Panel Discussion

Increasing the Diversity of the Engineering Pipeline

Engineering Deans Institute
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Remarks by Ashok Saxena, Dean of Engineering, University of Arkansas, Fayetteville, AR

The Undergraduate Pipeline

The economic Imperative : More B.S. engineering graduates are necessary for building a better and a more robust American economy

- In the summer of 2005, I visited a global research center of a major US Corporation located in Bangalore, India. During my visit with the CEO of that center, I asked how much money his company saved by conducting their research projects in India. He quickly responded without any hesitation that his company was not in India because it saved the company money. He went on to say that they were there because of the abundantly available scientific and engineering talent!

- Last month, the head of Computer Science and Computer Engineering Department at the University of Arkansas, Dr. Susan Gauch, told me that her phone was ringing off-the-hook with representatives of big US companies on the other end asking for help in recruiting graduates from her program. They told her that they were looking to start

software and other centers for back-office services in the region and needed our help in recruiting IT professionals. It was clear that they were looking for alternatives to their off-shore activity; so just imagine what they would do if if they were unable to find the right talent.

- In December of 2009, I visited Mike Duke, the CEO of Wal-Mart, himself an engineer, to describe our Engineering Career Awareness Program (ECAP) and to ask him for financial support for the program. After listening to me for 15 minutes, he said, "This country needs more engineers and Wal-Mart needs more engineers at all levels." Although Wal-Mart is in the retail business, Mike said that engineers had the right education to become problem solvers, inventors and adopters of technological solutions. I left his office 30 minutes after arriving there thinking that this was one of the easiest sales jobs of my life.

- The bottom line is that the US needs more engineering graduates. The availability of more engineers will encourage more businesses to locate in the US, attracting more higher paid jobs giving rise to economic prosperity. Our graduate programs can certainly use more domestic students, as almost certainly Sarah will discuss as part of her remarks.

Ten year Trends in Engineering Degrees Awarded and Diversity Among Graduates

- We have examined the trends for engineering degrees awarded and engineering enrollments in the US and have found:
  - The engineering degrees awarded in the US either remianed constant or declined between 2003 and 2009, but did rise in 2010. My best guess is that they will rise again in 2011.
  - The freshman and overall enrollments decreased or remained constant until 2006 after which they began to rise significantly and have continued to rise since then with a positive second derivative; that is encouraging!
  - When we disect by gender and ethnic groups the data for degrees awarded, we find almost flat trends until 2009 except for Hispanic Americans whose numbers have increased consistently over the past ten years. In the past year, however, the numbers increased for all under-represented groups and the growth in that group has contributed to 50% of the overall growth among the engineering graduates. This is certainly

welcome news, but it is not clear that the trend will be sustained!

- Hispanic Americans stand out among the various groups as having contributed the most to the growth.
- Looking at the pipe-line, overall enrollments have increased but the relative percentage of each group has been flat with the exception of Hispanic Americans, where we have seen consistent increases in percentages. Thus, based on enrollment trends we would not predict significant shifts in the percentage growth in under-represented minoroties among engineering graduates except of course for Hispanic Americans.

How has the ECAP Program at the University of Arkansas helped in beating these trends?

- A Recruitment to Graduation Program for Underrepresented Engineering Students
  - Developed and implemented by Engineering with campus partners
  - Has strong institutional support
  - Funding for 72 students comes from
    - College of Engineering
    - University of Arkansas Silas Hunt Program

        - NSF grant (DUE-0807180)
        - Private donors
        - Corporate donors
    - Program cornerstones – Recruitment
        - Reaching into untapped communities and schools
        - Targeting recruitment plans for underserved populations
        - Publicizing the ECAP program
        - Hosting Engineering Adventure recruitment event
        - Articulation agreements with feeder schools and community colleges
    - Result: Largest Engineering incoming class of minorities and women in UA history! On the average, every ECAP student attracts two more of his/her friends.
    - This program has assited UAF in catching up with national averages for percentages of women and African-Americans enrolled in Engineering, a big step forward.

    - Retention Results

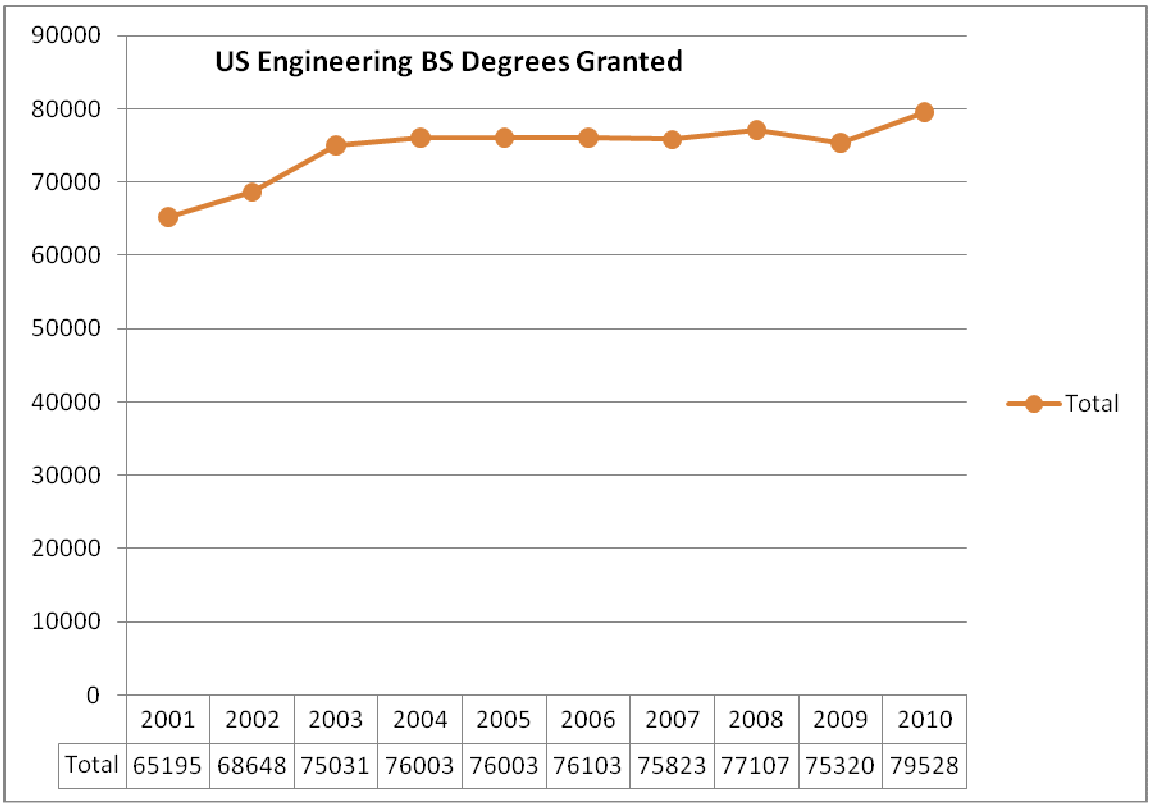
- ECAP students are being retained at significantly higher rates in engineering and also university-wide than their engineering classmates
- ECAP students are also maintaining a significantly higher GPA than their engineering classmates

Question for the Audience

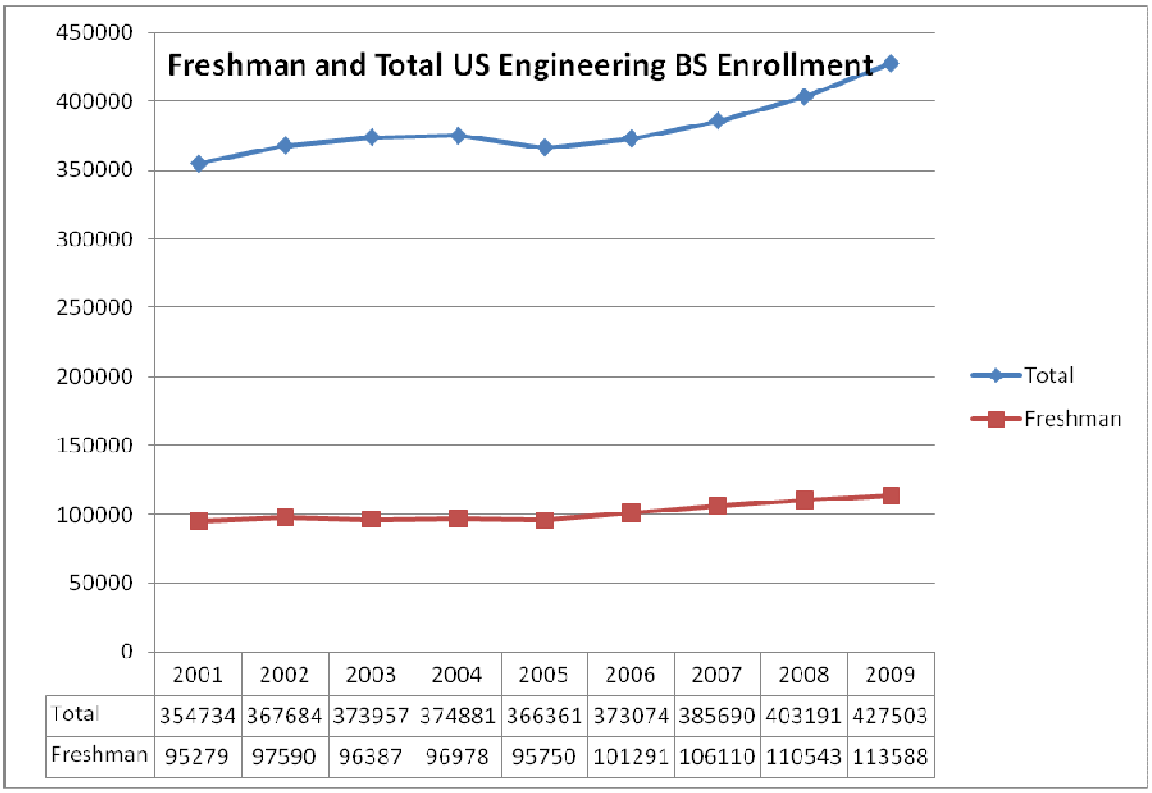
We have been trying to increase diversity among engineering graduates for several years. Do we now understand the issues well enough related to attracting more minorities and women into engineering? Assuming the answer is yes, what strategies are **most** effective in becoming successful?

1. Talk about how engineers benefit society and improve the quality of life of all humans
2. Allocate more resources in the form of scholarships for the first generation college degree seekers
3. Provide resources to assure their success and use success stories as a bait at the time of recruitment
4. Having faculty of color and diverse ethnic backgrounds and female faculty as role models
5. All of the above

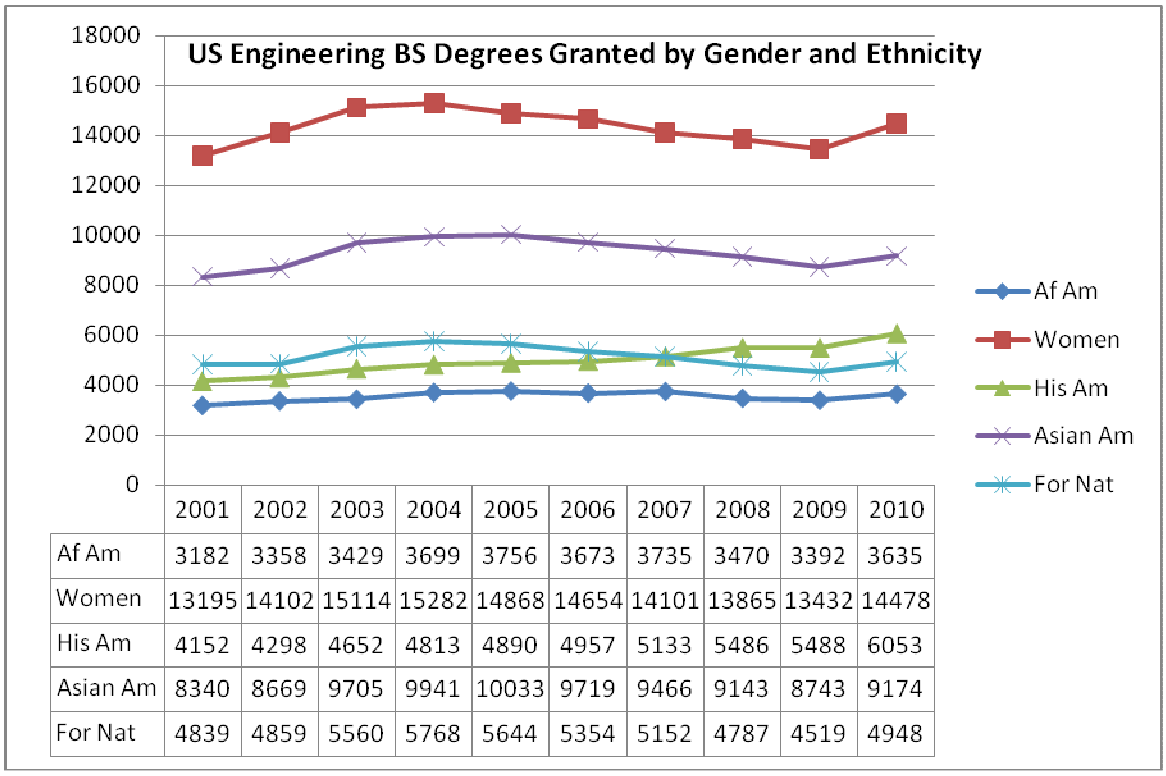
Supporting Data



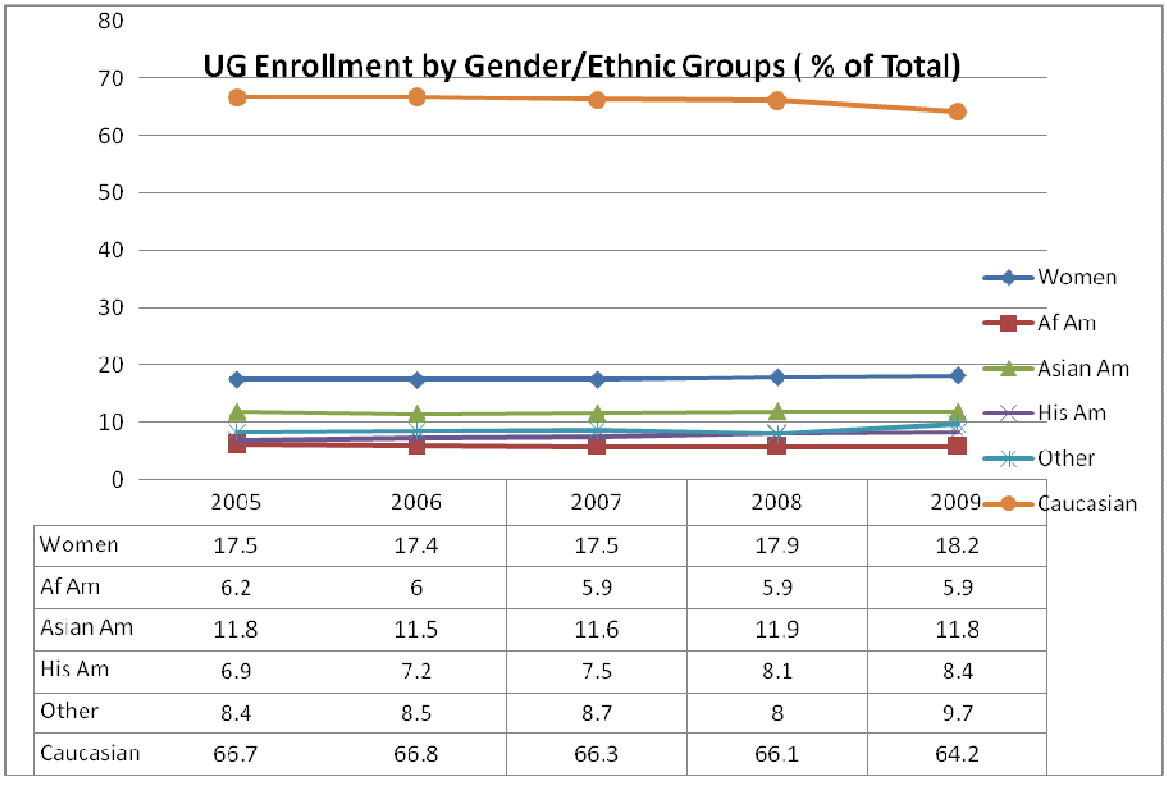
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	65195	68648	75031	76003	76003	76103	75823	77107	75320	79528



	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	354734	367684	373957	374881	366361	373074	385690	403191	427503
Freshman	95279	97590	96387	96978	95750	101291	106110	110543	113588

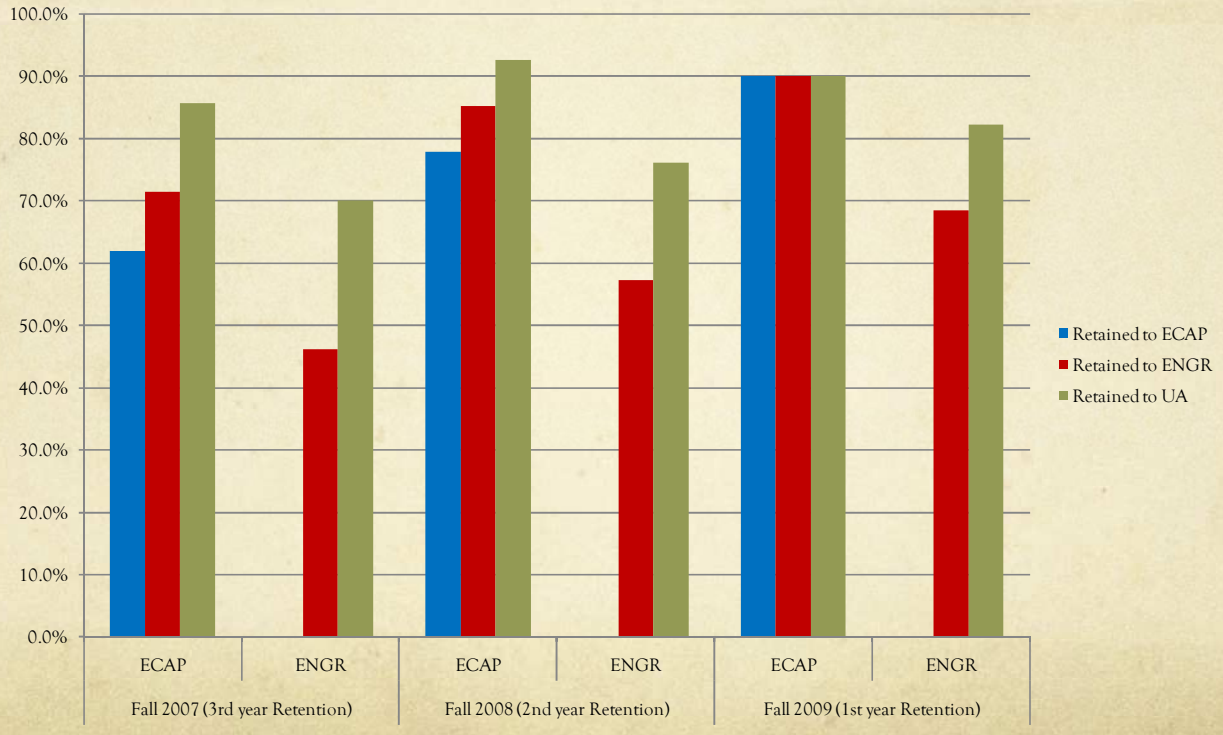


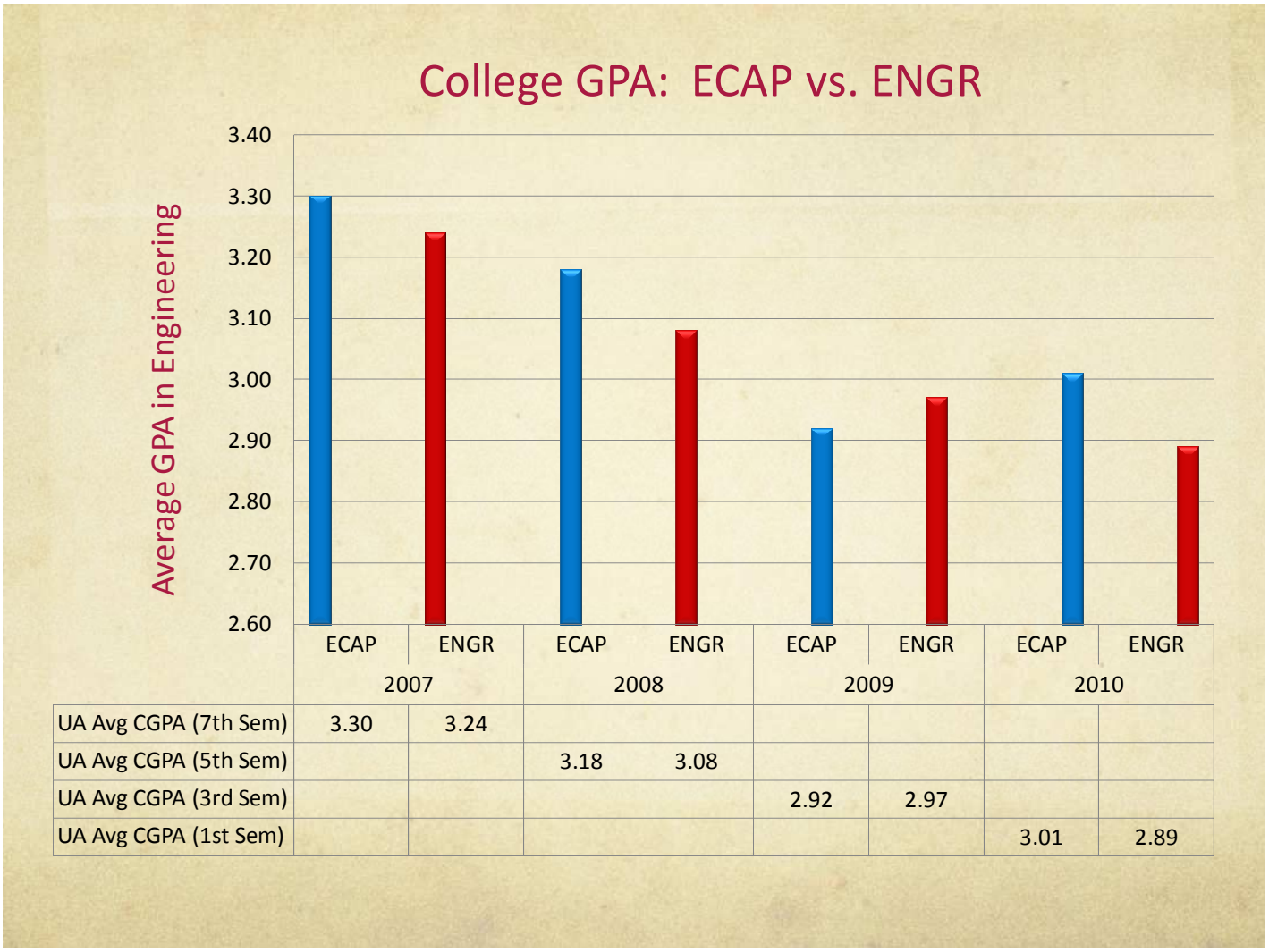
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Af Am	3182	3358	3429	3699	3756	3673	3735	3470	3392	3635
Women	13195	14102	15114	15282	14868	14654	14101	13865	13432	14478
His Am	4152	4298	4652	4813	4890	4957	5133	5486	5488	6053
Asian Am	8340	8669	9705	9941	10033	9719	9466	9143	8743	9174
For Nat	4839	4859	5560	5768	5644	5354	5152	4787	4519	4948



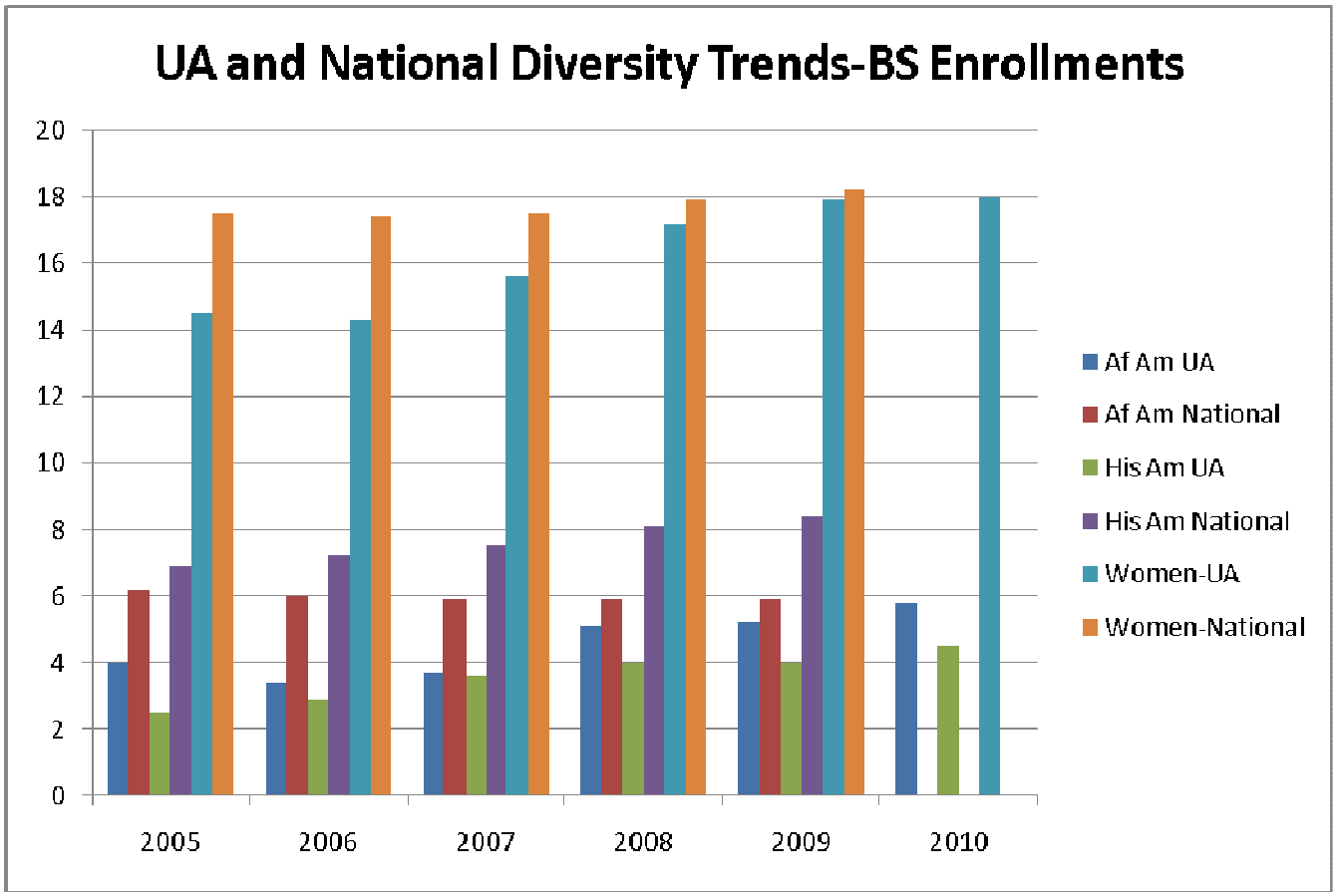
	2005	2006	2007	2008	2009
Women	17.5	17.4	17.5	17.9	18.2
Af Am	6.2	6	5.9	5.9	5.9
Asian Am	11.8	11.5	11.6	11.9	11.8
His Am	6.9	7.2	7.5	8.1	8.4
Other	8.4	8.5	8.7	8	9.7
Caucasian	66.7	66.8	66.3	66.1	64.2

Retention Data





	2007		2008		2009		2010	
	ECAP	ENGR	ECAP	ENGR	ECAP	ENGR	ECAP	ENGR
UA Avg CGPA (7th Sem)	3.30	3.24						
UA Avg CGPA (5th Sem)			3.18	3.08				
UA Avg CGPA (3rd Sem)					2.92	2.97		
UA Avg CGPA (1st Sem)							3.01	2.89


UA and National Diversity Trends-BS Enrollments
20
18
16
14
12
10
8
6
4
2
0
2005
2006
2007
2008
2009
2010
Af Am UA
Af Am National
His Am UA
His Am National
Women-UA
Women-National

BS Degrees Awarded to Women Ranked by Number of Degrees Awarded (National Average = 18%)

Institution	Number of Total Degrees Awarded	% Women
1. Georgia Tech	1543	22.6
2. U. Michigan	1203	15.9
3. MIT	626	40.4
4. U. Puerto Rico	614	39.5
5. Cornell	719	29.6
6. Purdue	1116	18.8
7. U T Austin	958	21.9
8. Penn State	1303	15.5
9. Virginia Tech	1166	15.7
10. UC Berkeley	819	22.2

BS Degrees Awarded to Women Ranked by Percent of Degrees Awarded (National Average = 18%)

Institution	Total Degrees Awarded	% Women with BS Degrees
1. Yale University	60	41.7
2. MIT	626	40.4
3. U. Puerto Rico	614	39.4
4. George Washington Univ.	118	38.1
5. Harvey Mudd	59	35.6
6. Southern Methodist Univ.	101	32.7
7. North Carolina A&T	202	32.2
8. Harvard Univ.	101	31.7
9. Vanderbilt Univ.	280	31.4
10. Washington Univ.	273	30.8

Disciplines with highest % of women graduates

1. Environmental 43.7
2. Biomedical 36.9
3. Chemical 35.0
4. Biological and Agriculture 32.6
5. Industrial/Manufacturing 30.2

Disciplines with lowest % of women graduates

1. Computer Engineering 7.9
2. Computer Sci (inside Engineering) 10.5
3. Electrical/Computer 11.2
4. Mechanical 11.4
5. Electrical 11.5