Departments	Freshman	1729	1847	2106	2036	2129	1926	2036	1954	2109
	Transfer	126	125	122	166	189	172	203	213	208
EE+ME+ET Depts only	Freshman	291	321	354	395	372	350	363	341	409
	Transfer	47	48	34	36	51	44	66	79	57

The American Association of Community Colleges (AACC) in its recent publication, *Improving Access to the Baccalaureate*[2] identifies unintended obstacles limiting transfer students' access to the baccalaureate that can be grouped into three major categories: (1) College Cost and Financial Aid, (2) Articulation and Program-Specific Transfer agreements, and (3) Reliable Information and Academic Advising.

Therefore, in designing the ET^2 program for EET transfer students, we needed to answer the following three questions: (1) Is the financial aid adequate to attract and retain transfers from 2-year schools; (2) Do our programs have curricular flexibility to award transfer credits for most or

all of credit-bearing coursework at 2-year-schools; and (3) Do we have the infrastructure and resources to inform, advise and support transfers from 2-year schools?

Financial Aid: With expected family contribution as a proxy for income, it appears that students who start their undergraduate studies at a community college are the neediest and therefore the most likely to receive a Pell grant. Based on the 2000-01 longitudinal study[3], National Center for Education Statistics (NCES) data indicates that the 2- to 4-year transfer students who filed a financial aid application had a median expected family contribution of $1,848, compared with the median for all community college attendees of $2,676 and the median for non-community college attendees of $4,105. For all baccalaureate recipients who received a Pell grant, the median cumulative Pell amount was approximately $3,500.

In the MEET (Multi-department Engineering & Engineering Technology Transfer Scholars) program[4], after which this project is modeled, each transfer scholar received $3,000 in the first year and $2,000 in each of the subsequent two years for a total of $7,000/student. With this NSF scholarship as part of our financial aid package, we were able to attract and retain the MEET transfer scholars[5].

For the ET^2 Scholars' Program, the amounts we requested from NSF were $4,000 ($1^{st}$ year) and $3,000 ($2^{nd}$ & 3^{rd} years) reflecting tuition and cost of living increases in the last 5 years. The NSF scholarship of a total of $8,000/student requested was in addition to other grants and aid awarded by our university.

Program-Specific Transfer Credits: EET programs at our university have articulation agreements with twenty 2-year schools. The articulation agreements are designed to transfer in credit to bring each student at or close to 3^{rd} year level at our university. These articulations are periodically discussed and refined at the annual conferences of our state's Engineering Technology Association and the Two Year Engineering Science Association.

To allow students greater curricular flexibility, including the opportunity to earn a minor in another discipline, we completed a university-wide curricular reform in 2005 that required each academic program to have at least *three free electives*. Thus, beginning in Fall of 2006, students from 2-year schools are able to transfer most or all of their credit-bearing coursework.

Academic Advising and Support Infrastructure: Table 3 below identifies the number of faculty from each participating department that are involved in the transfer application evaluation and advising process. Faculty members review transcripts of all students who apply for transfer from a 2-year school, evaluate program-specific transfer credits and send their recommendations to the Office of Undergraduate Admissions. Upon entry to our university, each transfer student is assigned a specific academic advisor.

Table 3: Number of faculty involved in transfer application and advising

Academic Department	# of faculty evaluating transfer applications	# of faculty advising transfer students
Civil Engineering Technology	2	2
Electrical, Computer & Telecommunications ET	3	3

Manufacturing & Mechanical Engineering Technology	4	4
Mechanical Engineering	1	1
Electrical Engineering	1	1

We have a well-established infrastructure of student support and intervention programs. Table 4 shows that the participating departments have excellent retention rates for transfer students. Retention data for the entire university, as well as for students entering as freshmen are also included in the table for comparison.

Table 4: % Students retained after 1-year of study at the university

Entry: Fall Quarter of→		**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Freshmen	University	86%	85%	87%	88%	88%	90%	88%	89%
	EE+ME+ET	78%	82%	85%	86%	87%	89%	89%	89%
Upper-division Transfer	University	92%	85%	91%	86%	88%	84%	89%	85%
	EE+ME+ET	91%	88%	91%	91%	84%	86%	95%	85%

Table 5 shows that transfer students are graduating at a *higher* rate than freshmen students in EET programs. One assessment metric of the ET^2 program will be to review this data annually, and determine ways to further improve the graduation rates.

Table 5: Graduation Rate within 7 Years of Study at the university

Entry: Fall Quarter of →		**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Graduating in/before →		**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Freshmen	University	57%	60%	63%	59%	63%	62%
	EE+ME+ET	59%	56%	58%	53%	55%	57%
Upper-division Transfer	University	87%	80%	75%	84%	77%	81%
	EE+ME+ET	90%	88%	82%	85%	87%	87%

For AY 2006-7, 96% of the graduates were either hired or accepted to graduate school within six months of graduation. 100% of the BS/MS dual degree program graduates were placed within six months of graduation, at a median starting salary of $55,000.

Table 6 provides salary data from AY 2006-7 for BS graduates in the participating programs, and shows that our graduates enter the workforce with excellent starting salaries. Please note that the range of starting salaries include the financial aid awards of those entering graduate school full-time.

Table 6: AY 2006-7 Graduate Salary Data

BS Degree Program	**Annual Salary**		
	Low	High	Median
Civil Engineering Technology	$33,500	$55,000	$44,200
Electrical Engineering Technology	$35,040	$53,000	$51,000
Manufacturing Engineering Technology	$40,000	$46,000	$43,000
Telecommunications Engineering Technology	$40,000	$63,000	$49,000
Electrical/Mechanical Engineering Technology	$42,000	$57,000	$49,500
Mechanical Engineering Technology	$38,000	$58,000	$50,000
Computer Engineering Technology	$42,000	$63,000	$55,000

Electrical Engineering	$48,000	$65,000	$52,000
Mechanical Engineering	$35,000	$70,000	$52,000

NSF Award and Its Implementation

In AY 2007-8, we submitted a proposal to NSF focusing on students who wish to *transfer* at the 3rd year level from 2-year schools to a sub-set of the five-year engineering and engineering technology programs at our university, and requesting scholarship support of $8,000/student. Our goals were to:

1. Recruit, retain and graduate 25 *additional* transfer students *per year* in our engineering and engineering technology BS programs;

2. Identify women and minority students whenever possible but allow the scholarship to be provided to all students meeting the eligibility conditions;

3. Identify scholars in academic trouble, proactively intervene on their behalf, and arrange help for them to continue and graduate;

4. Prepare scholars with the necessary skills, education, and work experience to enter the high technology workforce upon completion of BS degree; and

5. Perform a regular and thorough assessment of the ET^2 program that will be used for the contract reporting purposes and also will be an integral part of our standard program review process.

In August 2008, NSF awarded us a 4-year grant from its S-STEM program to support the ET^2 Transfer Scholars. In support of this project, the university will contribute $50,000 to ensure that ET^2 scholars have continuing financial support after the grant expires and help them graduate on time. This support indicates the university's enthusiasm, a firm commitment of service to our EET students, and an endorsement of the goals and objectives of the ET^2 program.

For AY 2008-9, the award did not allow us enough time to intensely recruit 5 transfer students in *each* of the five participating departments for a total of 25 scholars. However, we were able to award scholarships to 22 transfer students who met the financial aid eligibility and U.S. residency criteria. Table 8 lists the distribution of ET^2 scholars among the participating departments:

Table 8: Distribution of AY 2008-9 ET^2 Scholars

Academic Department	Code	# of Scholars
Civil Engineering Technology, Environmental Management & Safety	CET	6
Electrical, Computer & Telecommunications Engineering Technology	ECTET	1
Manufacturing & Mechanical Engineering Technology/Packaging Science	MMET/PS	8
Mechanical Engineering	ME	6
Electrical Engineering	EE	1

For AY 2009-10 and beyond, we have several strategies to recruit transfer students. Last Fall, over twenty different engineering technology faculty members recruited at eighteen different community colleges in the region. Our Office of Admissions has two open house events each year for transfer students in January and March. The engineering technology departments send personal invitations for the transfer open houses to each student that faculty meet at a community college during the Fall recruiting sessions. In addition, each year the College of Engineering encourages groups of students and faculty from select community colleges to visit the campus whenever possible for a personalized session on academic offerings and opportunities.

The Office of Cooperative Education and Career Services (CECS) supports the university's special emphasis on learning through experience. The co-operative education program at our university was started in 1912. Since that time it has grown into one of the largest and most comprehensive in the world. CECS assigns each student a program coordinator who provides assistance with career counseling and the job search process from the beginning of the co-op process right through career entry upon graduation. CECS services remain available to alumni for a lifetime. CECS staff spends considerable time developing opportunities with employers nationwide, as well as monitoring and fostering current relationships. These linkages with business and industry enhance our ability to provide an education that meets the needs of the job market, and aids students in their pursuit of successful careers.

All academic programs participating in this proposed project require students to complete at least 4 quarters of co-op employment before graduation. Co-op wage data are shown in Table 9 below for AY 2006-7.

Table 9: AY 2006-7 Co-op Wages

Academic Program	**Co-op Wage Data ($/hour)**		
	Low	High	Average
Civil Engineering Technology	$7.00	$23.00	$12.65
Electrical Engineering Technology	$7.50	$25.51	$14.04
Manufacturing Engineering Technology	$10.00	$20.00	$15.09
Telecommunications Engineering Technology	$10.00	$25.00	$15.62
Electrical/Mechanical Engineering Technology	$10.00	$20.73	$15.56
Mechanical Engineering Technology	$8.00	$25.00	$14.29
Computer Engineering Technology	$6.00	$25.00	$14.71
Electrical Engineering	$8.00	$28.85	$15.62
Mechanical Engineering	$6.25	$28.00	$15.09

During the first quarter at our university, all transfer students including ET^2 scholars are required to take a non-credit course in which they learn to prepare resumes, cover letters, practice interviewing, and become familiar with the services of the co-op office to conduct the job search for their first co-operative education experience.

Concluding Remarks

1. The ET^2 program has a clear and specific plan for assessment and evaluation that includes both the assessment of student progress and the overall evaluation of the project. The

assessment tools complement the assessment structures already in place and functioning well in the five participating departments. Of the 22 scholars enrolled in the Fall quarter, 21 have returned for a full academic load in the Winter quarter.

2. A brochure on the ET^2 Scholars' Program has been designed and produced in-house describing the program, scholar selection process and criteria, and a brief frequently-asked-questions (FAQ) section. The Office of Financial Aid and Scholarships sent the brochure along with the letter of scholarship award to each ET^2 Scholar. The brochure will mailed to all constituents in the regional 2-year schools as well as distributed during recruiting visits and at regional conferences to publicize the program.

3. In the January 2009 Transfer Student Open House, 42 students were registered to tour the five participating departments. We hope to host many more in our March 2009 Open House.

4. In February 2009, we will be hosting a luncheon meeting, the first of several such meetings, in the Rapid Prototyping Lab to help build a sense of community among the current ET^2 scholars and their faculty advisors. It will be an opportunity for informal conversations in a small group setting. These informal meetings will help us determine how the new scholars are acclimatizing to the campus. We expect to hold a similar event each quarter with each co-author taking turn to host the event.

5. Each quarter, the Registrar's Office will provide the Program Administrator with a customized report providing personal and academic information on each ET^2 scholar. The report will help in identifying students who are on Dean's List for superior academic performance. These scholars will be sent a congratulatory letter in addition to normal recognitions at quarterly socials.

6. Through dissemination at ASEE and IEEE meetings, we are hoping that this project will serve as a model for other selective universities to provide transfer students the access to the baccalaureate[6,7].

Acknowledgement

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