
AC 2012-3064: PERSISTENCE, COOPERATIVE EMPLOYMENT, AND GRADUATION STATISTICS OF TRANSFER SCHOLARS IN ENGINEERING AND ENGINEERING TECHNOLOGY PROGRAMS

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Persistence, Cooperative Employment and Graduation Statistics of Transfer Scholars in Engineering & Engineering Technology Programs

Introduction

Full-time and part-time transfer students from 2-year schools are important stakeholders in academic programs at our university. This paper introduces the Engineering and Technology Transfer Scholars' (ET²) program funded in 2008 by the National Science Foundation¹ (NSF) that focuses on students who transfer at the 3rd year level from 2-year schools to our university. With scholarship support from NSF, our aim is to recruit, retain and graduate a total of 75 additional transfer scholars in our engineering and engineering technology BS degree programs². The NSF scholarship support is provided in addition to grants and aid awarded by our university.

The five objectives of the ET² program are to: (i) graduate a total of 75 additional transfer students from our engineering/technology BS programs, (ii) identify women and minority students whenever possible, but allow the scholarship to be provided to all students meeting program requirements, (iii) identify scholars in academic trouble and provide help to them through proactive intervention, (iv) prepare students with the skills, education and work experience to enter the high technology workforce, and (v) perform regular and thorough assessment of the program. This paper focuses on objective (iv).

During AY 2008-12, we awarded 76 scholarships to transfer students in the ET² program. Table 1 shows data on academic status for each cohort of scholars at the end of the fall quarter of AY 2011-12.

Table 1: Academic Status of ET² Scholars in Fall 2011					
Academic Year of Entry	Number of ET² Scholars				
	Recruited	Continuing	Graduated	Transferred	Left Univ.
AY 2008-09	22	5	16	0	1
AY 2009-10	24	20	1	1	2
AY 2010-11	27	27	0	0	0
AY 2011-12	3	3	0	0	0
Totals	76	55	17	1	3

Of the AY 2008-09 cohort of 22 scholars: (i) one student left the program after obtaining a full-time well-paying job offer from his coop employer; (ii) fifteen students have graduated and are employed full-time in STEM functions; and (iii) the remaining six students are continuing their studies and are expected to graduate at the end of this academic year. This paper focuses on the cooperative employment statistics of this AY 2008-09 cohort.

Of the AY 2009-10 cohort of 24 scholars, one student transferred to another STEM program at our university, and two students left the university after an extended leave of absence³. At the end of the fall quarter of this academic year, fifty seven scholars were either in school or on paid full-time cooperative employment⁴.

Cooperative Employment Data on the AY 2008-09 Cohort

At our university, all undergraduate engineering and engineering technology students must complete a minimum of 50 weeks (typically 4 or more quarters) of paid cooperative education (co-op) employment. Each student finds co-op employment with help from an assigned co-op coordinator in the Office of Cooperative Education and Career Services (OCE). OCE 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. OCE services remain available to alumni for a lifetime.

Each student typically works 40 or more hours per week during a co-op assignment. At the end of each coop period, the student must electronically submit a coop report to his/her academic advisor, as well as request the coop supervisor to submit a performance evaluation report. The academic advisor meets with the student to review both reports. Upon successful review, the student is granted a “satisfactory” grade for the coop period.

Of the twenty one ET² scholars remaining in the AY 2008-09 cohort, one student had a complete waiver from the coop requirement based on his prior industrial experience. The remaining twenty scholars were on coop assignments during the eleven quarters beginning in spring of 2009 (2008-3 through 2011-1). Table 2 compares the hourly wages of these twenty scholars (“ET²”) with those of their peers (“All”) at our university.

Item	Coop #1		Coop #2		Coop #3		Coop #4	
	All	ET ²	All	ET ²	All	ET ²	All	ET ²
# of responses	1575	20	1170	20	530	14	193	10
Average Wage (\$/hr)	14.82	13.50	15.56	13.74	16.39	14.91	16.77	14.50
Median Wage (\$/hr)	15.00	12.00	15.00	12.75	16.00	14.00	16.00	14.50
Highest Wage (\$/hr)	49.23	21.50	40.00	21.50	35.00	24.00	60.00	20.00
Lowest Wage (\$/hr)	7.25	9.50	7.50	10.00	8.00	8.00	8.00	10.00

Both the average and median hourly wages of ET² cohort are lower than the peer groups in each of the four coop periods. Corresponding values differ from \$1.32 to \$3.00 per hour. Please note that relative to the student population in the engineering and engineering technology programs, the number of ET² scholars may be too small for the differences in average and median values to be statistically meaningful. In general, the wage rate increased for nearly all students in both groups as they progressed from one coop to the next. The average wage rate trend is shown in Figure A.

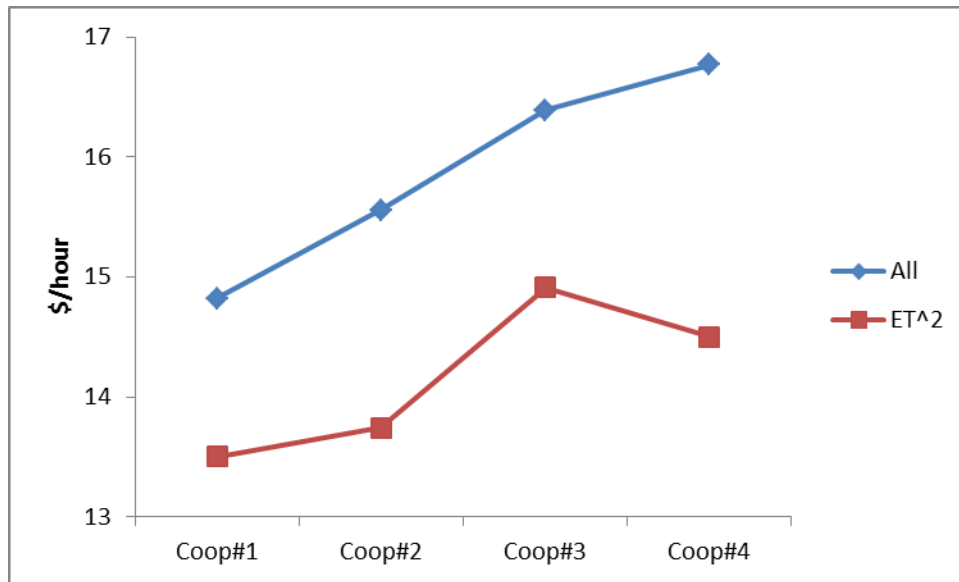


Figure A: Average Hourly Wage Rate

Coop supervisors are asked to evaluate each student on a scale of one (poor) to 5 (excellent) on seventeen items in addition to free form comment. Table 3 lists these seventeen items – each identified by a short label.

Table 3: List of items evaluated by coop supervisors		
#	Label	Description
1.	Quality	Quality of Work: Accuracy, thoroughness, timeliness
2.	Quantity	Quantity of Work: Volume, pace and effort
3.	Learn	Ability to Learn: Grasps and retains new skills and concepts
4.	Initiative	Initiative: Originates ideas and seeks new responsibilities, proactively seeks assistance
5.	Knowledge	Ability to apply knowledge of mathematics, science, and engineering
6.	Experiment	Ability to design and conduct experiments, as well as to analyze and interpret data
7.	Design	Ability to design a system, component, or process to meet desired needs
8.	Team	Ability to function on multi-disciplinary teams
9.	Solution	Ability to identify, formulate and solve problems
10.	Ethics	Demonstration of professional and ethical responsibility
11.	Communication	Ability to communicate effectively, written and oral
12.	Tools	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice
13.	Preparation	Quality of technical preparation
14.	Respect	Respect for diversity and a knowledge of contemporary

		professional, societal, and global issues
15.	Awareness	Ability to understand own strengths and weaknesses, and receive feedback
16.	Leadership	Ability or potential to lead others and/or projects, set and achieve goals, create change and inspire confidence
17.	Overall	Overall performance

Table 4 lists the average scores for each of the seventeen evaluation items.

#	Item Label	Coop #1		Coop #2		Coop #3		Coop #4	
		All	ET ²	All	ET ²	All	ET ²	All	ET ²
1.	Quality	4.2	4.3	4.3	4.4	4.3	4.2	4.4	4.5
2.	Quantity	4.2	4.1	4.3	4.1	4.3	4.2	4.4	4.7
3.	Learn	4.4	4.4	4.4	4.3	4.5	4.4	4.6	4.6
4.	Initiative	4.1	4.1	4.2	4.0	4.2	4.1	4.2	4.5
5.	Knowledge	4.2	4.2	4.3	4.2	4.3	4.4	4.4	4.6
6.	Experiment	4.1	4.2	4.2	4.1	4.2	4.2	4.3	4.1
7.	Design	4.1	4.3	4.2	4.2	4.2	4.0	4.3	4.6
8.	Team	4.3	4.3	4.4	4.3	4.4	4.4	4.4	4.6
9.	Solution	4.1	4.1	4.2	4.0	4.2	4.1	4.3	4.4
10.	Ethics	4.4	4.4	4.4	4.3	4.5	4.5	4.5	4.6
11.	Communication	4.1	4.2	4.2	4.2	4.2	3.9	4.2	4.1
12.	Tools	4.2	4.3	4.3	4.3	4.4	4.4	4.4	4.7
13.	Preparation	4.2	4.2	4.2	4.2	4.3	4.0	4.3	4.5
14.	Respect	4.3	4.1	4.4	4.1	4.4	3.9	4.5	4.3
15.	Awareness	4.2	4.3	4.2	4.2	4.2	4.4	4.3	4.8
16.	Leadership	3.9	4.0	4.0	3.6	4.0	3.8	4.1	4.0
17.	Overall	4.3	4.2	4.3	4.2	4.4	4.3	4.4	4.6
# of responses		1761	20	1286	20	600	14	213	10

Except for item 16 – Leadership, all averages are 3.9 or above. Corresponding average scores for the two groups are comparable. Most of the averages improved as the students progressed from one coop to the next.

The number of “not applicable (NA)” responses to some of the items is quite revealing about the nature of coop assignments for a significant fraction of students. Table 5 lists the percentage of responses that was NA for each item.

For “All” students, percentage of “NA” responses exceeding 10% are seen for items 5, 6, 7, 8, 9, 12, 13, 14, and 16. The percentage of “NA” responses is similarly higher for the same items for the ET² group. Please note that because the total number of responses for the ET² group is low (≤ 20), the percentage value can vary drastically if even one response was omitted from analysis.

#	Item Label	All				ET ²			
		Cp#1	Cp#2	Cp#3	Cp#4	Cp#1	Cp#2	Cp#3	Cp#4
1.	Quality	0	0	0	0	0	0	0	0
2.	Quantity	0	0	0	0	0	0	0	0
3.	Learn	0	0	0	0	0	0	0	0
4.	Initiative	1	1	0	1	0	0	0	0
5.	Knowledge	12	11	6	5	15	15	7	10
6.	Experiment	30	27	22	18	20	25	36	30
7.	Design	28	27	24	21	40	35	36	20
8.	Team	17	14	10	15	20	15	21	30
9.	Solution	17	15	12	10	15	15	14	10
10.	Ethics	9	8	4	4	10	10	0	0
11.	Communication	0	0	0	0	0	0	0	0
12.	Tools	13	12	7	6	10	10	7	0
13.	Preparation	11	10	5	6	10	10	7	0
14.	Respect	18	16	16	20	15	10	29	40
15.	Awareness	8	8	5	4	10	10	0	0
16.	Leadership	21	19	15	14	20	20	14	20
17.	Overall	0	0	0	0	0	0	0	0
# of responses		1761	1286	600	213	20	20	14	10

For “All” students, percentage of “NA” responses exceeding 20% are seen for Experiment (#6), Design (#7), and Leadership (#16). Thus, a significant fraction of the earlier coop assignments does not involve design of experiments, design of system or component or process, or leadership activities.

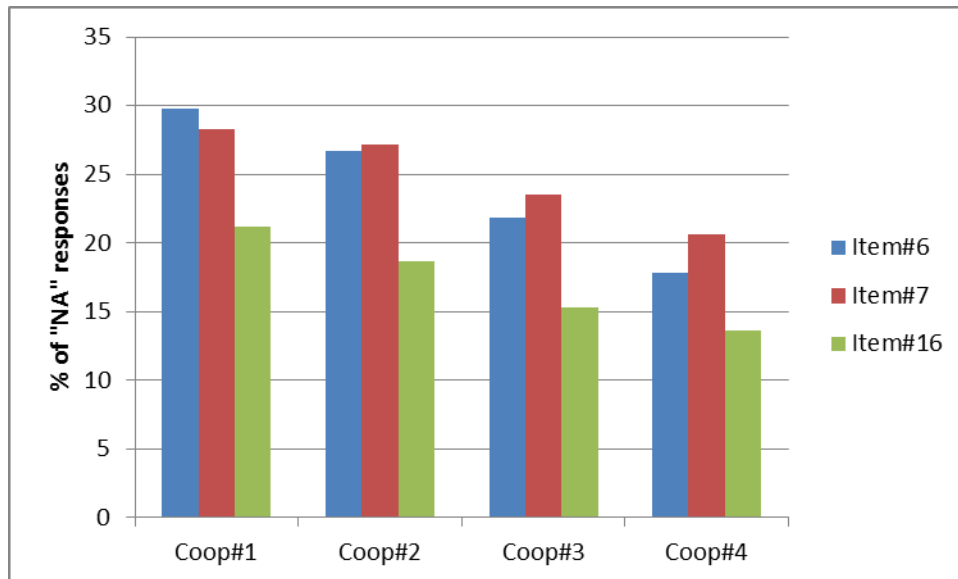


Figure B: % of “NA” responses for items #6, 7 and 16 for “All” students

Figure B shows a plot of percentage of “NA” responses for these items #6, #7, and #16 as the students progressed from one coop to the next. The decreasing trend indicates that as the students progress from one coop to the next, they become more involved in experimental design and leadership activities.

As a final question, the coop supervisors are also asked: “If available and appropriate, would you offer a regular employment position to this student upon graduation?”. Table 6 summarizes the responses to this question.

Item	Coop #1		Coop #2		Coop #3		Coop #4	
	All	ET²	All	ET²	All	ET²	All	ET²
Total # of responses	1761	20	1286	20	600	14	213	10
# of “yes” responses	1478	16	1106	17	529	12	194	9
# of “no” responses	135	1	91	2	25	1	9	1
# of “NA” responses	148	3	89	1	46	1	10	0
% “yes” responses	92%	94%	92%	89%	95%	92%	96%	90%

The percentage value in the last row is calculated by disregarding the “NA” responses. In all cases, if an appropriate position is available, 89% or more coop employers will hire these students upon graduation.

Conclusions

1. The ET² project has been successful meeting its goals of recruiting 75 transfer scholars with better than 95% retention rate, and expects to graduate all scholars currently enrolled.
2. The hourly wage rates for ET² scholars on coop averaged from \$13.50 to \$14.91. These rates were slightly lower than their peers which averaged from \$14.82 to \$16.77. In general, the hourly rate increased for nearly all students as they progressed from one coop to the next.
3. On sixteen of seventeen items the students were evaluated by their coop supervisors, the average scores (≥ 3.9) were comparable for both groups. The averages improved as the students progressed from one coop to the next. On item labeled Leadership (#16), the average score was lower than 3.9 in two instances.
4. The percentage of “Not Applicable (NA)” responses for three of the seventeen items exceeded 20%. The three items focused on design on experiments (#6), design of system or component or process (#7), and leadership (#16). The percentages decreased as the students progressed from one coop to the next.
5. For both groups, 89% or more employers would readily hire our students upon graduation if an appropriate position was available.

Acknowledgements

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