Successful Multi-department Engineering and Engineering Technology Transfer Students

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Abstract

This paper describes the results of the Rochester Institute of Technology's (RIT) Multi-department Engineering and Engineering Technology (MEET) Scholars Program. This program began in December, 2004 and is designed to recruit, retain and graduate additional transfer students in our selected engineering and engineering technology degree programs.

The MEET Scholars Program represents a collaborative effort for transfer students from five academic departments across two colleges, and the Enrollment Management and Career Services Division at RIT. All of the programs in the five participating departments are ABET-accredited, and require students to obtain approximately one year of industry co-op experience before graduation. The MEET Scholars program involves our mandatory cooperative education program which helps students address their financial needs and facilitate placement in the high technology workforce.

Introduction

In September of 2004 the National Science Foundation (NSF) awarded RIT a four-year grant of $396,000 from its 2004 Computer Science, Engineering, and Mathematics Scholarships (CSEMS) program. The CSEMS program addresses the shortage of graduates that are U.S. citizens graduating from baccalaureate institutions with majors in computer science, engineering, and mathematics. The RIT CSEMS MEET program uses the pipeline of transfer students that graduate from community colleges with associate degrees in engineering technology and engineering science. Nine academic programs that attract the largest amount of transfer students in engineering and engineering technology to RIT were selected to participate in this grant. Transfer students to these nine programs had declined for several years prior to 2004.

RIT is a private career-oriented university with a modern 1,300 acre campus located in Rochester, New York, the third largest city in New York. RIT prepares students for successful careers in a global, technology-based society in more than 200 different academic programs and delivers courses on-campus, online, and in several international locations. RIT has one of the oldest and largest cooperative education programs in the world. Many degree programs emphasize co-operative education where periods of

formal instruction are combined with off-campus hands-on paid internships which enhance the university's "learn by doing" philosophy.

There are five undergraduate programs in engineering in the Kate Gleason College of Engineering (KGCOE) and seven undergraduate programs in engineering technology in the College of Applied Science and Technology (CAST) at RIT. The Multi-department Engineering and Engineering Technology (MEET) Scholars Program is a collaborative effort between the Enrollment Management and Career Services Division at RIT and the following five academic departments and nine academic programs:

- Electrical, Computer and Telecommunications Engineering Technology (ECTET) Programs from the ECTET Department in CAST
- Manufacturing, Mechanical, and Electrical/Mechanical Engineering Technology Programs from the Manufacturing and Mechanical Engineering Technology/ Packaging Science Department in CAST
- Civil Engineering Technology (CET) Program from the Civil Engineering Technology /Environment Management/Safety Technology Department in CAST
- Electrical Engineering Program with several options from the Electrical Engineering Department in KGCOE
- Mechanical Engineering Program with several options from the Mechanical Engineering Department in KGCOE

All of the RIT ET and engineering baccalaureate programs are five-year programs that require 50 weeks of mandatory paid co-operative educational experience. This experience usually begins in the third year of each of these programs and can be accomplished in five single blocks (10 weeks) or a combination of single and double blocks (20 week) over a three year period. Each student finds co-op employment with help from an assigned co-op coordinator from Enrollment Management and Career Services Division.

Transfer Students

Many speeches, conferences, and reports in the United States during the past ten years have tried to address the future supply of engineers for the workforce and expanding the pipeline that provides students for careers in engineering. The plenary speaker, Marilyn Moats Kennedy, at the last American Society for Engineering Conference for Education and Industry Collaboration in California in 2007 told the conference attendees that many universities and colleges are not providing pathways for adults over twenty-five years of age to enter this pipeline. Kennedy believes that there are many adults who would like to make career changes and prepare themselves to become engineers. There are postsecondary institutions in the United States that can prepare students to enter this pipeline and transfer to another institution that offers a Bachelor of Science degree in engineering or engineering technology. Postsecondary institutions are defined by the U.S. Department of Education as institutions that offer programs of at least two years but less than four years of duration and include community colleges whose tuition costs are often subsidized by the local and state governments. Community colleges in the United States also provide workforce development and skills training as well as preparing students to transfer to four-year institutions. Adult students in workforce training could

be candidates for the engineering pipeline and continue at the community college and receive associate degrees which are usually two to three years in length for a full-time student. 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 4-year colleges. [1]This research also shows that 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 interested in engineering or engineering technology among these populations varied between 7 to 9%. Thus, transfers from 2-year schools form an extremely attractive pool to expand and diversify the engineering and technology workforce of the future.

Transfers from 2-year schools, both full-time and part-time, were declining as important stakeholders in academic programs at RIT and one of the goals of the MEET program was to increase the numbers of transfer students in electrical engineering, mechanical engineering and all engineering technology (EE+ME+ET) programs. Table 1 shows freshmen enrollments and full-time upper-division transfers to RIT, and within the five engineering and engineering technology departments participating in this project. For 2004-6, it shows that full-time transfers comprise 10% of incoming students in all of RIT whereas the proportion of engineering/technology transfers ranges from 12 to 19%.

Table 1: Freshmen & Upper-Division Transfer Enrollments

Entry: Fall Quarter of→		**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
All of RIT	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
EE+ME+ET Pipeline	Freshman + Transfer	338	369	388	431	423	394	429	420	466
Transfer Students	EE+ME+ ET	14%	13%	9%	8%	12%	11%	15%	19%	12%

Table 1[2] shows that the number of full-time transfers to engineering and engineering technology programs at RIT decreased in 2000, 2003, and 2006. The Multi-department Engineering and Engineering Technology (MEET) Transfer Scholars' Program was developed in 2004 with a CSEMS grant from NSF (#DUE-0422346) that expires in August 2008. The pipeline of engineering and engineering technology students has steadily increased since 1998 but the number of transfer students in this pipeline decreased steadily until 2002. The first year (2004) of the MEET program had an increase in the number of transfer students in the pipeline and the MEET retention was the best with this group of students.

Retention

One of the goals of the MEET program was to retain 90% of the MEET scholars at RIT. All of the MEET scholars have remained in their original programs and the MEET program has met this goal after three years. Table 2 summarizes the retention and graduation data for the MEET Scholars' Program:

Table 2: MEET Scholar Retention and Graduation Data

Academic Year ↓	Total #	Became Ineligible For Aid	Left RIT	Graduated from RIT	Retention Rate %
2004-5	30	0	0	Not applicable	100%
2005-6	45	1	1	2	98%
2006-7	54	0	2	22	96%
2007-8*	51	1			

*Retention or graduation data is incomplete for the current AY 2007-8

In 2004-5, 30 transfer students were awarded the MEET scholarship of $1,500/quarter (reduced to $750/quarter in subsequent years due to savings from coop wages). Of these 30 students, one became ineligible for aid due to part-time status, two graduated in 2006 and 23 scholars graduated in 2007. In the fall quarters of 2005, 2006 and 2007, scholarships were awarded to 15, 11 and 18 new transfer students respectively. One student left RIT in 2005-06 and two students left RIT in 2006-7 without graduating. Retention was better in the years when the MEET selection committee has larger pools of transfer students.

Table 3: % Students retained after 1-year of study at RIT

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

Table 2 shows that the MEET Scholars retention after one year of study at RIT was 100% in 2004-05, 98% in 2005-06, and 96% in 2006-07. These rates are higher that the rates achieved by all transfer students enrolled in the MEET academic programs given in Table 3 and the freshman retention rates. Thus, the retention rates in this program have been excellent in the first three years of the program.

Table 4: Graduation Rate within 7 Years of Study at RIT

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

Three of the 80 MEET scholars have left RIT at this point in time and two other MEET scholars changed from full-time to part-time students which met they were no longer eligible for MEET funding. A return to full-time status would make them eligible for funding. Transfer students should ideally graduate after three years at RIT if they transferred one-half of all required courses in their program to RIT. Twenty four of the thirty MEET scholars who started this program in 2004 have graduated and RIT has successfully retained all of the 2004-05 MEET scholars. The graduation rate of the 2004-05 scholars is 80% after three years and can improve in the next four years since only three of eighty MEET scholars have left RIT at the beginning of the fourth year of the program. One of the students who entered the MEET program in 2005-06 left after one quarter and two students who entered the MEET program in 2006-07 have left RIT. Additional information on ET retention initiatives that are in place for these students was presented at the 2005 ASEE Annual Conference. [3]

Enrollment of Female and AALANA Students

Another goal of the MEET program was to encourage more female and African-American, Latino American, and Native American (AALANA) students to enroll in the engineering and engineering technology programs.

Table 5: Upper-Division Transfer Enrollments by Female and AALANA Populations

Entry Fall Quarter of:		**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
All of RIT	All	126	125	122	166	189	172	203	213	208
	Female	44 (35%)	38 (30%)	45 (37%)	80 (48%)	69 (37%)	63 (37%)	58 (29%)	64 (30%)	76 (37%)
	AALANA	13 (10%)	9 (7%)	5 (4%)	16 (10%)	10 (5%)	9 (5%)	13 (6%)	13 (6%)	8 (4%)
EE+ME +ET only	All	47	48	34	36	51	44	66	79	57
	Female	5 (11%)	2 (4%)	1 (3%)	3 (8%)	1 (2%)	4 (9%)	4 (6%)	9 (11%)	9 (16%)
	AALANA	4 (9%)	3 (6%)	0	2 (6%)	3 (6%)	2 (5%)	3 (5%)	0	1 (1%)

Table 5 shows that fewer female and AALANA transfer students enter the MEET programs as compared with all of the programs at RIT. There are ten female MEET students which is 12.5% of all of the eighty students in the program in the fall of 2007 so

these numbers will increase in 2007. It appears that the recent increase in female transfer students during the past two years has been helped by the MEET program. There are only two AALANA students in the MEET program. One student entered the program this year (2007-08) and one entered the program last year (2006-07). The MEET program did not increase the enrollment of AALANA transfer students at RIT unless last year.

The deans of the Kate Gleason College of Engineering and the College of Applied Science and Technology both realized that there are low enrollments of female students in engineering and engineering programs at RIT and have encouraged the development of the Women in Engineering (WE) program in the KGCOE and with the Women in Technology (WIT) program in CAST.

RIT realized that the number of AALANA students is low in all of the its Science, Technology, Engineering, and Mathematics (STEM) programs and has recently obtained a grant for the NSF Louis Stokes Alliances for Minority Participation (LSAMP) and developed a relationship with the Atlanta University Center which facilitates the completion of dual degrees in engineering with students from Morehouse and Spelman colleges. Partners for the LSAMP are community colleges in Rochester and Syracuse, New York. These two programs should increase the number of AALANA transfer students entering RIT STEM programs.

MEET Scholarship Structure and Selection

RIT has awarded eighty MEET scholarships to transfer students for six quarters since December, 2004. The goal was to award seventy-five scholarships and five additional scholarships have been awarded since 3 students have left RIT and two students are now part-time students and no longer eligible for the scholarships. MEET scholars each receive a scholarship of $1500 each quarter during their first two quarters at RIT that they are enrolled in a full load of academic courses. The scholarship award is reduced to $750/quarter for the remaining four quarters of on-campus study as the MEET scholar has completed one or more co-operative education blocks. It has been our experience that a student in a MEET program can save $1,000 or more from 10-week co-op earnings of approximately $5,400. Thus, after two such coops, a student's financial need decreases.

Awardees under the MEET Scholars Program must be transfer students that meet the current admissions criteria for one of the MEET programs listed above, U.S. citizens, enrolled full-time, and demonstrate financial need. The Selection Committee consists of the MEET Department faculty representatives and the Director of Financial Aid. The Director of Financial Aid identifies all full-time transfer students in the nine MEET programs that have demonstrated financial need as defined by the U.S. Department of Education rules for federal financial aid. All eligible students are considered for the scholarship. The scholarship is renewed annually if the student continues to demonstrate financial need and maintains a quarterly GPA greater than 2.5. Any MEET scholar whose GPA falls below 2.5 will have one quarter of probation to improve their GPA if they participate in an appropriate intervention program to improve their academic

performance. A MEET scholar whose GPA has not improved in the probation quarter will no longer be eligible for the MEET Scholarship Award in the next academic year. Two of the MEET scholars have been placed on probation and each time the student improved their GPA in the following quarter.

Each academic department has a MEET faculty representative who is the principal investigator or co- principal investigator on the grant. The faculty representatives mentor the scholars and develop intervention programs to improve the scholar's academic performance if the scholar's GPA falls below 2.5 in any academic quarter. Descriptions of the mentoring and the intervention programs for these scholars were presented at the 2004 ASEE Annual Conference. [4]

Lessons Learned

Transfer students are an excellent pipeline for engineering technology and engineering programs and there numbers in the pipeline has increased at RIT since 2002. RIT graduation rates show that transfer students graduate at a higher rate than students who start at RIT as freshman.

Transfer students in the MEET programs do not require additional academic support as compared to other students at RIT as all of the eighty MEET scholars have consistently maintained grade point averages greater than 2.5 except for two students in two different quarters.

Future programs need a more aggressive recruitment program for AALANA students. Brochures were developed for the MEET program and distributed to prospective students when they attended RIT open houses. Information on the MEET program was on the CAST website. It appears that a more pro-active approach will be need in the future if RIT is going to increase the number of transfer students admitted to RIT. RIT future participation in the AALANA recruitment programs described above will help to increase the number of AALANA transfer students to engineering and engineering technology programs.

Future programs would benefit from additional social activities. We have found that it has been difficult to recruit MEET scholars to attend quarterly social functions and have observed that many of these students would benefit from more social interaction with their professors, department chairs, and advisors.

Conclusions

The MEET program at the beginning of its last year has met one of the goals of the program proposed to the NSF which was to retain 90% of the MEET scholars at RIT. All of the students have been successful in the completing their cooperative education requirements and the students who have graduated from RIT are all employed in STEM fields which has allowed us to provide these students with skills, education, and work

experience needed to enter the high technology workforce during the cooperative educational experience and upon graduation from RIT.

The MEET program has also been successful in developing connections between the engineering technology and engineering programs which are located in different buildings and colleges at RIT. Additional work will be required in the future to increase the numbers of female and AALANA students in the engineering and engineering technology programs at RIT.

Reference Information

[1]Postsecondary Institutions in the United States: Fall 2006 and Degrees and Other Awards Conferred: 2005-06, National Center for Education Statistics, Department of Education, 2007. PDF

[2] The source of data for all tables in J. Graham from Institutional Research at RIT

[3] Richardson, C. Engineering Technology Retention Programs at RIT, 2005 ASEE Annual Conference Proceedings

[4] C. Richardson, S. Gupta, M. Valentine, R. Merrill, V. Amuso, Multi-department Engineering and Engineering Technology Scholars Program, 2005 ASEE Annual Conference Proceedings

Biographical Information

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