

NACME RESEARCH REPORT



2008 GRADUATING SCHOLARS SURVEY

This report was authored under contract by Lisa M. Frehill, Executive Director, and Nicole M. Di Fabio, Research Associate, of the Commission on Professionals in Science and Technology (CPST).

CREATING OPPORTUNITIES, ENSURING SUCCESS

Executive Summary

A study of the NACME Scholars who graduated between January and September, 2008 was conducted to determine:

- Scholars' level of satisfaction with instructional and support features of their undergraduate engineering program
- Research and/or internship experiences acquired by the Scholars during their undergraduate degree program
- Post graduation employment positions, locations and relatedness to their degree program.
- Graduate education coursework and degree plans.

The Minority Engineering Program (MEP) coordinators at each of the 25 NACME partner institutions were critical in garnering a 90% response rate, which is considered exceptional in survey research, providing a strong basis for generalization. MEP coordinators were provided with modest funds--\$50-\$100 or t-shirts—to provide an incentive to students to complete the survey. Full instructions and the survey are included in an appendix to this report.

As of 7/7/2008 we had received:

- surveys from 24 of the 25 schools (96% return rate).
- 145 total surveys
 - overall rate: $145/178 = 81.5\%$
 - second strata rate: $145/169 = 85.8\%$
- Of these 145 surveys, 96 were in the population of interest (those who were graduating in Spring or Summer 2008). **The response rate for this population: 90% (96/106).**
- There were very few instances in which a MEP coordinator reported being unable to obtain a completed survey from a student who was in the population of interest.

Key findings:

- The NACME Scholarship was the most important funding source cited by students: 73% of students indicated that the NACME Scholarship was a “very important” funding source for their undergraduate education among 14 possible sources that were rated.
- More than half of the graduating scholars indicated an interest in pursuing a doctoral degree.
- One-third planned on pursuing a master's degree in engineering within 12 months of graduation.
- “Professional interests” were a key factor in students' post-graduation plans: 73% of males and 65% of females said this factor “greatly influenced” their plans.
- “Working conditions” were also critical to making plans: 50% of women and 62% of men said these conditions “greatly influenced” their plans with 38% of women saying it was the most important factor.
- Students reported 174 internship/co-ops at 127 different companies. These were critical experiences:
 - 69% indicated that they “would work for the company based on their internship experience;”
 - 57% indicated the internship “provided a lot of skills/knowledge applicable to coursework;”
 - 23% said the internship helped them choose an engineering area; and
 - 29% of women indicated the internships were critical in helping them see a career path or to establish a cultural preference for a workplace.

- Almost all of the students—all but 3 men—indicated that their post-graduation employment was “somewhat” or “closely related” to their degree field.
- Undergraduate experiences with research and interactions with faculty were critical to students’ post-graduation educational planning. Students who had worked with faculty on research, had attended conferences, or presented research at conferences were quite likely to express an interest in both enrolling in an engineering master’s program within the next 12 months and in eventually pursuing a Ph.D. in engineering.

Recommendations:

Conference participation can be critical to growing the next generation of engineering leaders and educators. Travel funding to attend conferences should be a topic of discussion with the MEP coordinators because schools differed greatly in the support available and the sources of this support.

- At the “Very High Research Activity” and “High Research Activity” institutions, faculty members or departments may have travel funds. MEP Coordinators need to make sure that students are aware of being proactive in seeking these funds and that faculty are also proactive in inviting students to participate and present research.
- At the “Sub-Ph.D.-granting” institutions, NACME may need to provide a separate source of funds for student travel to conferences.
- Students need to be aware of the importance of participating in professional societies, including the merits of attending conferences.

NACME should continue to work closely with the MEP Program Coordinators at its partner schools to continue to connect with the students. Students were aware of their status as NACME Scholars: this status should be made prestigious, something that students “advertise” to employers post-graduation, and NACME should work to maintain contact with the students. Since research experiences provide a bridge to graduate school, NACME should work with MEP Coordinators, allied programs (e.g., Louis Stokes AMP and McNair), and faculty at partner institutions to enable increased participation in research by the NACME Scholars.

Results

Who are the NACME Graduating Scholars?

Table 1a provides a demographic overview of the 96 respondents who reported that they were planning to graduate (or had already graduated) between January and September, 2008. Whereas women tend to account for about 20% of all engineering graduates in a year nationwide, women accounted for 28% of the NACME Graduating Scholars. In terms of race/ethnicity, a majority of the students supported by the NACME program were of Latino/a descent, followed by African American students. There had been a problem with the way these questions were asked on the survey this year; hence ethnicity was unknown for 14 students. This problem will be rectified with next year’s survey. The average age was 24 and the vast majority of students have never been married and only two students (both male) reported that they had children.

Table 1a. Demographic Overview of Respondents

	Number	Percent
Gender		
Female	27	28.1%
Male	66	68.8%
Unknown	3	3.1%
Race/ethnicity		
American Indian /Alaska Native	1	1.0%
African American	25	26.0%
Latino/a	53	55.2%
Multiple responses	1	1.0%
White	2	2.1%
Unknown	14	14.6%
Age		
Minimum	21	
Maximum	33	
Mean	24	
Std. Dev.	2.5	
Graduated from High School in United States	76	79.2%
Marital Status		
Married or marriage-like relationship	10	10.4%
Divorced/separated	3	3.1%
Never married	82	85.4%
Number with children	2	(both male)
Adult in home when growing up had attended college.	61	63.5%

Table 1b provides an overview of the institutions included in the NACME Graduating Scholars Study using the 2005 Carnegie Classification scheme and reports the control of each school and whether the institution is a Historically Black College or University (HBCU), a Hispanic Serving Institution (HSI) or a Minority Serving Institution (MSI). The new Carnegie system departs from previous schemes from the Carnegie Foundation in several ways. Without going into great detail, suffice to say here that the well-known category “Carnegie Research I” has now been split into “Research University-Very High Research Activity” and “Research University-High Research Activity.” Table 1c provides a list of the NACME institutions and their 2005 Carnegie classification. Eight NACME schools were in the “Very High Research” category with 31 survey respondents. Another 40 students were at the 8 “High Research Activity” institutions. The remaining 24 respondents were at six institutions at which the terminal degree is lower than the doctoral degree – in the analyses that follow, these students have been combined into one institutional type category called “Sub Ph.D.” or denoted “< Ph.D.” in some graphs and charts.

Table 1b. Institutional Characteristics of Universities Attended by NACME Graduating Scholars

	Number	Percent
Carnegie Classification		
Research University, Very High Research Activity	31	33%
Research University, High Research Activity	40	42%
Master's-Granting Institutions	15	16%
Baccalaureate Institutions	3	3%
Special Focus, Colleges of Engineering	6	6%
Institutional Control		
Public	81	85%
Private	14	15%
Special Institutions		
HBCU	10	11%
HSI	22	23%
MSI	34	36%

Three of the institutions are private (Kettering, Polytechnic, and Tuskegee), while all of the others are public institutions. There are 3 HBCUs, 4 HSIs, and 8 MSIs¹. Since only ten students hailed from HBCUs, care needs to be exercised in interpreting these results for this type of institution.

Table 1c. NACME Institutions' 2005 Carnegie Category

Research University-Very High Research Activity	
Arizona State University at the Tempe Campus	
Georgia Institute of Technology-Main Campus	
Kansas State University	
University of California-San Diego	
University of Colorado at Boulder	
University of Washington-Seattle Campus	
Virginia Polytechnic Institute and State Univ	
University of Illinois at Chicago	
Research University-High Research Activity	
Florida International University (HSI, MSI)	
University of Missouri-Rolla	
New Jersey Institute of Technology	
North Carolina A & T State University (HBCU, MSI)	
Polytechnic University	
University of Central Florida	
University of Houston-University Park (MSI)	
University of Texas at El Paso, (HSI, MSI)	
Master's Granting Institutions	
California State University-Los Angeles (HSI, MSI)	
Prairie View A & M University (HBCU, MSI)	
Rochester Institute of Technology	
CUNY City College (HSI, MSI)	
Baccalaureate Institutions	
Tuskegee University (HBCU, MSI)	
Special Focus - Engineering	
Kettering University	

¹ HBCUs are Historically Black Colleges and Universities; HSIs are Hispanic-Serving Institutions, and MSIs are Minority-Serving Institutions. Only HBCUs have a historical basis within the relevant ethnic community. HSIs and MSIs are defined as such due to having enrollments of students of Hispanic origin or from minority groups of 25 percent or higher.

Figure 1. NACME Scholars' Majors by Gender.

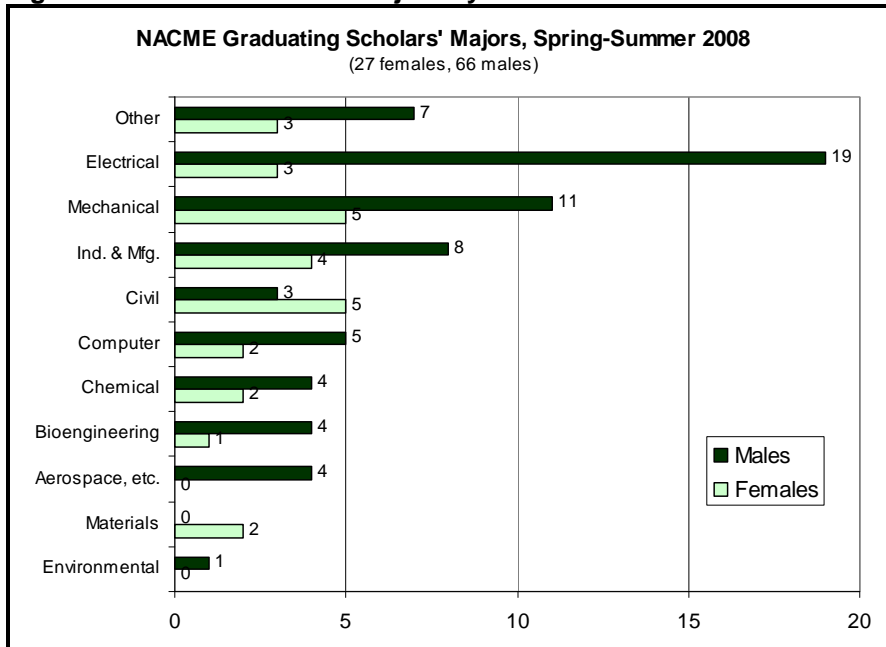
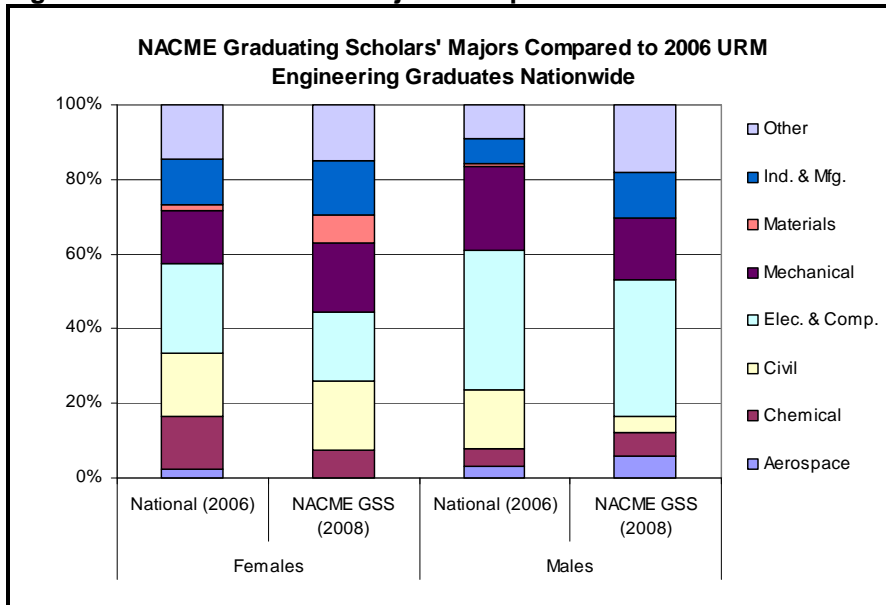


Figure 2. NACME Scholars' Majors Compared to All U.S. URM BSE Recipients, 2006.



Figures 1 and 2 show the major fields for the NACME scholars alone and in comparison to the under-represented minorities who received bachelor's degrees in engineering in 2006. Fields such as civil and chemical engineering are not as highly represented by the NACME scholars in comparison to the national level. Men are not as well represented in mechanical engineering among NACME Scholars as they are among nationwide under-represented minority (URM) bachelors of science in engineering (BSE) recipients. Female NACME Scholars, however, are slightly more highly represented in mechanical engineering than URM women nationwide.

Post-Graduation Plans and the Role of Research Experiences as Undergraduates

Figures 3 and 4 show NACME scholars' interests and plans for post-bachelor's study. Quite a few NACME scholars expressed an interest in pursuing a doctoral degree at some point: more than half (n=53, 55%) of the NACME scholars indicated this interest. Likewise, when they were asked about their educational plans for the next 12 months, quite a few students—indeed just over one third—indicated an interest in pursuing a master's degree in engineering within the next twelve months. A majority did have some sort of post-bachelor's study plans, only 23 scholars (24%) indicated that they had no plans for subsequent study. Figure 5 indicates that most of the scholars do plan to work in a job immediately after graduation: this is consistent with the general educational career pattern for engineers. Only 21 of the students planned to *immediately* enter graduate programs.

Figure 3. NACME Scholars' Interest in Doctoral Study

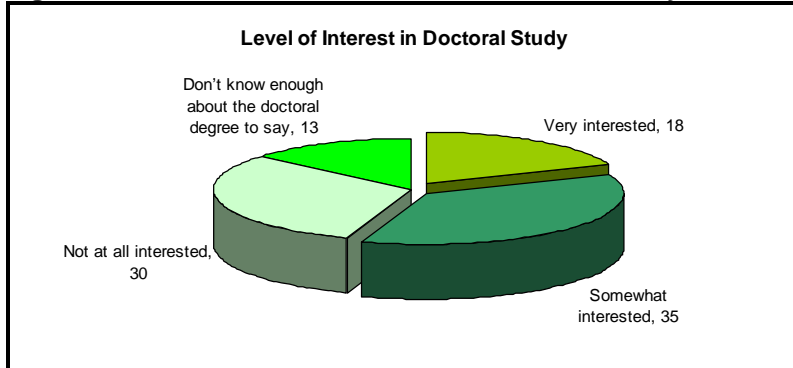


Figure 4. NACME Scholars' Educational Plans for the Next Twelve Months

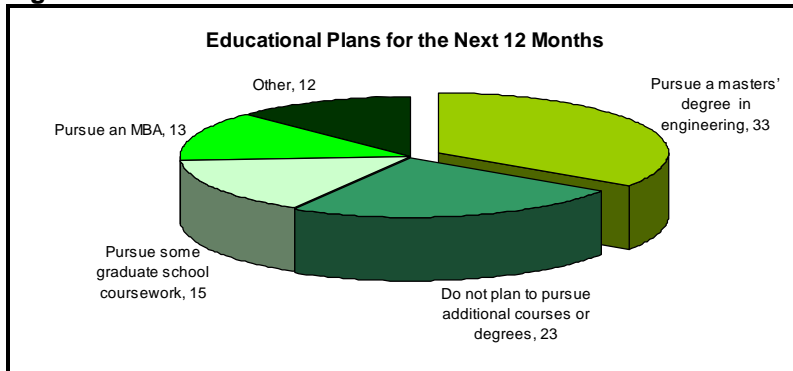


Figure 5. NACME Scholars' Immediate Post-Graduation Plans

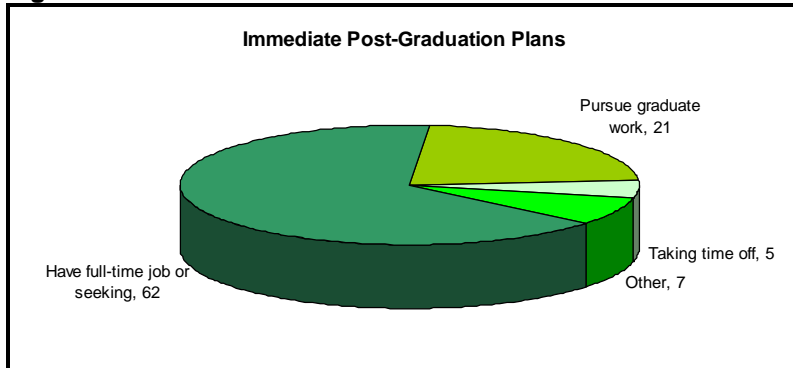
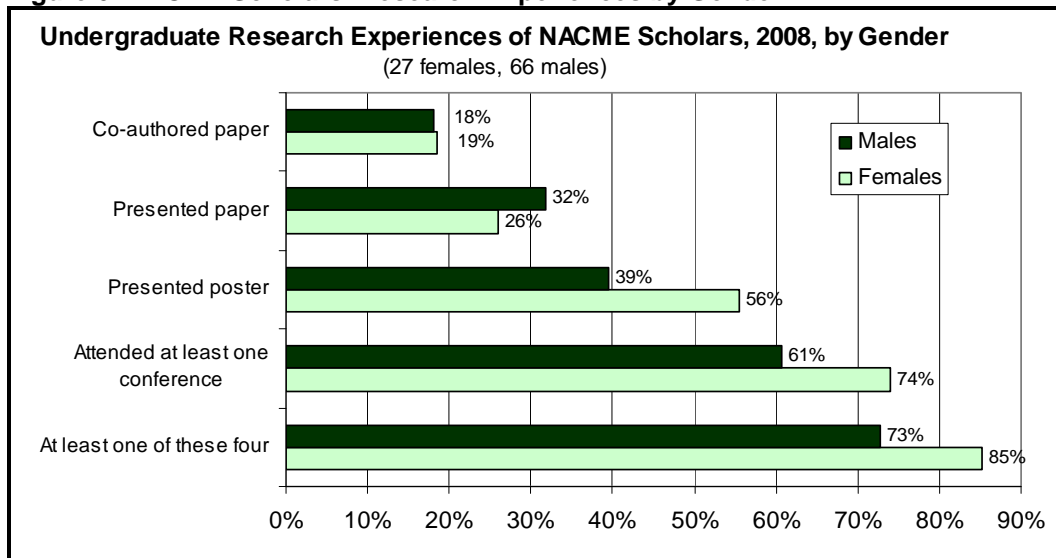


Figure 6. NACME Scholars' Research Experiences by Gender



The survey asked the NACME scholars about their undergraduate research experiences. Figure 6 and Table 2 explore some of the ways in which scholars' research experiences were related to gender and then how these experiences and gender, together, appear to impact the post-bachelor's educational expectations. In Figure 6, we see that men and women were equally likely to report co-authoring a paper with a professor but men were more likely than women to indicate that they had presented a paper at a conference. Women were more likely than men to have attended at least one conference and to have presented a poster at a conference. Women (85%) were also more likely to have done at least one of these four important research activities than were men (73%).

Table 2. How Do Undergraduate Research Experiences Impact Graduate School Plans?

	Masters in Engineering			Doctoral Study		
	Females	Males	Total	Females	Males	Total
	Number					
Attended a conference	10	13	23	12	23	35
Presented a poster at conference	6	7	13	11	17	28
Presented a paper at conference	2	5	7	5	12	17
Co-authored a paper with faculty	4	5	9	4	8	12
	50%	33%	25%	60%	58%	38%
	40%	27%	14%	73%	65%	30%
	29%	24%	8%	71%	57%	18%
	80%	42%	10%	80%	67%	13%
n	27	66	93	27	66	93

Table 2 shows the number of students who had engaged in each of these four activities and how this relates to the expression of interest in a doctoral degree or in earning a master's degree in engineering (MSE). In this case, we have coded the number and percent of students who said that they were "very interested" or "somewhat interested" in pursuing a doctoral degree at some point in the future and the number and percent of scholars who indicated that they planned to pursue an MSE in within the next 12 months. Almost all of the women (80%) who had co-authored a paper with a professor indicated a desire to earn an MSE and to eventually earn a doctoral degree in engineering. Conference attendance also seems to have made a big impact upon women: 50% of those who had attended a conference indicated that they planned to pursue an MSE within 12 months and 60% indicated that they planned to pursue doctoral study at some time. More than half of the men who had attended a conference, who had presented a paper or a poster at a conference, or who had co-authored a paper with a professor were

quite likely to indicate that they were interested in pursuing a doctoral degree. These same research activities were less effective in encouraging men than women to pursue a MSE degree.

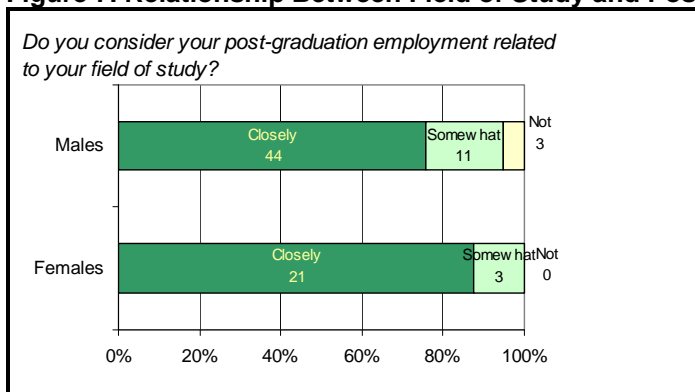
Table 3. Percent Who Reported Each Factor “Greatly Influenced” Their Post-Graduation Plans by Gender

	Females	Males
Professional interests	65%	73%
Working conditions (e.g., hours, equipment, working environment)	50%	62%
Compensation package (pay, bonuses, etc.)	48%	52%
Promotion opportunities	46%	55%
Job location	46%	53%
Worked previously for the employer in an internship/co-op	32%	28%
Family-related reasons (e.g., children, spouse’s job, desire to be near relatives)	23%	23%
Worked at a similar company as an intern/co-op	19%	13%
	n	27
		66

What were the factors that students said impacted their post-graduation plans? Table 3 indicates that males’ and females’ general patterns for a range of reasons why they chose their employer were similar, although men held slightly stronger opinions. Both males and females indicated that “Professional interests” “greatly influenced” their post-graduation plans, while working conditions were cited by half or more of the respondents as having “greatly influenced” these plans. More than half of men also indicated that “Compensation package,” “Promotion opportunities” and “Job location” all “greatly influenced” their post graduation plans. It is important to note that less than one in four men and women (23%) indicated “family-related reasons” as having greatly influenced their post graduation plans.

When asked specifically about the *top* reason or the *second most important* reason, though, there were some important differences between women and men. Among women, 42% cited “working conditions” versus just 28% of men as one of the two primary factors in their post-graduation plans. (And 38% of women cited working conditions as the primary factor.) “Professional interests” were also cited as a key reason by men (41%) and women (46%).

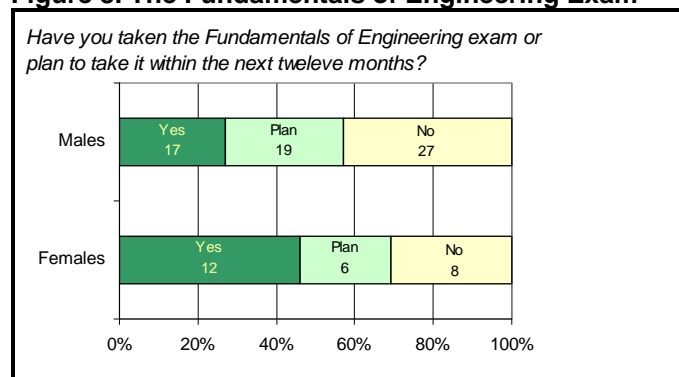
Figure 7. Relationship Between Field of Study and Post-Graduation Employment



Finally, Figure 7 shows that the overwhelming majority of Graduating Scholars will be in employment that they believe is closely related to their degree field: 88% of women and 76% of men indicated this with all other women saying that their employment was at least “somewhat related” and all but three of the remaining men indicating that they jobs would be “somewhat related” to their degree field.

Figure 8 shows that women (69%) are more a little likely than men (57%) to indicate that they have either taken or plan to take the Fundamentals of Engineering exam, the first exam required to become a licensed professional engineer.

Figure 8. The Fundamentals of Engineering Exam



Assessing the Quality of the Undergraduate Experience

There were a number of survey items that asked students about their use of various services and their satisfaction with those services. The vast differences across universities have important implications for such items. That is, whereas a Minority Engineering Program office might be a critical service at a non-minority serving institution, such an office is less important at a Historically Black College or University (HBCU) or a Hispanic Serving Institution (HSI). Table 4 reports on the availability of various services, the extent to which students used each type of service and their satisfaction with those services.

Tables 5a and 5b indicate for each of these services, the number of students who indicated that they “wish” their institution had the service, the number who said that their institution did not have the service and that they did not need it and the number and percentage who did not know whether their institution had the service.

Most of the services were quite available to students. Students who had not been transfers from two-year colleges were probably unlikely to know of transfer assistance services, which means that it is not surprising that 46% of the students responded “don’t know” as shown in Table 5. There were only two other services available to less than 75% of students: peer mentoring (a relatively recent innovation in higher education) and travel funds to attend conferences.

Academic advisement, internships/co-ops, and tutoring were the top most available services but students’ use and ratings of these varied. Academic advisement was also the most used of these services but received just middling marks on satisfaction from the students. Students were most satisfied with the internship/co-op opportunities, a topic to which we will return later in this report. Although not as well-used as other services (40%), students who may have used tutoring were quite satisfied with this service with 72% saying they were “very satisfied” with the tutoring services they used. Research opportunities were quite available (83%), used by quite a few students (65%), and, when used, also brought high marks from the scholars, 73% of whom indicated they were “very satisfied” with research opportunities. Finally, although travel funds for conferences were the third most often used service (72%) students were far from very satisfied (58%) and these were not as widely available as other services. Many students were unaware of whether travel funds were available (n=18) but this was the service that the most (n=7) students wished was available. Tutoring, supplementary instruction and mentoring were the other three kinds of services students “wished they had” but were not available, although, in all three of these cases, a larger number of students said that these services were not available and that they did not need them. Such a gap indicates that students’ preferences related to these services greatly varies.

Table 4a. Student Services

	Available	Usage	Satisfaction
Academic advising	98%	82%	62%
Internship/co-op opportunities	96%	70%	80%
Tutoring	85%	40%	72%
Research opportunities	83%	65%	74%
Professional association membership	79%	76%	69%
Mentoring	75%	47%	63%
Supplementary instruction	75%	61%	60%
Travel funds to attend conferences	63%	72%	58%
Peer mentoring	57%	38%	44%
Two-year transfer assistance	31%	53%	37%

Notes: Available: percent of students who reported "yes" program or service was available.
Usage: percent of students saying they used it "Sometimes" or "Often" among those who said their school had the program or service.
Satisfaction: percent who were "Very satisfied" among those who reported using the program or service.

In Table 4b, we look at how students assessed services at different types of institutions. The general patterns just discussed for students, overall, are quite similar regardless of institution type, but there are some key differences too. Research opportunities were not confined to institutions with doctoral degrees (those in the “very high research” and “high research” categories): students at institutions without doctoral programs were equally likely to indicate these opportunities existed. More importantly, even though such opportunities were abundant at the top institutions—the “very high research” activity institutions—only 54% of students availed themselves of these opportunities (but gave them very high scores on satisfaction) with proportionately more students at “lower tier” schools participating in these opportunities with slightly lower levels of satisfaction.

Travel funds to attend conferences differ greatly across the three types of institutions. Students at “high research activity” schools reported the highest availability level (75%) in contrast to those at higher tier institutions, where less than half (48%) of students indicated that funds were available. Indeed, 63% of students at the sub-doctoral-granting institutions indicated travel funds were available. This, of course, is interesting because it may often be assumed that faculty at the top research institutions—those ranked by Carnegie as “Very High Research” universities—would have ample travel funds to support students to go to conferences. However, with the availability of postdocs and graduate students in these faculty members’ labs, it is possible that these scholars receive travel funding ahead of undergraduate students such as the NACME Scholars. It is interesting to note, however, that nearly one-in-three students at the “very high research” institutions were unaware of whether travel funding was available (see Table 5b)

In several ways, the “high research activity” institutions appear to offer services that are on par with those at the normally and better funded “very high research” universities with these services utilized at comparable rates with comparable marks for satisfaction. Though services are also available at those institutions not conferring doctoral degrees, utilization and satisfaction are often lower than that at the other two types of institutions. For example, tutoring was most available at the “sub-Ph.D.” institutions but was less utilized and drew lower satisfaction ratings than the tutoring at the “very high research” universities. However, it could be the case that at a smaller institution, students may more easily form study groups and not need formalized tutoring services. It would be quite useful to discuss these results with the MEP coordinators as a way to better flesh out the issues that are important for students at each type of institution.

Table 4b. Student Services by Institutional Type

	Very High Research Activity			High Research Activity			High Degree Less than Ph.D.		
	Available	Usage	Satisfaction	Available	Usage	Satisfaction	Available	Usage	Satisfaction
Academic advising	100%	87%	68%	98%	77%	64%	95%	83%	50%
Internship/co-op opportunities	97%	60%	88%	93%	78%	86%	100%	71%	76%
Research opportunities	84%	54%	86%	83%	73%	77%	83%	65%	74%
Tutoring	81%	44%	100%	85%	47%	66%	92%	27%	63%
Supplementary instruction	74%	57%	48%	75%	70%	89%	75%	56%	50%
Mentoring	74%	30%	69%	80%	50%	74%	67%	69%	67%
Professional association membership	68%	71%	79%	88%	77%	81%	79%	79%	72%
Peer mentoring	52%	38%	89%	60%	42%	57%	58%	36%	50%
Travel funds to attend conferences	48%	67%	77%	75%	77%	68%	63%	67%	64%
Two-year transition	26%	75%	86%	35%	50%	56%	29%	43%	40%

Notes: Available: percent of students who reported "yes" program or service was available.

Usage: percent of students saying they used it "Sometimes" or "Often" among those who said their school had the program or service.

Satisfaction: percent who were "Very satisfied" among those who reported using the program or service.

Table 5a. Knowledge of Services' Availability and Need

	Wish we had	No, not needed	Don't Know	
			Number	Percent
Two-year transfer assistance	1	21	44	46%
Peer mentoring	3	14	24	25%
Travel funds to attend conferences	7	10	18	19%
Mentoring	6	11	7	7%
Supplementary instruction	5	7	11	11%
Professional association membership	2	6	12	13%
Research opportunities	5	6	5	5%
Tutoring	6	8	0	0%
Internship/co-op opportunities	1	3	0	0%
Academic advising	1	1	0	0%

Table 5b. Knowledge of Services' Availability and Need by Institution Type

	Very High Research Activity			High Research Activity			High Degree Less than Ph.D.		
	Available	Usage	Satisfaction	Available	Usage	Satisfaction	Available	Usage	Satisfaction
Academic advising	100%	87%	68%	98%	77%	64%	95%	83%	50%
Internship/co-op opportunities	97%	60%	88%	93%	78%	86%	100%	71%	76%
Research opportunities	84%	54%	86%	83%	73%	77%	83%	65%	74%
Tutoring	81%	44%	100%	85%	47%	66%	92%	27%	63%
Supplementary instruction	74%	57%	48%	75%	70%	89%	75%	56%	50%
Mentoring	74%	30%	69%	80%	50%	74%	67%	69%	67%
Professional association membership	68%	71%	79%	88%	77%	81%	79%	79%	72%
Peer mentoring	52%	38%	89%	60%	42%	57%	58%	36%	50%
Travel funds to attend conferences	48%	67%	77%	75%	77%	68%	63%	67%	64%
Two-year transition	26%	75%	86%	35%	50%	56%	29%	43%	40%

Notes: Available: percent of students who reported "yes" program or service was available.

Usage: percent of students saying they used it "Sometimes" or "Often" among those who said their school had the program or service.

Satisfaction: percent who were "Very satisfied" among those who reported using the program or service.

How did students feel about the advisement and support that they received related to pursuing graduate education? Students were first asked two general questions: "How satisfied are you with the advisement you received related to graduate school opportunities?" and "How satisfied are you with the assistance you received with the graduate school application process?" Responses to each are shown in Figure 9 and Figure 10, respectively. Then, students were asked the following question.

You may have had access to or have received advice from any number of sources about your post-graduation options. In the table below, we list several of the sources that sometimes provide help to engineering students in identifying opportunities, clarifying goals, etc. Please circle the number that best represents the assistance you received from each of the possible sources.

The responses to this item, which asked about 10 different possible sources of advice, are shown in Table 6a and 6b.

Figure 9 shows the level of satisfaction with the advice students received about graduate school for all of the respondents and then, separately, for those at each of the different types of institutions. In general, students were quite satisfied with the advice they had received: a majority at each type of institution said that they were “Satisfied” or “Very satisfied” with graduate school advisement. Such sentiments were universal for the 10 respondents who graduated from one of the three HBCUs. It is important to note that students at HSIs (Hispanic Serving Institutions) and those at the institutions that did not confer doctoral degrees were the least likely to indicated that they were “Very satisfied”.

Figure 9. Satisfaction with Graduate School Advice

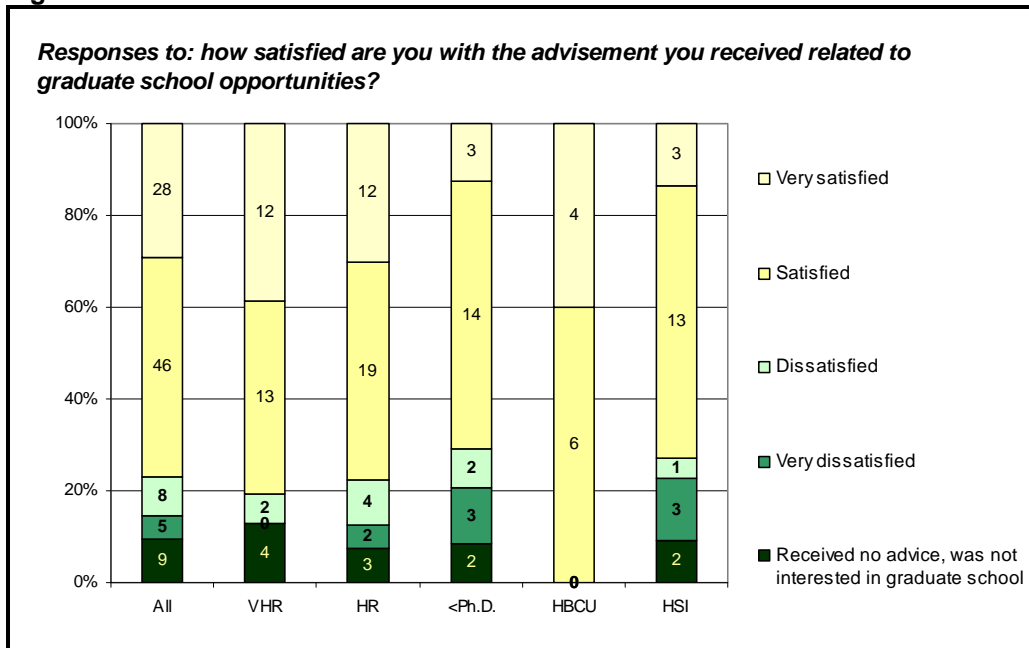


Figure 10 reports students’ answers to the question about their satisfaction with assistance with the graduate school application process. In the future, it might be helpful to ask students more specific questions to test their knowledge about graduate school—for example, to determine if they were made aware of fellowship or graduate assistantship opportunities—because they may not have been provided full information about the affordability of graduate education. As with the previous item, students expressed high levels of satisfaction with the assistance they received. There were more students (n=25 overall)—as would be expected—who indicated that this assistance was not needed because they did not plan to pursue graduate studies. Also, students expressed a higher level of satisfaction with the general advisement they received about graduate school (as reflected by the percentage who said they were “very satisfied”) than with the assistance with the application process.

Figure 10. Satisfaction with Assistance with Graduate School Application Process

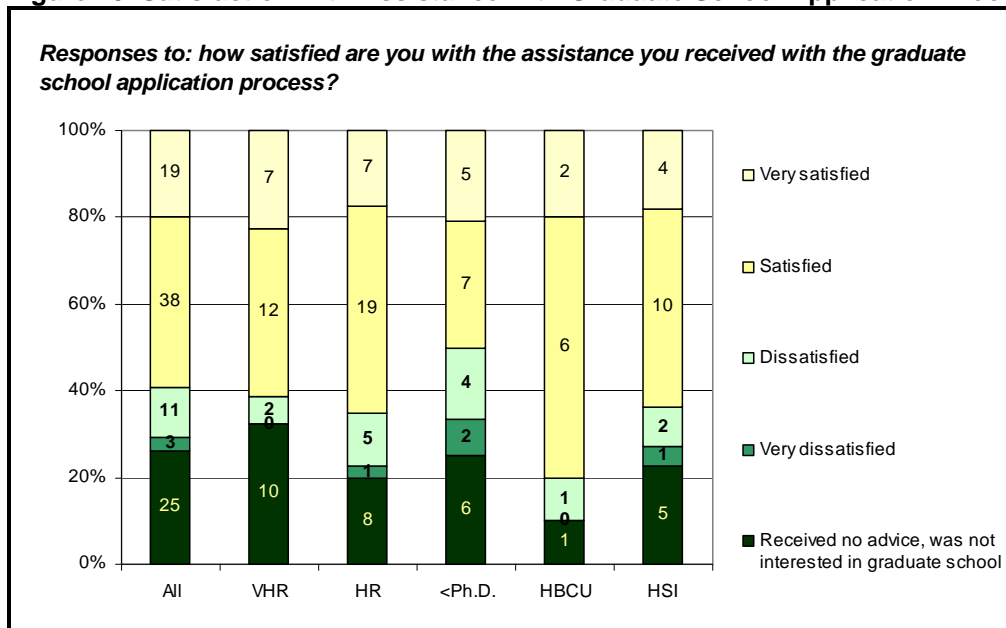


Table 6a reports results associated with from what sources students received post-graduation advice. Faculty, not surprisingly, are critical in this process. More than half of students indicated that they sought the advice of faculty and received help. Another 36% indicated that faculty approached them with advice: a majority of these students then indicated that they welcomed this advice.

Table 6a. Advice Related to Post-Graduation Options

	I sought out help and received it.	I was approached and was glad to receive the advice.	I was approached but not interested in the advice.	I learned about the service too late.	I was not interested in help with post-graduation planning.	Not applicable or not available.
Faculty member(s) in my department	52%	28%	8%	3%	4%	4%
Department head(s)	22%	25%	5%	3%	13%	32%
Dean(s)	12%	16%	6%	1%	17%	48%
Career services center on campus	34%	23%	5%	5%	14%	19%
Minority engineering program office (MEP)	18%	16%	5%	9%	12%	40%
Women in engineering program office (WIE)	5%	7%	3%	2%	13%	70%
Professional society	24%	25%	8%	3%	13%	27%
An employer (internship, co-op)	36%	28%	7%	2%	4%	22%
Ethnic programs office on campus	20%	10%	10%	4%	16%	40%
Family member(s)	39%	32%	5%	0%	4%	20%

Students were less likely to turn to department heads and deans but it is important to note that these key academic administrators did, indeed, reach out to the students. One in four students were approached by their department head with some welcomed advice while 22% were approached by the dean. Employers were also critical with 36% of students seeking advice and another 35% having advice proffered. Finally, family members were also important post-graduation advisors. Thirty-nine percent of students asked family members and another 37% being offered advice by family members.

In Table 6b, we look at the advice students received from faculty at different types of institutions. At the Very High Research activity institutions, 68% of students sought out help and received it and then another 20% were approached with advice by the faculty. In contrast, students at the High Research activity institutions were actually more likely to be approached by the faculty than to have sought help from the faculty, which was also the case at the HBCUs. Students at the institutions that did not award doctoral degrees or who were at an HBCU or an HSI were all interested in some post-graduation planning, while a small percentage of those at doctoral-granting institutions (5-7%) were no interested in this help.

Table 6b. Faculty Advice Related to Post-Graduation Options by Institution Type

	All	VHR	HR	<Ph.D.	HBCU	HSI
I sought out help and received it	52%	68%	38%	54%	30%	46%
I was approached and was glad to receive the advice	28%	13%	40%	29%	70%	36%
I was approached but not interested in the advice	8%	7%	13%	4%	0%	9%
I learned about the service too late	3%	7%	3%	0%	0%	0%
I was not interested in help with post-graduation planning	4%	7%	5%	0%	0%	0%
Not applicable or not available.	4%	0%	3%	13%	0%	9%

Table 7 indicates the relative importance of various sources of funding for the NACME Scholars. Scholars were asked to rate the relative importance of 14 different possible sources of funding for their undergraduate programs. NACME funding was the top source, rated as “very important” by 73 (77%) of the graduating scholars. The next most important source of funding were other fellowships or scholarships (70%) followed by federal and state grants (52%).

Importantly, there was near-universal sentiment on the part of these scholars that the NACME funding was “very important” to them in their education.

Recent research has indicated, for example, that Latinos/as are particularly averse to loans as a means of financing higher education, to some extent due to predatory lending practices in those communities. In addition, there have been recent anecdotal accounts that more students are relying upon personal credit cards to fund their education, a potentially financially dangerous practice. Interestingly, students were slightly more likely to report that credit cards were “very important” than several other loan sources.

Table 7. Number and Percent Reporting that Each Source was “Very Important” to Funding Their Education

	Percent	Number
NACME scholarship.	77%	73
Fellowships or scholarships other than NACME (do not count “Lottery Scholarships” here).	69%	66
Federal or state grants (e.g., Pell grants, Lottery Scholarships, etc.)	52%	49
Student loans from the school you attended, the federal or state government repayable after you leave school.	48%	46
Earnings from internships/co-ops or other non-work-study employment.	46%	44
Financial support from parents, spouse, relatives, not to be repaid	44%	42
Work-study.	22%	21
Credit cards	14%	13
Tuition waivers.	13%	12
Financial assistance from your employer.	12%	11
Loans from banks that are not specifically student loans.	11%	10
Loans from parents or other relatives (to be repaid).	8%	8
GI Bill benefits.	3%	3
Armed forces reserves or ROTC funds.	2%	2
	n	95

Internship and Co-Op Experiences

The students reported on 174 internship and co-op experiences at 127 different companies. The companies for which the most students reported internships are shown in Table 8. Lockheed Martin had employed 10 of the 96 Graduating Fellows at some point, while General Electric and Raytheon had each employed 8. With the exception of the companies shown here, more companies employed two or fewer of the Graduating Scholars.

Table 8. Student Internship Employers

Top Internship Companies		
Rank	Company Name	Number
1	Lockheed Martin	10
2	General Electric	8
	Raytheon	8
3	General Motors	5
4	John Deere	4
	NASA	4
5	Exxon Mobil	3
	Proctor & Gamble	3
	United Parcel Services	3

Students were asked three separate questions as a way to assess their internship experiences. These experiences were generally paid – very few students reported unpaid experiences – and as shown in Table 9, more than half of both male and female students indicated that the experience provided them with “a lot” of skills/knowledge applicable to their engineering coursework. In addition, just under 70% of both females and males indicated that they would work for the company with which they had the internship: an important indicator that these experiences probably had a positive impact on students. That is, if students had negative experiences at these companies, then we would expect that students would be unlikely to indicate that they would return to work for these employers.

Table 9. Assessment of Internship/Co-op Experiences

Internship Impacts	Females		Males		Total	
	n	%	n	%	n	%
Internship experience provided "a lot" of skills/knowledge applicable to your coursework	12	52%	30	59%	42	57%
Would work for the company based on my internship experience	16	70%	36	69%	52	69%
How did internships/co-ops assist in the formulation of career options or choices?						
Engineering area	5	21%	13	24%	18	23%
Career path/career focus	7	29%	10	19%	17	22%
Cultural preference for workplace	7	29%	5	9%	12	15%
Advantage in looking for/getting jobs	3	13%	7	13%	10	13%
Avoidance: learned about something I did NOT want	4	17%	6	11%	10	13%
Industry focus	3	13%	5	9%	8	10%
Hands-on experience, real-world or applied skills	1	4%	6	11%	7	9%
Graduate school encouragement/motivation	2	8%	3	6%	5	6%
Professional conduct/personal skills	1	4%	4	7%	5	6%
Mentoring	0	0%	2	4%	2	3%
Helping society	0	0%	2	4%	2	3%
Self confidence and motivation	0	0%	2	4%	2	3%
	n	24	54		78	

Table 9 also shows the range of answers that students provided to one of the only "open-ended" items on the survey: "Did any of these internships or co-ops assist you in your formulation of career options or choices? If so, briefly say how." Because some students had multiple internships, it is impossible to "match" these responses to specific experiences. Nor would it be useful to do so, since very few students would have worked for the same employer. Also there are too many other variables that could impact the internship experience of a student with an employer.

The data here show that more than a fourth of men said that their internships helped them firm up their interest in a specific engineering area (discipline) or subfield within the discipline. For women, internship experiences were a critical way for them to see how their employment would provide a particular career path and, importantly, a way for them to determine their "cultural preference" for workplaces. Racial/ethnic bias continues to be an issue for workers of color just as sex-based bias continues to plague women of all racial/ethnic backgrounds in some engineering workplaces². Internships have become a critical tool for young people who may not be as generally sensitive to issues of race/ethnic and/or gender bias as their predecessors several decades ago, to determine whether the workplace culture will be welcoming or not. This finding "squares" with those in the research literature in which women engineering students' first experiences of such biases occur in internship and co-op settings³. Many scholars also cited the advantage conferred by having had some work experience in the labor market: approximately 13% of women and men indicated that their internship either gave them a direct "foot in the door" with the company with which they were working or that the mention of the experience impressed interviewers or other potential employers.

Employers who better manage the potential problems that arise in interpersonal situations in which interns experience negative bias incidents—based on race/ethnicity, gender, or any other dimension—will be more likely to be able to retain these highly-qualified students post-graduation than employers who do little to foster a respect for diversity.

² Frehill, Lisa M. "Is the engineering workplace warming for women?" *SWE Magazine*, October, 2007.

³ Frehill, Lisa M. "Subtle Sexism in Engineering" in Benokraitis, Nijole (ed.) *Subtle Sexism: Current Practices and Prospects for Change* (Newbury Park, CA: Sage), 1997.

Appendix B. Internship Employers Reported by NACME Graduating Scholars

ADC Telecommunications
Air Products and Chemicals
Alabama A&M University, Self Healing and Smart Structures Research
Amylin Pharmaceuticals
Anheuser-Busch
Arizona State University
Artic Region Super Computing Center
ATK COOP Alliant Tech Systems
Autoliv Electronics America
B.P.
BCT Partners
BNSF Railway
Boeing Co.
Bovis Lendlease LMB Inc.
Brookhaven National Lab, Energy Technology Department
Burns and McDonnell
Caltech Jet Propulsion Lab
Cermer Corporation
Cheparral Steel
City College
Con Edison
Core Engineering
Crutchfield
Delphi
Delta Design
Demerara Engineering
DMJM Harris/EACONY
Drexel REV Program
Duke Energy
El Paso Energy
Enturia
Exxon Mobil
Federal Mogul
Financial Plus FCU
Ford Motor Company
FPL
Garlock Sealing Technology
General Electric
General Motors
Gilbone
Goldman Sachs
Granite Construction
Hamilton Sundstrand Co.
Harris RF
HDR Engineering

Honeywell FM&T
Hordesty and Hanover
IBM
Infermahon Builders
Infinean
Intel
Jacobs Engineering
Jacobson Engineering
Jet Propulsion Laboratory
John Deere
Johnson and Johnson
JP Morgan Chase
Kansas Department of Transportation
Keyspan Energy
L.A. Public Defenders Office
Lear Corporation
Lockheed Martin
L'Oreal
LSI Logic
Lutron Electronics
Lyndell Refinery
M2 Group
Malcolm Pirnie Inc.
Marathon
Merck
Metropolitan Transit Authority, Environmental Engineering
Midwest Research Institute
Mueser Rutledge Consulting Engineers
NAHLB Program through UMDNJ
NASA - Muspin Applied Physics Laboratory, Johns Hopkins University
NASA Kennedy Space Center
NASA, Johnson Space Center
NASA-WJSC
NASA-WSTF
National Dance Institute
NC Bioenvironmental Engineering Department-NCA&T
New York Power Authority
Northrop Grumman
Northwest Airlines
NYC Transit
O'Brian and Gere
P6 County Office of Engineering
Pantex
Parker Hannifin
Phillip Morris USA
Pioneers in Education
Pratt and Whitney Rocket Dye
Proctor and Gamble
Quoromone
Raytheon

Rice University
Rockwell Collins
SAIC
SCMEX
Shell Oil
Sprint-Nextel
Stantec Consulting
Symmetry Electronics
Texas Department of Transportation
Texas Instruments
Texas Transportation Institute
TIES-Habitat for Humanity
Toyota
U.P.S.
U.S. Fevert Service
UIC/Motorola
Ulliman Schutte
University of North Carolina at Chapel Hill
Valley Crest Landscape Developers
Verizon Wireless
Walt Disney World Resort
Walter P. Moore
Washington State University REV Program
Waste Min Co.
White Sands Missile Range
Whiting Turner
Wildcat Discovery Technologies
Williams Gas Pipeline
Xerox Corporation