PRE-PUBLICATION VERSION
July 2003

"Walking the Talk" in Retention-to-Graduation: Institutional Production of Minority Engineers – A NACME Analysis

Daryl E. Chubin and Eleanor Babco*

Introduction

If "past is prologue to the future," then America may fall short of producing the talent needed to propel the world's technological development through the first half of the 21st century. The demographics are clear. Although 30 percent of the school-age population consists of U.S. underrepresented minority students, the working population of U.S. engineers is predominately white non-Hispanic, with a fair representation of Asians, but only a sprinkling of African American, Latino, and American Indian participants. While women comprise about half of the school-age population, they represent only about 10 percent of the engineering workforce.

Over the past 25 years, women and underrepresented minorities (African Americans, Latinos, and American Indians) have made much progress in earning baccalaureate degrees in engineering. In 1977, women earned 1,961 or 4.9 percent of the 40,095 bachelor's degrees awarded in engineering. In 2002, they earned 14,102 or 20.5 percent of the 68,648 engineering baccalaureates. Underrepresented minorities earned 1,915 or 4.8 percent of the engineering bachelor's degrees in 1977. In 2002, they earned 7,971 or 11.6 percent.

Despite this overall progress in baccalaureate degree production, the proportion of women and minority freshmen in engineering has been declining since 1995. Although the absolute numbers have been increasing for both women and underrepresented minority engineering freshmen, the numbers for men and non-minority freshmen have been increasing at a faster pace. In 1995, women represented 19.9 percent of the freshman class; in 2001, they represented 18.3 percent. In 1995, underrepresented minorities constituted 17.4 percent of the freshman engineering class; in 2001, they represented 15.8 percent.

* The authors are, respectively, Senior Vice President, Policy & Research, National Action Council for Minorities in Engineering (NACME), Inc., and Executive Director, Commission on Professionals in Science and Technology.
The assistance of Eugene Lin, NACME Research Associate, and Nathan E. Bell, CPST Research Associate, is gratefully acknowledged. For further information, contact dchubin@nacme.org.

The origins of this underrepresentation of minorities – older and more contemporary cohorts alike, are no mystery. Minorities and women are underserved by our decentralized K-12 education system. The net effect is depressed science literacy and numeracy, which coupled with a paucity of academic advising and role models, precludes many from even considering the pursuit of a career in engineering.[1] With this decline in the proportion of women and minority freshmen entering U.S. engineering schools, it becomes more and more important to retain those women and minorities already enrolled in undergraduate study.

This analysis focuses on this one key concept known as "retention" in the panoply of post-enrollment decisions, campus interventions, and academic experiences that contribute to the production of new baccalaureate engineers. It is a national study of institutional performance that updates NACME's history in assessing programs and practices, e.g., financial aid, that influence progress in undergraduate education and later success of minorities in engineering.[2]

The current study measures institutional performance in retention-to-graduation of the baccalaureate engineering class of 2001 (i.e., the cohort that matriculated in 1995-96). It is preceded by a review of production trends disaggregated by group that paints the national picture, then compares institutions' graduation of two aggregates – underrepresented minority (URM) and non-URM engineers.

Study Setting

A bane to all who study careers is the lack of a data source that reports longitudinal tracking of engineering students from the time they enter college through their entry into the workforce or graduate school. But one source reports the population totals and demographics of enrolled students, by engineering institution, from the first-year to the bachelor's degree level, and to graduate level. This database – *Engineering & Technology Enrollments* and *Engineering & Technology Degrees*, created and maintained by the Engineering Workforce Commission (EWC) – was utilized by the Commission on Professionals in Science and Technology (CPST) in support of NACME for this study.

The context for interpreting retention is degree production. Retention is an interim achievement, if you will, en route to awarding the baccalaureate. Thus, first we examine institutional production of BS engineers, then turn to the more challenging analysis (since it requires data assembled annually) of institutional performance in retaining minority and nonminority students to degree completion. By separating performance with different student groups, universities can be seen as contributing to the engineering degree pool with regard both to its composition as well as its number. Without drawing from the diversity of the student population, a university is simply not providing the opportunity for *all* students to be educated in engineering. The nation cannot afford such selectivity, which perpetuates disadvantage and concedes minority talent to other disciplines and careers.[3]

Top Institutional Producers: Which Are Serving Minorities?

The variations by institution among the racial/ethnic groups they are successful in educating are striking. Some of this success is due simply to geography (proximity and access by certain populations), but some can be traced to policies and practices that reflect institutional commitments to boost the production of engineers from underrepresented groups. These institutions should be lauded not only for their commitment, but moreover, for the observed results – a diversification of students earning the BS in engineering.

Looking back over the five years (1998-2002), we can calculate the average annual number of graduates (**Table 1**). We find there is no institution among the top producers for *all* underrepresented groups in engineering. Some institutions, however, appear on two lists – New Jersey Institute of Technology (African Americans and Hispanics), North Carolina State at Raleigh (African Americans and American Indians), and Massachusetts Institute of Technology (Hispanics and American Indians).

Table 1

Top Producers of African American Engineers*, 1998-2002

Institution	Average** No. of Grads
North Carolina A&T	190.0
Georgia Institute of Technology	133.0
Florida A&M University	116.8
Prairie View A&M Univ	91.4
Tuskegee University	84.0
Morgan State University	75.4
Southern University	70.2
Howard University	67.8
North Carolina State Univ-Raleigh	63.8
University of Michigan-Ann Arbor	58.2
Tennessee State University	58.0
CCNY (City College, CUNY)	51.6
University of Maryland-College Park	43.4
Clemson University	43.2
New Jersey Institute of Technology	43.0

* Bachelor's Level

** Annual Average of the five years, 1998-2002

Source: CPST, data derived from Engineering Workforce Commission, *Engineering and Technology Degrees,* 1998-2002

Top Producers of Latino Engineers*, 1998-2002

Institution	Average** No. of Grads
University of Puerto Rico	651.0
Poly Univ of Puerto Rico	292.2
Florida Intl University	129.6
University of Texas-El Paso	105.4
Texas A&M University	102.6
University of Texas-Austin	91.4
University of Florida	87.6
Texas A&M Univ-Kingsville	79.2
NM State University	64.0
Cal Poly-Pomona	63.0
Mass. Institute of Technology	60.2
University of New Mexico	49.6
University of Central Florida	49.2
New Jersey Institute of Technology	49.0
University of Arizona	46.0

* Bachelor's Level

** Annual Average of the five years, 1998-2002

Source: CPST, data derived from Engineering Workforce Commission, *Engineering and Technology Degrees,* 1998-2002

Top Producers of American Indian Engineers*, 1998-2002

Institution	Average** No. of Grads
U Colorado-Boulder	14.2
Oklahoma State Univ	13.0
NM State University	9.0
Northern Arizona Univ	9.0
U Oklahoma	8.0
Mass Inst of Technology	7.2
U New Mexico	6.8
Arizona State University	6.0
NC State Univ-Raleigh	5.4
U Washington	5.4
U Alabama-Huntsville	5.2
U Tulsa	5.2
Michigan Tech University	5.0
U Arizona	5.0
Old Dominion University	4.8

* Bachelor's Level ** Annual Average of the five years, 1998-2002

Source: Engineering Workforce Commission

Engineering and Technology Degrees, 1998 - 2002

In all, the top 15 producers for the period 1998-2002 distribute as follows:

- For African American engineering baccalaureates, an HBCU – North Carolina A&T – with an average annual number of baccalaureate graduates of 190 - leads the pack. Georgia Institute of Technology continues in second at 133 graduates.
- Not unexpectedly, the most prolific producers of Hispanic graduates are the University of Puerto Rico and the Polytechnic University of Puerto Rico, averaging 651 and 292 graduates. Among U.S. mainland institutions, Florida International University followed by the University of Texas at El Paso, excel.
- For American Indian baccalaureate graduates, the University of Colorado at Boulder, with an average of 14 graduates over the five-year period set the pace, followed by Oklahoma State University at 13 graduates.

A list of the 100 most productive institutions in 2001 of BS engineers belonging to the three URM groups and women are appended (Appendix Tables A-D). Aside from the ranks of particular institutions, we note that:

- Nearly six out of every ten Latino graduates came from the top 25 institutions (2,445 out of 4,152). In other words, production is concentrated among fewer universities (not all officially designated, by the way, as "Hispanic Serving Institutions");
- The top 25 producers graduated nearly half (1,537 or 48.3%) of the 3,182 African Americans who earned a baccalaureate in engineering. While less than a third (28%) of the top 25 producers are HBCUs, these institutions graduate 41% of the African American BS Grads in the top 25. Overall, the 11 HBCUs award one in five (22%) of BS engineering degrees earned by African Americans.
- Only 15 institutions produced at least a handful of the American Indian bachelor's degree recipients in 2001, with the top 25 accounting for most of this yield (137 out of 275 or 53.9%).
- The top 25 producers of women BS engineers are more distributed by degree-conferring institution, but more likely to be research universities. Thirty-four universities produced at least 100 women engineers in 2001.

A modest fraction of the 300 BS-granting engineering schools in the U.S. are represented on these lists. They are walking the "extra mile" to increase minority participation in graduate study and the engineering workforce.

Retention Methodology

With these production statistics in view, we can begin to dissect the stories underlying the outcomes. In other words, absolute numbers matter – but they don't complete the picture.

Retention is a symbol of student progress toward degree completion. How many reach that milestone relative to those who do not can be thought of in many ways: support for students, efficiency in production, specialization by group, etc. As we shift the focus to retention, we move closer to the constellation of qualities that distinguish retention as institutional success from attrition as student failure.

Our study duration is designed to follow a particular engineering class – the Class of 2001 – from initial entry (freshmen) to graduation while taking into account the fifth year commonly needed for undergraduates to complete their degrees. The sixth year accommodates transfer students – those who changed major, declared their major late, or transferred from a two-year college, and thus needed additional time to complete the degree. The years spanned are 1995, 1996, 1997, 1998, 1999, 2000, with the graduating class in 2001.

Retention rates are a measure of the number of students from a freshman engineering class who ultimately (defined here as six years) graduate. This measure ranges from 0% to 100% and represents a proportion of an institution's freshman engineering enrollment that earns the BS. This measure has been amended, however, to account for the possible influx of students into a graduating class that may occur beyond freshman year. We refer to it as the "'at least' retention rate." 'At least' retention rate calculations incorporate graduates of two-year institutions who seek and gain entry to baccalaureate engineering degree programs. The details are summarized in **Table 2**.[4]

Table 2

'At Least' Retention Rate Calculation

The engineering classes are listed by year of the cohort, specifically year 1, year 2, year 3, and year 4. These cohort years are spread out chronologically, with each providing a certain number of students. This can be seen as follows:

Chronological Year	Cohort Year
1995	Year 1
1996	Year 1, Year 2
1997	Year 1, Year 2, Year 3
1998	Year 2, Year 3, Year 4
1999	Year 3, Year 4
2000	Year 4

'At Least' Attrition Rate=[('At Least Class'-Graduating Class)/'At Least' Class]*100

Where 'At Least' Class = Average of Year One Class (i.e. the Average of 1995Y1 + 1996Y1+1997Y1)+(Average value <Year three Class-Year Two Class>)+(Average value <Year Four Class-Year Three Class>)

Average value <Y3-Y2> and Average value <Y4-Y3> were found by averaging the differences in cohort years. So:

Factor	Values Used
Average <Y3-Y2>	1999Y3-1998Y2; 1998Y3-1997Y2, 1997Y3-1996Y2
Average <Y4-Y3>	2000Y4-1999Y3, 1999Y4-1998Y3, 1998Y4-1997Y3

'At least' Retention Rate = 100 minus 'At least' Attrition Rate
'At least' measures seek to account for the possible influx of students as each academic year passes (for example, transfer students from 2 year institutions).

Retention rates for the 94 engineering institutions that met the study criteria and were included in the Class of 2001 analysis are shown, in alphabetical order, in **Table 3**.[5]

Table 3 - Retention Rates for Listed Engineering Institutions, Class of 2001

School	All	African American	Latino	American Indian	Women	Total URM	Non-URM
Auburn University	50.7	37.6	26.1	30.0	52.1	36.2	53.7
Boston University	72.4	63.6	72.0	0.0	62.0	73.1	74.0
Brigham Young University	37.9	0.0	26.7	40.0	35.1	31.0	45.0
Brown University	46.5	26.8	28.1	N/A	47.8	27.9	52.1
Cal State U - Los Angeles	27.6	30.0	17.8	150.0	19.4	19.9	37.1
Carnegie Mellon University	79.1	41.5	116.1	0.0	90.0	75.6	79.5
Clarkson University	73.5	46.2	63.2	0.0	79.3	50.0	74.0
Clemson University	53.8	35.2	91.3	0.0	48.9	39.1	58.9
Colorado School of Mines	59.0	33.3	37.9	40.9	58.0	38.0	65.5
Colorado State University	53.3	18.8	64.9	35.3	56.8	55.9	59.2
Cornell University	98.2	71.8	74.4	33.3	96.7	72.4	100.5
Drexel University	67.3	50.0	26.1	0.0	61.8	44.2	74.6
Duke University	70.9	33.3	94.7	0.0	58.5	53.6	73.0
Embry-Riddle Aeronaut U	37.9	11.1	10.8	54.5	36.8	14.2	45.7
Embry-Riddle U-Prescott	41.6	35.3	12.0	0.0	40.2	19.6	49.3
George Washington University	54.6	37.5	36.0	0.0	49.2	39.0	57.5
Georgia Inst of Tech	74.5	54.8	64.5	85.7	78.6	57.8	83.5
Grand Valley State University	35.1	6.8	0.0	0.0	29.5	6.1	40.1
Howard University	34.7	36.2	N/A	0.0	35.7	36.2	29.3
Iowa State University	44.9	18.9	37.5	0.0	41.8	26.5	53.4
Johns Hopkins University	80.2	50.0	52.2	0.0	74.3	50.7	83.4
Kansas State University	41.3	20.8	15.8	34.6	41.9	22.4	45.7
Kettering (GMI Engrg & Mgmt Inst)	36.5	32.7	18.8	0.0	36.6	28.4	37.7
Lamar University	30.7	16.1	24.3	37.5	26.6	19.2	36.3
Lawrence Technological U	85.0	31.6	75.0	0.0	87.3	33.3	92.5
Lehigh University	78.4	36.4	84.0	150.0	78.4	63.2	83.7
Louisiana State University	43.0	24.9	49.4	17.6	43.1	30.7	47.8
Louisiana Tech University	31.8	32.7	0.0	21.4	28.4	29.1	34.1
Loyola Marymount University	27.5	0.0	33.3	0.0	32.4	24.1	31.6
McNeese State University	24.6	4.9	50.0	0.0	48.4	8.8	29.6
Mercer University	43.3	35.1	0.0	0.0	48.1	33.3	51.1
Michigan State University	48.7	23.4	20.7	15.0	51.0	23.5	56.5
Morgan State University	39.1	37.0	0.0	N/A	51.2	36.7	66.0
NC State Univ - Raleigh	65.4	37.1	58.8	16.2	53.2	40.1	73.1
NM Inst of Mining & Tech	43.1	85.7	46.2	0.0	43.2	40.6	43.7
Northeastern University	69.9	67.2	51.2	0.0	60.3	61.7	84.2
Northern Arizona University	25.2	0.0	15.2	9.4	25.1	11.3	33.5
Northwestern University	88.1	44.8	73.0	180.0	89.8	62.9	90.8
Oakland University	52.2	7.1	14.3	300.0	60.5	12.0	57.3
Ohio University	49.8	32.4	30.0	0.0	56.0	31.0	60.1
Penn State University	57.2	25.7	48.5	0.0	65.4	33.5	58.5
Polytechnic University	54.7	45.8	18.8	20.0	62.9	31.8	62.5
Prairie View A&M University	31.1	29.7	54.5	N/A	49.1	30.4	17.9
Rice University	66.6	24.5	32.6	75.0	64.3	33.1	82.9
Rochester Inst of Tech	58.3	26.9	75.0	30.0	69.7	42.9	60.6
Rutgers University	66.1	55.4	27.8	0.0	85.5	42.6	71.5
Santa Clara University	61.8	27.3	28.6	37.5	56.8	30.3	68.5
Southern University	17.8	17.5	100.0	0.0	22.5	17.5	10.9
St Marys University	33.6	150.0	34.5	N/A	28.1	38.4	29.5

Table 3 - Retention Rates for Listed Engineering Institutions, Class of 2001 - Continued

School	All	African American	Latino	American Indian	Women	Total URM	Non-URM
Stanford University	118.0	94.9	103.1	30.0	109.7	96.2	118.7
Syracuse University	59.6	63.4	24.3	0.0	65.2	50.0	64.2
Tennessee State University	36.9	34.8	0.0	N/A	46.0	34.8	51.3
Texas A&M University	41.0	30.9	33.0	29.0	42.7	32.7	45.3
Texas Tech University	36.0	6.7	27.7	54.5	35.8	23.5	41.2
Tulane University	71.5	48.0	150.0	0.0	73.4	77.1	70.7
U Alabama Birmingham	55.7	31.8	50.0	0.0	50.0	32.6	68.3
U Arizona	49.5	56.3	43.6	15.4	48.6	41.3	55.5
U Arkansas	41.5	10.7	12.5	20.0	38.5	12.4	53.8
U Cal - Irvine	55.1	14.3	42.6	37.5	70.6	39.9	61.9
U Cal - Santa Barbara	52.4	17.6	44.4	75.0	47.6	44.5	55.4
U Central Florida	66.3	35.1	62.3	240.0	59.4	54.4	80.1
U Colorado - Boulder	70.8	52.2	68.4	64.3	73.3	66.3	73.3
U Dayton	50.1	28.1	55.6	60.0	45.9	46.2	55.1
U Delaware	40.6	30.6	72.0	0.0	42.5	37.2	42.1
U Houston	43.3	25.2	47.8	27.3	41.6	41.7	48.6
U Kansas	50.3	15.3	39.6	52.9	59.4	34.2	56.9
U Louisville	46.6	31.3	20.0	0.0	53.6	29.8	52.4
U Lowell	54.7	33.3	19.4	0.0	48.8	26.9	56.7
U Maryland - College Park	48.8	36.2	32.1	60.0	49.5	35.8	56.1
U Massachusetts - Amherst	58.6	42.0	40.5	0.0	62.8	42.4	59.9
U Miami	52.5	32.0	57.1	0.0	45.1	46.9	62.8
U Minnesota	42.1	30.5	30.9	37.5	37.6	31.6	47.7
U Missouri - Columbia & KC	58.2	53.2	52.9	0.0	48.8	53.5	64.7
U Missouri - Rolla	43.5	28.0	23.8	47.4	42.2	29.1	50.6
U New Orleans	31.4	7.6	25.0	7.7	34.4	11.9	44.1
U of Alabama	38.1	19.8	100.0	60.0	34.9	21.9	43.9
U Pennsylvania	76.4	58.4	70.9	0.0	80.8	66.7	78.7
U Pittsburgh	91.5	91.4	69.2	0.0	89.4	87.5	93.7
U Rhode Island	59.6	19.4	23.7	0.0	55.6	21.4	65.3
U South Carolina	59.6	45.0	60.0	0.0	50.0	45.7	69.9
U Southwestern Louisiana	80.6	51.6	72.4	133.3	96.5	57.1	91.1
U Tennessee - Knoxville	59.1	48.5	50.0	50.0	54.6	49.5	60.3
U Texas - Austin	49.6	40.1	40.6	50.0	48.8	40.7	57.0
U Wisconsin - Madison	58.3	26.3	12.0	30.0	52.4	20.7	64.2
U Wisconsin - Milwaukee	53.3	24.6	26.5	0.0	38.4	22.9	64.1
U Wyoming	70.6	0.0	64.3	0.0	76.9	43.5	72.6
US Coast Guard Academy	51.7	15.8	10.7	50.0	47.1	17.3	56.8
Vanderbilt University	62.7	16.7	64.3	0.0	51.0	37.5	65.1
Villanova University	65.9	23.1	72.0	150.0	78.6	61.5	65.6
Virginia Military Inst	55.2	30.0	54.5	0.0	225.0	37.5	56.4
Washington University	91.2	65.9	64.3	0.0	96.0	66.7	101.1
West Virginia University	53.1	48.8	83.3	60.0	53.7	60.9	58.3
Western Michigan University	48.7	18.1	36.0	60.0	34.2	23.1	57.1
Wright State University	32.0	7.3	0.0	0.0	31.6	6.8	37.5

Some Interpretations

The analysis reveals several findings. Above all, retention rates by group could be computed for only half of the 94 institutions; the other half did not graduate a single member of each of the four groups in question, i.e., Syracuse (and 46 others) awarded no engineering BS to a American

Indian, Morgan State (and 6 others) graduated no Latinos, and Brigham Young (plus 3 others) degreed no African Americans. All 94, however, graduated at least one woman in engineering.

We also note:

- There has been a slight improvement in minority retention from 36.5 to 38.8 from the 1999 rate, while non-minority retention has slipped from 68.3 to 61.0, which more closely resembles the 1995 figure of 59.3.
- Of the 94 institutions with complete data, 40 (42%) have URM retention rates and 38 (40%) have non-URM rates that exceed the national averages. For the 28 institutions with rates for both groups that exceed the national averages, the differences in retention range from 1 to 34 percent.
- Two nonminority institutions in 2001 achieved higher retention rates for URMs than for non-URMs – Tulane and West Virginia. Other institutions in which the retention rates are similar for URMs and for non-URMs are University of Colorado at Boulder, Villanova, Boston University, Carnegie Mellon, University of Pittsburgh, University of Delaware, Lehigh University, University of Pennsylvania, and Stanford University.

Of the top 100 producers of BS engineering graduates, because of incomplete data and thus exclusion from the analysis, retention rates were calculated for only 47of the top 100 producing institutions (**Table 4**). Stanford University earned the number one spot when looking at retention rates – actually a retention rate of 118. This indicates that Stanford not only kept the students they recruited at the freshmen level, but they also attracted more transfer students in the junior and senior years and had more students graduating than they did enrolling.

Although Stanford is ranked number one in retention, they were ranked number 55 in production of engineering baccalaureates. In 2001, they graduated 351 engineers, of whom 25 (7.1%) were African Americans, 33 (9.4%) were Hispanic, one (0.3%) was American Indian and 94 (26.8%) were women. This profile is a kind of scorecard that demonstrates institutional performance in converting the aspirations of incoming talent into the achievement of degrees. It is the essence of human resource development and a calibration of how a university "adds value" to the graduate student pool and the engineering profession.

Table 4
Retention Rates of Top Ranked Producers of 2001 BS Engineering Graduates
(Ranked by Retention Rates)

Rank	Total Grads	School	Retention Rates All
55	351	Stanford University	118.0
10	767	Cornell University	98.2
54	352	U Pittsburgh	91.5
67	309	Washington University	91.2
65	312	Northwestern University	88.1
57	337	U Southwestern Louisiana	80.6
84	268	Johns Hopkins University	80.2
60	330	Lehigh University	78.4
58	335	U Pennsylvania	76.4
1	1436	Georgia Inst of Tech	74.5
73	289	Clarkson University	73.5
90	241	Boston University	72.4
32	472	U Colorado - Boulder	70.8
74	286	Northeastern University	69.9
48	383	Drexel University	67.3
33	459	U Central Florida	66.3
45	399	Rutgers University	66.1
8	987	NC State Univ - Raleigh	65.4
96	229	Vanderbilt University	62.7
88	249	U South Carolina	59.6
70	301	U Tennessee - Knoxville	59.1
28	496	Colorado School of Mines	59.0
20	607	U Wisconsin - Madison	58.3
91	240	Rochester Inst of Tech	58.3
53	354	U Missouri - Columbia & KC	58.2
2	1337	Penn State University	57.2
76	284	U Cal - Irvine	55.1
72	294	Polytechnic University	54.7
30	474	Clemson University	53.8
95	229	Colorado State University	53.3
71	301	West Virginia University	53.1
23	560	Auburn University	50.7
77	284	U Kansas	50.3
11	751	U Texas - Austin	49.6
40	417	U Arizona	49.5
34	459	U Maryland - College Park	48.8
16	670	Michigan State University	48.7
14	691	Iowa State University	44.9
27	498	U Missouri - Rolla	43.5
44	400	Louisiana State University	43.0
22	580	U Minnesota	42.1
99	220	U Arkansas	41.5
49	370	Kansas State University	41.3
7	999	Texas A&M University	41.0
56	350	Brigham Young University	37.9
50	367	Kettering (GMI Engrg & Mgmt Inst)	36.5
75	285	Texas Tech University	36.0

Arrayed by group, production and retention rates for 2001 BS engineering graduates are shown in Tables 5-8**.** Notably:

- For African Americans (**Table 5**), HBCUs do not dominate by retention, but they graduate the largest numbers.[6]
- Similarly, Latino BS engineering graduates are retained by a range of institutional types, but degreed by HSIs (**Table 6**).
- Georgia Institute of Technology is ranked number one in retaining American Indian graduates and women graduates for the Class of 2001 (**Tables 7-8**).

For all URMs combined (**Table 9**) and non-URM engineering BS recipients (**Table 10**), Stanford University leads in retention. Several high ranked by URM retention rates exceeding 60 percent – Pittsburgh, Boston U., Penn, Northwestern – represent small numbers of graduates compared to Georgia Institute of Technology, a high producer with a retention rate just a few percentage points shy of 60 percent. The message is that some institutions do a stellar job with the minorities they enroll, while others recruit to expand the minority enrollment in engineering and also succeed in retaining them to graduation (far beyond the national retention average).

Table 5 - Retention Rates of Top Ranked Producers of 2001 African American BS Engineering Graduates (Ranked by Retention Rate of African American Graduates)

Rank	African American Grads	School	Retention Rates African American
33	25	Stanford University	94.9
24	32	U Pittsburgh	91.4
50	17	Cornell University	71.8
55	15	Northeastern University	67.2
97	9	Washington University	65.9
56	15	Syracuse University	63.4
57	15	U Pennsylvania	58.4
93	9	U Arizona	56.3
21	34	Rutgers University	55.4
2	112	Georgia Inst of Tech	54.8
43	22	U Missouri - Columbia & KC	53.2
19	37	U Southwestern Louisiana	51.6
27	30	Drexel University	50.0
98	8	Johns Hopkins University	50.0
30	27	U Tennessee - Knoxville	48.5
28	29	Polytechnic University	45.8
16	46	U South Carolina	45.0
82	10	Northwestern University	44.8
90	9	Carnegie Mellon University	41.5
40	23	U Texas - Austin	40.1
18	43	Auburn University	37.6
9	64	NC State Univ - Raleigh	37.1
5	88	Morgan State University	37.0
11	61	Howard University	36.2
13	51	U Maryland - College Park	36.2
22	33	Clemson University	35.2
76	11	Mercer University	35.1
46	20	U Central Florida	35.1
3	97	Tennessee State University	34.8
49	18	Louisiana Tech University	32.7
51	17	Kettering (GMI Engrg & Mgmt Inst)	32.7
54	16	U Miami	32.0
60	14	U Alabama Birmingham	31.8
81	10	Lawrence Technological U	31.6

Table 6 - Retention Rates of Top Ranked Producers of 2001 Latino BS Engineering Graduates (Ranked by Retention Rates)

Rank	Latino Grads	School	Retention Rates
			Latino
80	10	Tulane University	150.0
31	33	Stanford University	103.1
94	7	Clemson University	91.3
96	7	Lehigh University	84.0
91	8	Rochester Inst of Tech	75.0
38	29	Cornell University	74.4
83	9	Northwestern University	73.0
70	12	Boston University	72.0
68	13	U Pennsylvania	70.9
35	31	U Colorado - Boulder	68.4
55	16	Colorado State University	64.9
25	37	Georgia Inst of Tech	64.5
87	9	U Wyoming	64.3
88	9	Vanderbilt University	64.3
12	60	U Central Florida	62.3
51	20	NC State Univ - Raleigh	58.8
19	44	U Miami	57.1
98	7	Northeastern University	51.2
65	13	Louisiana State University	49.4
48	21	Penn State University	48.5
26	37	U Houston	47.8
56	16	NM Inst of Mining & Tech	46.2
58	16	U Cal - Santa Barbara	44.4
14	57	U Arizona	43.6
41	27	U Cal - Irvine	42.6
6	88	U Texas - Austin	40.6
100	7	U Kansas	39.6
40	27	Colorado School of Mines	37.9
82	9	Iowa State University	37.5
79	10	St Marys University	34.5
97	7	Loyola Marymount Univ	33.3
5	95	Texas A&M University	33.0
78	10	Rice University	32.6
64	14	U Maryland - College Park	32.1

Table 7 - Retention Rates of Top Ranked Producers of 2001 American Indian BS Engineering Graduates (Ranked by Retention Rates)

Rank	American Indian Grads	School	Retention Rates
			American Indian
16	4	Georgia Inst of Tech	85.7
46	2	Rice University	75.0
51	2	U Cal - Santa Barbara	75.0
28	3	U Colorado - Boulder	64.3
52	2	U Dayton	60.0
53	2	U Maryland - College Park	60.0
49	2	Texas Tech University	54.5
41	2	Embry-Riddle Aeronaut U	54.5
30	3	U Kansas	52.9
57	2	U Tennessee - Knoxville	50.0
58	2	U Texas - Austin	50.0
32	3	U Missouri - Rolla	47.4
22	3	Colorado School of Mines	40.9
35	2	Brigham Young University	40.0
72	1	Lamar University	37.5
31	3	U Minnesota	37.5
99	1	U Cal - Irvine	37.5
89	1	Santa Clara University	37.5
39	2	Colorado State University	35.3
24	3	Kansas State University	34.6
40	2	Cornell University	33.3
34	2	Auburn University	30.1
87	1	Rochester Inst of Tech	30.0
94	1	Stanford University	30.0
26	3	Texas A&M University	29.0
100	1	U Houston	27.3
75	1	Louisiana Tech University	21.4
83	1	Polytechnic University	20.0
50	2	U Arkansas	20.0
74	1	Louisiana State Univ	17.6
44	2	NC State Univ - Raleigh	16.2
18	4	U Arizona	15.4
76	1	Michigan State University	15.0
10	5	Northern Arizona Univ	9.4

Table 8- Retention Rates of Top Ranked Producers of 2001
Women BS Engineering Graduates (Ranked by Retention Rates)

Rank	Women Grads	School	Retention Rates
			Women
37	94	Stanford University	109.7
10	183	Cornell University	96.7
73	55	U Southwestern Louisiana	96.5
48	81	Washington University	96.0
52	75	Carnegie Mellon Univ	90.0
34	103	Northwestern University	89.8
49	79	U Pittsburgh	89.4
94	46	Lawrence Technological U	87.3
33	104	Rutgers University	85.5
42	87	U Pennsylvania	80.8
82	51	Clarkson University	79.3
1	330	Georgia Inst of Tech	78.6
58	64	Lehigh University	78.4
71	57	Johns Hopkins University	74.3
31	105	U Colorado - Boulder	73.3
56	69	U Cal - Irvine	70.6
3	249	Penn State University	65.4
83	51	Rice University	64.3
80	52	Polytechnic University	62.9
70	57	Boston University	62.0
54	70	Drexel University	61.8
75	53	Oakland University	60.5
44	84	U Central Florida	59.4
61	63	U Kansas	59.4
90	48	Duke University	58.5
27	109	Colorado School of Mines	58.0
93	46	Colorado State University	56.8
72	57	U Tennessee - Knoxville	54.6
98	46	West Virginia University	53.7
11	182	NC State Univ - Raleigh	53.2
24	117	U Wisconsin - Madison	52.4
19	134	Auburn University	52.1
12	164	Michigan State University	51.0
77	53	Vanderbilt University	51.0

Table 9 - Retention Rates of top Ranked Producers of 2001 URM BS Engineering Graduates (Ranked by Retention Rates)

Rank	URM Grads	School	Retention Rates
			URM
33	59	Stanford University	96.2
64	35	U Pittsburgh	87.5
100	19	Boston University	73.1
43	48	Cornell University	72.4
81	28	U Pennsylvania	66.7
60	38	U Colorado - Boulder	66.3
93	22	Northwestern University	62.9
92	22	Northeastern University	61.7
4	153	Georgia Inst of Tech	57.8
47	48	U Southwestern Louisiana	57.1
19	84	U Central Florida	54.4
80	28	U Missouri - Columbia & KC	53.5
72	32	U Tennessee - Knoxville	49.5
31	60	U Miami	46.9
40	50	U South Carolina	45.7
66	34	Drexel University	44.2
42	49	Rutgers University	42.6
49	47	U Houston	41.7
25	70	U Arizona	41.3
12	113	U Texas - Austin	40.7
18	86	NC State Univ - Raleigh	40.1
77	29	U Cal - Irvine	39.9
56	40	Clemson University	39.1
63	35	Colorado School of Mines	38.0
17	88	Morgan State University	36.7
29	61	Howard University	36.2
41	49	Auburn University	36.2
27	67	U Maryland - College Park	35.8
14	97	Tennessee State University	34.8
57	40	Penn State University	33.5
7	121	Texas A&M University	32.7
53	42	Polytechnic University	31.8
95	22	U Minnesota	31.6
62	36	Louisiana State University	30.7

Table 10 - Retention Rates of Top Ranked Producers of 2001 non-URM BS Engineering Graduates (Ranked by Retention Rates

Rank	Non-URM Grads	School	Retention Rates Non-URM
61	292	Stanford University	118.7
59	297	Washington University	101.1
10	719	Cornell University	100.5
52	317	U Pittsburgh	93.7
99	196	Lawrence Technological U	92.5
63	289	U Southwestern Louisiana	91.1
62	290	Northwestern University	90.8
74	264	Northeastern University	84.2
51	318	Lehigh University	83.7
2	1283	Georgia Inst of Tech	83.5
77	256	Johns Hopkins University	83.4
38	375	U Central Florida	80.1
70	269	Carnegie Mellon Univ	79.5
57	307	U Pennsylvania	78.7
44	349	Drexel University	74.6
66	281	Clarkson University	74.0
88	222	Boston University	74.0
30	434	U Colorado - Boulder	73.3
7	901	NC State Univ - Raleigh	73.1
100	193	Duke University	73.0
43	350	Rutgers University	71.5
98	199	U South Carolina	69.9
27	461	Colorado School of Mines	65.5
90	217	Vanderbilt University	65.1
50	326	U Missouri - Columbia & KC	64.7
17	599	U Wisconsin - Madison	64.2
82	252	Polytechnic University	62.5
81	255	U Cal - Irvine	61.9
87	225	Rochester Inst of Tech	60.6
71	269	U Tennessee - Knoxville	60.3
93	210	Colorado State University	59.2
29	434	Clemson University	58.9
1	1297	Penn State University	58.5
65	288	West Virginia University	58.3

A Different Look: Disciplines of Engineering

To conclude the analysis, we take a different look, namely, at specific disciplines of engineering (**Table 11**).[7] The highest retention rates are in computer engineering for both URMs and non-URMs. The average gap, by discipline, is over 10 percent.

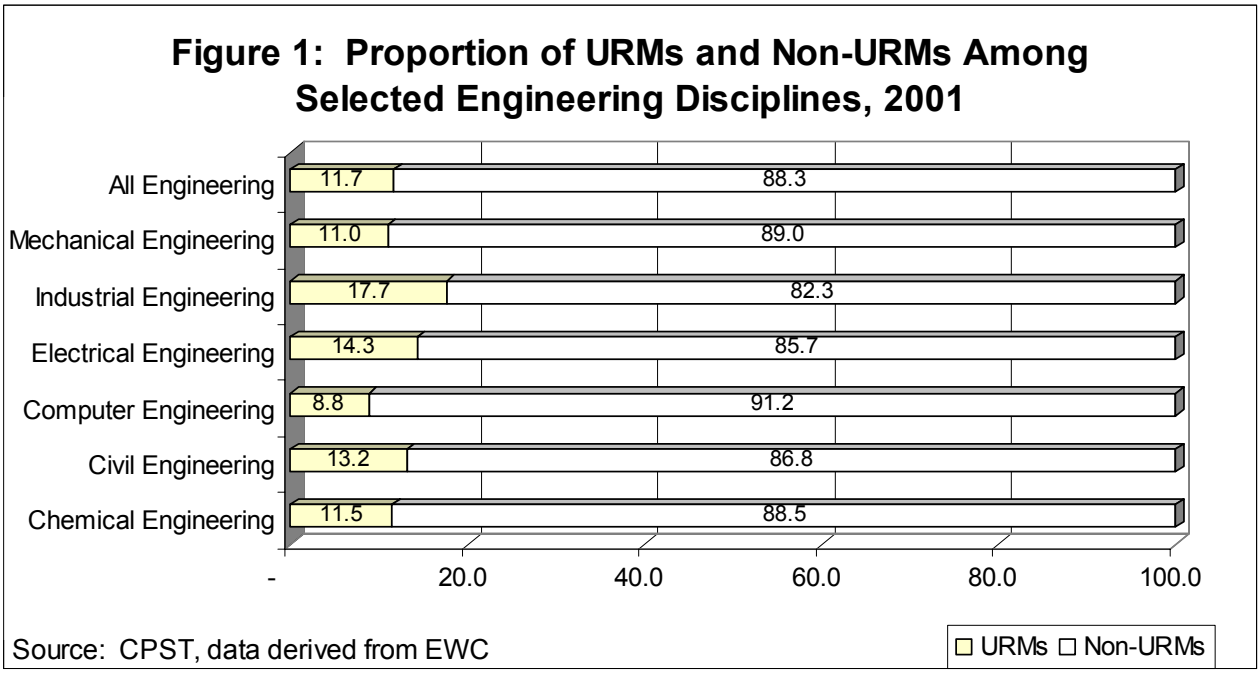
Table 11

Retention Rates by Selected Discipline, 2001

Discipline	Retention Rates	
	Total URM	Non-URM
Chemical Engineering	35.0	48.1
Civil Engineering	37.9	44.2
Computer Engineering	47.6	58.7
Electrical Engineering	36.3	47.2
Industrial Engineering	44.2	51.3
Mechanical Engineering	38.0	48.7
Total	38.9	49.5

Note: Retention rates for "total" include only the six disciplines listed.

There are two ways in which the subdisciplines of engineering can be examined. The first way is to look at the disciplines by the proportion of degrees earned in that discipline by various racial/ethnic groups. For example, in the total baccalaureate engineering graduating class of 2001, underrepresented minorities represent 11.8% of the total class, but their representation varied by discipline. At the extremes, URMs represent 17.7% of the class in industrial engineering, but only 8.8% in computer engineering (**Figure 1**).



Another perspective on field composition is to ask what disciplines tend to attract students of each individual racial/ethnic group. For the underrepresented minority Class of 2001, nearly one in four received their degree in electrical engineering (24.5%). Other proportions ranged from a high of 27.6% of African Americans and 22.4% of Latinos earning a BS degree in electrical engineering to 15.3% for American Indians. American Indians were more likely to receive their BS engineering degree in mechanical (22.2%), which is also the most popular engineering field of study for non-URMs, with one out of five earning their degree in that discipline. Overall, non-URMs favor mechanical, electrical, and computer engineering (**Table 13**).

Table 13. Percent Distribution of Field of Engineering by Underrepresented Minority Group, 2001

Discipline	African Americans	Latinos	American Indians	Total URMs	Total non-URMs
Chemical Engineering	10.6	7.1	10.5	8.8	8.8
Civil Engineering	9.6	17.5	18.5	14.4	12.4
Computer Engineering	14.8	12.4	15.6	13.6	18.3
Electrical Engineering	27.6	22.4	15.3	24.5	19.2
Industrial Engineering	8.2	9.7	4.0	9.1	5.4
Mechanical Engineering	16.4	20.2	22.2	18.8	20.0
Other Engineering	12.9	10.7	13.8	10.9	15.8
All Engineering	100.0	100.0	100.0	100.0	100.0

Conclusions

This retention-to-graduation analysis has focused on the performance of U.S. universities in producing baccalaureate engineers. In doing so, it has displayed what NACME calls "diversity within diversity." There are two meaning to this phrase:

1. Institutions specialize in the minority groups they are effective in supporting. The conditions for the success of these students probably benefit all who are enrolled (in engineering and perhaps other majors), but no institution consciously seeks to attract students from all the groups analyzed here – African American, Latino, American Indian, women. Thus, HBCUs excel with African American students, HSIs with Latinos. Research universities tend to do well with women.

2. Overall, there are institutions in each category that are exemplary in their retention-to-graduation of a certain minority group. No one type of institution has a monopoly on attracting, nurturing, and graduating students of color in engineering. In addition to HBCUs and HSIs, many research and comprehensive universities – public and private alike – are becoming more supportive of *all* students. Many of the most selective institutions enroll few minority students, but are successful in retaining and graduating them. Others enroll and confer degrees on many, but lose large numbers of students either to financial exigencies or to other disciplines.

For all that succeed in helping students persist to the baccalaureate, these findings begin to redefine our notion of "minority-serving institution."

A perennial need is how to refine the information available to *explain* retention and attrition, not just document it. Without a data source that follows individuals along a career pathway from precollege to workforce entry, strategic interventions that plug gaps, smooth transitions, and facilitate the journey from classroom to workplace will be greatly retarded. Recognizing that cost and privacy issues are nontrivial in developing longitudinal databases, we call on a federal agency – preferably NSF given its mission focus on science and engineering – to consider initiating this database as a policy tool to inform students, educators, sponsors, and employers.

After three decades of issuing (through its governing body, the National Science Board) a biennial report on the health of U.S. science and engineering,[8] NSF should commit to a richer set of indicators – like the group-disaggregated, institution-specific performance reported here – for monitoring the preparation and utilization of talent for the domestic and global economy. Accountability for the outcomes of our students is a shared responsibility of institutions of higher education. Publicizing those institutions that are graduating members of groups underrepresented in engineering would be a service to the community. As a sponsor of research and education innovations, NSF's reporting on performance would lend immense credibility to the claim, often heard in Washington, DC, that diversity is America's issue and higher education is the gateway to full participation in the fortunes of the nation.

Finally, knowledge of choices and experiences that attract and deter certain students from pursuing a career in engineering is of national import. Since at least the early 1990s, the policy preoccupation with the influx of foreign nationals at the graduate level has not been a cause for concern with *undergraduates*. The data bear out the reason: the fraction of noncitizens enrolled in undergraduate engineering programs has been stable at 5-6 percent since 1984.[9] But it's a different world today.

Immigration policy in an era of homeland security coupled with the mounting return, post-degree, of scientists and engineers to their native countries signals a trend that academic departments – and all who view human resources for engineering and science as a challenge to future workforce *composition* and not just supply and demand – are doubtless monitoring. Retention indicators would affirm that the federal government and its partners, too, are walking the talk.

ENDNOTES

[1] For reviews, see Patricia B. Campbell et al., *Upping the Numbers: Using Research-Based Decision Making to Increase Diversity in the Quantitative Disciplines*. Report commissioned by the GE Fund, January 2002; Beatriz Chu Clewell and Patricia B. Campbell, "Taking stock, where we've been, where we are, where we're going," *Journal of Women and Minorities in Science and Engineering*, vol. 8, 2002, pp. 255-283; and Gary S. May and Daryl E. Chubin, "A Retrospective on Undergraduate Engineering Success for Underrepresented Minority Students," *Journal of Engineering Education*, vol. 92, January 2003, pp. 1-13.

[2] NACME's history of retention-to-degree studies is over a decade long. See George Campbell, Jr. et al., Minority Graduation Rates: Comparative Performance of American Engineering Schools," *NACME Research Letter*, vol. 2, 1991; Catherine Morrison et al., "Retention of Minority Students in Engineering: Institutional Variability and Success," *NACME Research Letter*, vol. 5, 1995; Ronni Denes and Robert J. Highsmith, "Keeping Score: Comparative Performance of Engineering Institutions in Creating Access, 1997-98," *NACME Research Letter*, vol. 8, October 1998; and Annie Georges, "Keeping What We've Got: The Impact of Financial Aid on Minority Retention in Engineering," *NACME Research Letter*, vol. 9, September 1999.

[3] For more, see Shirley Ann Jackson, "The Quiet Crisis: Falling Short in Producing American Scientific and Technical Talent." Building Engineering and Science Talent (BEST), 2002; and John Brooks Slaughter and Daryl E. Chubin, "NACME, Engineering, and 'Generation Next," Pan-Organizational Summit on the U.S. Science and Engineering Workforce, Government-University-Industry Research Roundtable, Nov. 11-12, 2002, Washington, DC.

[4] In addition, a Y4-Y3 or Y3-Y2 or Y2-Y1 value that was <0 was treated as 0 to avoid retention scores <0 or >100. Retention rates over 100% indicate an overall influx of students that exceeds average Y1 class size.

[5] Of the 340 schools included in the EWC database, only 94 (28 percent) met the criteria to be included in all analyses. Grounds for exclusion were:

- Minority freshman class of less than ten for at least one year. This assured that the institutions had a sufficient minority population to allow an assessment of relative performance.
- Enrollment was unreported for at least one year of the study.
- Increases of freshmen to sophomore, sophomore to junior, or junior to senior enrollment of more than 15 percent. Because institutions that gain engineering majors after a first cohort may overstate freshman graduation rates, all institutions that recorded a 15% increase in the total number of students (both minority and nonminority) were excluded.

Appendix Table E lists all institutions that were not included in the final sample and the reason for their exclusion.

[6] Unfortunately, we were only able to compute retention rates for five of the 11 HBCUs. Central State University (5 African American graduates), Hampton University (21), NC AT&T (166), and UDC (28) could not be analyzed because they had not reported enrollment data in at least one of the studied years. Norfolk State (6 graduates) was eliminated because they reported zero minority freshmen in two of the studied years). Alabama A&M (11) and Tuskegee (71) were eliminated due to abrupt year-to-year increases and/or decreases (of more than 15%) that led us to suspect reporting errors to or by EWC.

[7] The EWC database that was utilized for this study did not allow analysis by institution and discipline since breakouts by class year, institution, and discipline cannot be compared simultaneously.

[8] See National Science Board, *Science and Engineering Indicators—2002*, vol. 1 (Arlington, VA: National Science Foundation, NSB-02-1, 2002.

[9] In 2000, foreign students represented 4.6 percent of freshmen enrollment – the same proportion as in 1984. In 1984, foreign nationals were 6.4 percent of total undergraduate enrollment, but by 2000, that fraction had *declined* to 5.8 percent. See Commission on Professionals in Science and Technology, *Professional Women & Minorities - A Total Human Resources Data Compendium*, 14th Edition (Washington, DC, July 2002), p. 263.

Appendix Table A - Top Ranked Producers of 2001 African American BS Engineering Graduates

Rank	School	African American Eng. Grads	Rank	School	African American Eng. Grads
1	NC A&T State University	166	51	Kettering (GMI Engrg & Mgmt Inst)	17
2	Georgia Inst of Tech	112	52	Columbia University	16
3	Tennessee State Univ	97	53	Ohio State University	16
4	FAMU/FSU College of Engrg	93	54	U Miami	16
5	Morgan State University	88	55	Northeastern University	15
6	Southern University	79	56	Syracuse University	15
7	Prairie View A&M Univ	73	57	U Pennsylvania	15
8	Tuskegee University	71	58	U Virginia	15
9	NC State Univ - Raleigh	64	59	Wayne State University	15
10	U Michigan - Ann Arbor	63	60	U Alabama Birmingham	14
11	Howard University	61	61	U Maryland Baltimore Cty	14
12	New Jersey Inst Tech	51	62	U Missouri - Rolla	14
13	U Maryland - College Park	51	63	Illinois Inst of Tech	13
14	Michigan State University	50	64	Old Dominion	13
15	Mass Institute of Technology	48	65	U Texas - Arlington	13
16	U South Carolina	46	66	Case Western Reserve Univ	12
17	CCNY (City College, CUNY)	45	67	George Mason University	12
18	Auburn University	43	68	U Cal - Berkeley	12
19	U Southwestern Louisiana	37	69	U Louisville	12
20	Mississippi State Univ	36	70	U Minnesota	12
21	Rutgers University	34	71	U Mississippi	12
22	Clemson University	33	72	U Washington	12
23	Florida Intl University	32	73	US Naval Academy	12
24	U Pittsburgh	32	74	Alabama A&M University	11
25	U South Florida	32	75	Cal State U - Long Beach	11
Total # Graduates from Rank 1-25 - 1537			**Total # Graduates from Rank 50-75 - 339**		
48.3% of All African American Graduates			**10.7% of All African American Graduates**		
26	Virginia Poly Institute	32	76	Mercer University	11
27	Drexel University	30	77	U Cal - Los Angeles	11
28	Polytechnic University	29	78	U Cal - San Diego	11
29	U District of Columbia	28	79	U Memphis	11
30	U Tennessee - Knoxville	27	80	Cal State U - Sacramento	10
31	U Illinois - Urbana Champgn	26	81	Lawrence Technological U	10
32	Florida Atlantic Univ	25	82	Northwestern University	10
33	Stanford University	25	83	San Jose State University	10
34	U Oklahoma	25	84	Temple University	10
35	US Military Academy	25	85	U Delaware	10
36	U Florida	24	86	U Kentucky	10
37	U Illinois - Chicago	24	87	U Nevada - Las Vegas	10
38	Texas A&M University	23	88	U Southern California	10
39	U of Alabama	23	89	Arizona State University	9
40	U Texas - Austin	23	90	Carnegie Mellon Univ	9
41	Louisiana State Univ	22	91	Oklahoma State Univ	9
42	Rennsselaer Polytechnic	22	92	So Illinois - Carbondale	9
43	U Missouri - Columbia & KC	22	93	U Arizona	9
44	Hampton University	21	94	U Cal - Davis	9
45	Purdue University	20	95	U Houston	9
46	U Central Florida	20	96	UNC - Charlotte	9
47	Penn State University	19	97	Washington University	9
48	U Alabama Huntsville	19	98	Johns Hopkins University	8
49	Louisiana Tech University	18	99	Northern Illinois Univ	8
50	Cornell University	17	100	NY Institute of Tech	8
Total # Graduates from Rank 26-50 - 589			**Total # Graduates from Rank 76-100 - 339**		
18.5% of All African American Graduates 18.5%			**7.5% of All African American Graduates**		

Appendix Table B - Top Ranked Producers of 2001 Latino BS Engineering Graduates

Rank	School	Latino Engineering Grads.	Rank	School	Latino Engineering Grads.
1	U Puerto Rico	695	51	NC State Univ - Raleigh	20
2	Poly Univ of Puerto Rico	311	52	US Naval Academy	20
3	U Texas - El Paso	137	53	US Air Force Academy	18
4	Florida Intl University	118	54	Manhattan College	17
5	Texas A&M University	95	55	Colorado State University	16
6	U Texas - Austin	88	56	NM Inst of Mining & Tech	16
7	U Florida	86	57	Purdue University	16
8	Cal Poly - Pomona	82	58	U Cal - Santa Barbara	16
9	Texas A&M U - Kingsville	65	59	Columbia University	15
10	New Jersey Inst Tech	64	60	FAMU/FSU College of Engrg	15
11	NM State University	62	61	Rutgers University	15
12	U Central Florida	60	62	U Notre Dame	15
13	Mass Institute of Technology	59	63	U Washington	15
14	U Arizona	57	64	U Maryland - College Park	14
15	U Texas - Pan American	49	65	Louisiana State Univ	13
16	U Michigan - Ann Arbor	48	66	Southern Methodist Univ	13
17	CCNY (City College, CUNY)	46	67	Stevens Inst of Tech	13
18	U Miami	44	68	U Pennsylvania	13
19	Cal State U - Long Beach	44	69	U Texas - Arlington	13
20	U Texas - San Antonio	40	70	Boston University	12
21	U South Florida	40	71	Polytechnic University	12
22	Arizona State University	40	72	U Cal - Santa Cruz	12
23	U New Mexico	39	73	George Mason University	11
24	U Cal Berkeley	39	74	U Texas - Dallas	11
25	U Houston	37	75	U Virginia	11
Total # Graduates from Rank 1-25 - 2445			**Total # Graduates from Rank 50-75 - 362**		
58.9% of All Latino Graduates			**8.7% of All Latino Graduates**		
26	U Houston	37	76	Harvard University	10
27	U Illinois - Chicago	37	77	Ohio State University	10
28	U Cal - San Diego	36	78	Rice University	10
29	U Illinois - Urbana Champgn	36	79	St Marys University	10
30	U Southern California	36	80	Tulane University	10
31	Stanford University	33	81	Florida Institute of Tech	9
32	U Cal - Los Angeles	33	82	Iowa State University	9
33	Cal State U - Sacramento	31	83	Northwestern University	9
34	San Jose State University	31	84	Princeton	9
35	U Colorado - Boulder	31	85	San Francisco State Univ	9
36	Cal State U - Fresno	30	86	U Colorado - Denver	9
37	Cal State U - Northridge	29	87	U Wyoming	9
38	Cornell University	29	88	Vanderbilt University	9
39	Cal State U - Los Angeles	27	89	Washington State Univ	9
40	Colorado School of Mines	27	90	Worcester Poly Institute	9
41	U Cal - Irvine	27	91	Rochester Inst of Tech	8
42	San Diego State Univ	26	92	Santa Clara University	8
43	Texas Tech University	25	93	U Cal - Riverside	8
44	Cal State U - Fullerton	24	94	Clemson University	7
45	Carnegie Mellon Univ	24	95	Illinois Inst of Tech	7
46	Rennsselaer Polytechnic	24	96	Lehigh University	7
47	Virginia Poly Institute	24	97	Loyola Marymount Univ	7
48	Penn State University	21	98	Northeastern University	7
49	U Cal - Davis	21	99	Northern Illinois Univ	7
50	Florida Atlantic Univ	20	100	U Kansas	7
Total # Graduates from Rank 26-50 - 719			**Total # Graduates from Rank 76-100 - 213**		
17.3% of All Latino Graduates			**5.1% of All Latino Graduates**		

Appendix Table C - Top Ranked Producers of 2001 American Indian BS Engineering Graduates

Rank	School	American Indian Eng. Grads	Rank	School	American Indian Eng. Grads
1	Mass Inst of Technology	11	51	U Cal - Santa Barbara	2
2	NM State University	10	52	U Dayton	2
3	Oklahoma State Univ	10	53	U Maryland - College Park	2
4	U Oklahoma	8	54	U Maryland Baltimore Cty	2
5	U New Mexico	7	55	U Michigan - Dearborn	2
6	U Washington	7	56	U Southern California	2
7	Worcester Poly Institute	7	57	U Tennessee - Knoxville	2
8	U Michigan - Ann Arbor	6	58	U Texas - Austin	2
9	Arizona State University	5	59	Wichita State University	2
10	Northern Arizona Univ	5	60	Arkansas Tech University	1
11	Old Dominion	5	61	Baylor University	1
12	San Diego State Univ	5	62	Bucknell University	1
13	U Alabama Huntsville	5	63	Cal Poly - Pomona	1
14	U Florida	5	64	Cal State U - Long Beach	1
15	Washington State Univ	5	65	Cal State U - Los Angeles	1
16	Georgia Inst of Tech	4	66	Catholic Univ of America	1
17	Montana State University	4	67	Dartmouth College	1
18	U Arizona	4	68	Florida Institute of Tech	1
19	U Central Florida	4	69	Gonzaga University	1
20	U Southwestern Louisiana	4	70	Harvard University	1
21	Virginia Poly Institute	4	71	Harvey Mudd College	1
22	Colorado School of Mines	3	72	Lamar University	1
23	Florida Atlantic Univ	3	73	Lehigh University	1
24	Kansas State University	3	74	Louisiana State Univ	1
25	Northwestern University	3	75	Louisiana Tech University	1
Total # Graduates from Rank 1-25 - 137			**Total # Graduates from Rank 50-75 - 34**		
% of All American Indian Graduates			**% of All American Indian Graduates**		
26	Texas A&M University	3	76	Michigan State University	1
27	U Cal - San Diego	3	77	Michigan Tech University	1
28	U Colorado - Boulder	3	78	Milwaukee School of Engrg	1
29	U Colorado - Denver	3	79	New Jersey Inst Tech	1
30	U Kansas	3	80	NY Institute of Tech	1
31	U Minnesota	3	81	Oakland University	1
32	U Missouri - Rolla	3	82	Parks College - St. Louis U	1
33	U Tulsa	3	83	Polytechnic University	1
34	Auburn University	2	84	Portland State Univ	1
35	Brigham Young University	2	85	Purdue University	1
36	Cal State U - Chico	2	86	Rennsselaer Polytechnic	1
37	Cal State U - Fresno	2	87	Rochester Inst of Tech	1
38	Cal State U - Sacramento	2	88	San Francisco State Univ	1
39	Colorado State University	2	89	Santa Clara University	1
40	Cornell University	2	90	SD School of Mines & Tech	1
41	Embry-Riddle Aeronaut U	2	91	Seattle Pacific Univ	1
42	Illinois Inst of Tech	2	92	So Illinois - Carbondale	1
43	Mississippi State Univ	2	93	So Illinois - Edwardsville	1
44	NC State Univ - Raleigh	2	94	Stanford University	1
45	Ohio State University	2	95	Texas Christian Univ	1
46	Rice University	2	96	U Alaska Anchorage	1
47	Saginaw Valley State Univ	2	97	U Cal - Berkeley	1
48	SD State University	2	98	U Cal - Davis	1
49	Texas Tech University	2	99	U Cal - Irvine	1
50	U Arkansas	2	100	U Houston	1
Total # Graduates from Rank 26-50 - 58			**Total # Graduates from Rank 76-100 - 25**		
% of All American Indian Graduates			**% of All American Indian Graduates**		

Appendix Table D - Top Ranked Producers of 2001 Women BS Engineering Graduates

Rank	School	Women Eng. Grads	Rank	School	Women Eng. Grads
1	Georgia Inst of Tech	330	51	Case Western Reserve Univ	76
2	U Michigan - Ann Arbor	309	52	Carnegie Mellon Univ	75
3	Penn State University	249	53	U Arizona	75
4	U Puerto Rico	222	54	Drexel University	70
5	U Cal - Berkeley	218	55	Kettering (GMI Engrg & Mgmt Inst)	69
6	Texas A&M University	215	56	U Cal - Irvine	69
7	Purdue University	210	57	FAMU/FSU College of Engrg	65
8	U Illinois - Urbana Champgn	183	58	Lehigh University	64
9	Mass Institute of Technology	207	59	Mississippi State Univ	64
10	Cornell University	182	60	New Jersey Inst Tech	64
11	NC State Univ - Raleigh	164	61	U Kansas	63
12	Michigan State University	161	62	U Missouri - Columbia & KC	62
13	U Texas - Austin	144	63	Worcester Poly Institute	62
14	Virginia Polytechnic Institute	142	64	George Mason University	61
15	U Washington	137	65	Poly Univ of Puerto Rico	61
16	U Cal - San Diego	137	66	Kansas State University	60
17	U Florida	136	67	U Texas - El Paso	60
18	U Cal - Davis	134	68	SUNY - Buffalo Campus	59
19	Auburn University	129	69	U Texas - Arlington	58
20	Michigan Tech University	125	70	Boston University	57
21	Rennsselaer Polytechnic	117	71	Johns Hopkins University	57
22	U Wisconsin - Madison	117	72	U Tennessee - Knoxville	57
23	Ohio State University	117	73	U Southwestern Louisiana	55
24	Iowa State University	115	74	U Oklahoma	54
25	U Virginia	115	75	Oakland University	53
Total # Graduates from Rank 1-25 - 4315 32.7% of All Women Graduates			**Total # Graduates from Rank 50-75 - 1570 11.9% of All Women Graduates**		
26	U Cal - Los Angeles	110	76	U South Carolina	53
27	Colorado School of Mines	109	77	Vanderbilt University	53
28	Columbia University	108	78	Cal Poly - Pomona	52
29	U Texas - Dallas	107	79	Oregon State University	52
30	U Maryland - College Park	106	80	Polytechnic University	52
31	U Colorado - Boulder	105	81	U Michigan - Dearborn	52
32	U Minnesota	105	82	Clarkson University	51
33	Rutgers University	104	83	Rice University	51
34	Northwestern University	103	84	Marquette University	50
35	U Missouri - Rolla	99	85	U Alabama Huntsville	50
36	Clemson University	97	86	U Iowa	50
37	Stanford University	94	87	Princeton	49
38	Washington State Univ	93	88	U Cincinnati	49
39	San Jose State University	92	89	U Kentucky	49
40	Cal Poly - San Luis Obispo	90	90	Duke University	48
41	Arizona State University	88	91	NM State University	48
42	U Pennsylvania	87	92	Tennessee Tech Univ	47
43	U South Florida	85	93	Colorado State University	46
44	U Central Florida	84	94	Lawrence Technological U	46
45	NC A&T State University	82	95	Oklahoma State Univ	46
46	Louisiana State Univ	81	96	Tennessee State Univ	46
47	U Southern California	81	97	U of Alabama	46
48	Washington University	81	98	West Virginia University	46
49	U Pittsburgh	79	99	Cal State U - Sacramento	45
50	U Illinois - Chicago	77	100	Rose-Hulman Inst of Tech	45
Total # Graduates from Rank 26-50 - 2347 17.8% of All Women Graduates			**Total # Graduates from Rank 76-100 - 1222 9.3% of All Women Graduates**		