



Engineering by the Numbers:

ASEE Retention and Time-to-Graduation Benchmarks
for Undergraduate Engineering Schools, Departments
and Programs



The **American Society for Engineering Education** is a global society of individual, institutional, and corporate members founded in 1893. We are committed to furthering education in engineering and engineering technology by promoting excellence in instruction, research, public service, professional practice, and societal awareness.

ASEE seeks to more fully engage with high school students, parents, teachers, engineering faculty and business leaders to enhance the engineering workforce of the nation.

ASEE is the only professional society addressing opportunities and challenges spanning all engineering disciplines, working across the breath of academic education, research, and public service.

- We support engineering education at the institutional level by linking engineering faculty and staff to their peers in other disciplines to create enhanced student learning and discovery.
- We support engineering education across institutions, by identifying opportunities to share proven and promising practices.
- We support engineering education locally, regionally, and nationally, by forging and reinforcing connection between academic engineering and business, industry, and government.

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Engineering by the Numbers: ASEE Retention and Time-to-Graduation Benchmarks for Undergraduate Engineering Schools, Departments and Programs

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American Society for Engineering Education
1818 N Street NW, Suite 600
Washington, DC 20036

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Engineering by the Numbers:

**ASEE Retention and Time-to-Graduation Benchmarks
for Undergraduate Engineering Schools, Departments
and Programs**

ASEE RETENTION AND TIME-TO-GRADUATION BENCHMARKS FOR UNDERGRADUATE ENGINEERING SCHOOLS, DEPARTMENT AND PROGRAMS

The American Society for Engineering Education conducts a survey every two years to track persistence and time to graduation of undergraduate engineering students. Participating engineering schools, departments, and programs provide data on first-time, full-time students starting from when they enter an engineering program. Depending on a school's policy, this may occur when a student is admitted to an engineering program or when he or she declares an intention to major in engineering.

The survey was first conducted in 2013 with a grant from the Alfred P. Sloan Foundation, which paid for its creation, and has continued as a fee-based service. Participating schools have access to benchmarking tools that allow them to view retention data in aggregate, such as retention at public or private schools, and create their own benchmarks for groups of schools that they select. Schools can also create a benchmark that shows the interquartile range of student retention and time to graduation. The fee pays for survey administration and for enhancements to the survey and on-line benchmarking tools.

By tracking engineering student retention and time to graduation, the survey provides national benchmarks of undergraduate engineering programs. These measures, grounded in common data collection and reporting methods, allow engineering deans to compare their schools' persistence and time-to-graduation rates with those of other schools. Besides its value in collecting data from schools across the country, the survey template has proven useful to some engineering deans in tracking in their own students' persistence and time to graduation. The data collected help them assess their schools' performance and conduct strategic planning.

National benchmarks of retention and time to graduation enable researchers to pose such questions as:

- Are there optimal persistence and graduation rates, and if so what are they? The national average for persistence of engineering students to the second year was 80 percent in 2014. Is that high enough, and is there a point at which time, money and effort to increase persistence and graduation would be better spent in other areas?
- Are some strategies or combination of strategies more effective than others? (Our research on retention best practices among engineering schools shows that engineering schools employ a variety of strategies to retain and graduate engineering students [1].)
- Are there effective retention strategies that overlap with providing quality engineering education?
- Are there particular efforts that work better at retaining underrepresented students? (Our retention benchmarks show that student persistence and graduation vary depending on gender, race and ethnicity.)

ASEE'S SURVEY – DATA LIMITATIONS

While the information ASEE collects from schools and that we present in this benchmark report represents the best national engineering education retention and time-to-graduation data currently available, it is necessarily incomplete.

The best possible benchmarks would result from all eligible engineering schools responding to ASEE's survey and providing data in the same way. However, not all schools that can participate in the survey do so. In 2015, for instance, there were a little over 400 engineering schools that met ASEE's criteria for participation – that is, they had at least one ABET-accredited undergraduate engineering program or a graduate engineering program. Of these, just 111, or about 28 percent, actually provided data that year.

In addition, the number of participating schools varies from year to year. For the years 2002 to 2004, we have data from around 100 schools. For the years 2005 to 2011, we have data from around 150 schools. For 2012 we have data from 129 schools. For 2013 to 2015, we have data from 111 schools. These variations limit our ability to report precise national retention and time-to-graduation trends and to interpret the results. For example, it's impossible to tell whether an improvement in four-year graduation rates for African-American and Hispanic / Latino students between 2013 and 2015 resulted from greater efforts by engineering schools, fewer schools providing data, or some other explanation, such as better high school preparation.

We also noted a disparity in numbers between responses from the same schools in 2015 to ASEE's Retention and Time-to-Graduation survey and the survey conducted for ASEE's *Profiles of Engineering and Engineering Technology Colleges*. [2]. The 111 schools reported 57,189 first-time, full-time freshman students in the ASEE Retention and Time-to-Graduation survey. The same 111 schools reported 65,753 full-time engineering students in their freshman year in the *Profiles* survey, a 13 percent difference. Or, 87 percent of full-time freshmen engineering students enrolled at the 111 schools were identified as traditional first-time, full-time students; they entered college directly after high school. 13 percent of students were identified as not being traditional first-time full time students; they entered college as freshmen with prior college credits and/or having done something between high school and college such as employment or time in the military.

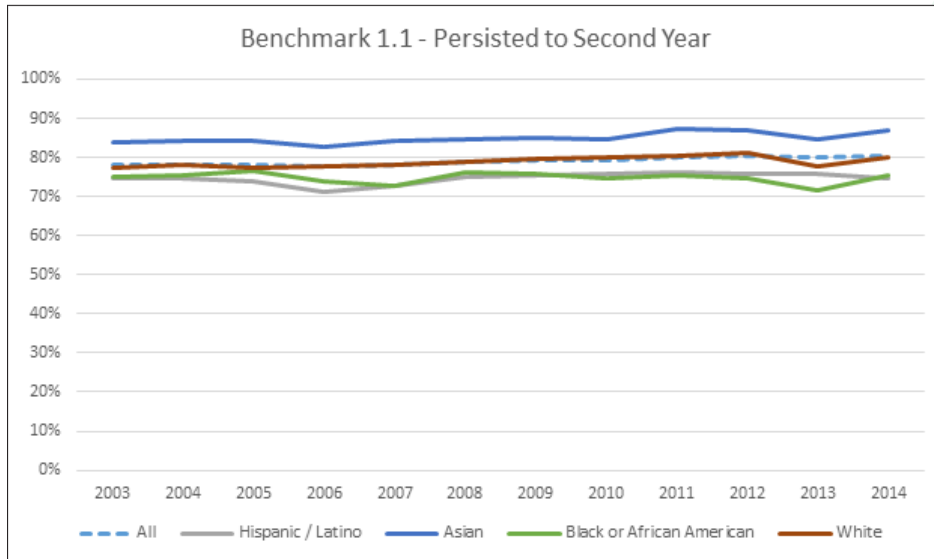
ASEE NATIONAL UNDERGRADUATE ENGINEERING PERSISTENCE AND GRADUATION BENCHMARKS

Our data show that undergraduate engineering student retention and graduation has increased over the past 10 years and that student persistence and graduation vary depending on gender, race, ethnicity, and type of institution. The first data series we present comprise the Longitudinal Retention and Time-To-Graduation Benchmark. This benchmark is calculated by taking the sum of all students who persisted to or graduated in a given year and dividing by the total number of students who started in that cohort. For example, if N is the sum of all first-time, full time freshmen in all schools for a group of students, and the sum of all students persisting to the second year for the same group of students is N_1 , the sum of all students persisting to the third year for the same group of students is N_2 , sum of all students graduating in four years for the same group of students is N_4 ; the calculation for the Longitudinal Retention and Time-to-Graduation benchmark for students persisting to the second year is N_1/N , the calculation for students persisting to the third year is N_2/N , and the calculation for students graduation in four years is N_4/N .

BENCHMARK 1: STUDENT PERSISTENCE TO THE SECOND YEAR

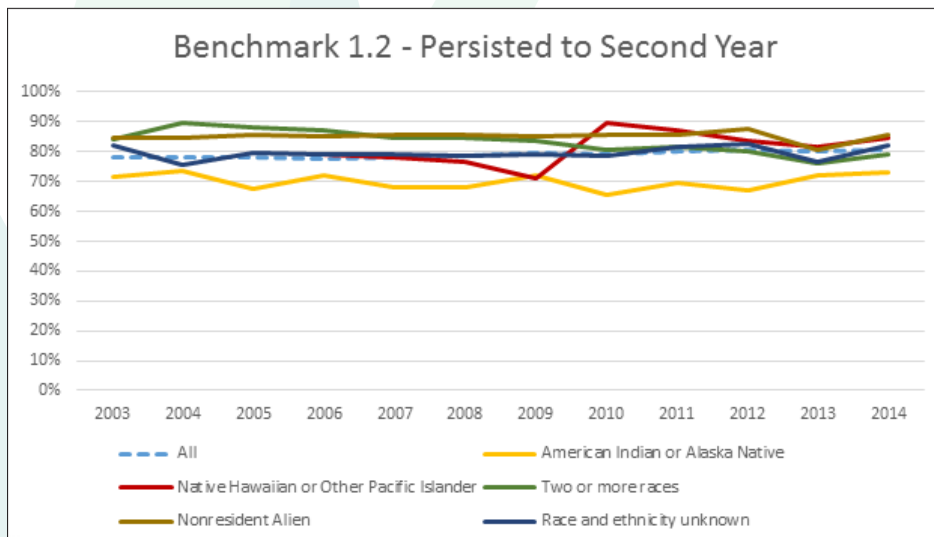
Benchmark 1.1 – Large Racial and Ethnic Groups

The first benchmark we present is persistence to the second year for larger racial and ethnic groups. Asian Americans show the highest persistence to the second year. Their rate of almost 84 percent in 2003 increased to 87 percent in 2014. White students unsurprisingly mirror the national average, since they make up just over 60 percent of the students reported in the survey. White student persistence was 78 percent in 2003, increasing to 82 percent in 2014. Persistence rates to the second year for black or African-American and Latino / Hispanic students were about the same in 2013 as they were in 2002. Black or African-American persistence was 74.5 percent in 2003 and 74.8 percent in 2014; Latino/Hispanic student persistence was 75.2 percent in 2003 and 75.6 percent in 2014.



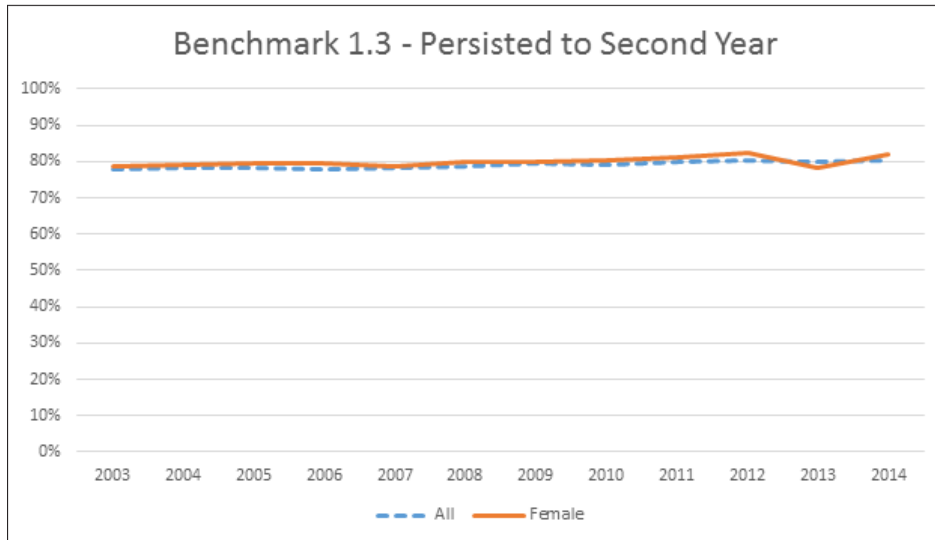
Benchmark 1.2: Smaller Racial and Ethnic Groups

Racial and ethnic groups with a smaller representation in the survey have persistence rates to the second year of between 70 and 90 percent. Groups identified as “two or more” ethnicities, “unknown,” and “non-resident alien” have second-year persistence rates higher than the national average. Native Hawaiian or Other Pacific Islander persistence “bounced” around the national average due to the small number of students included in the group. American Indian or Alaska Native had the lowest persistence rate of all racial and ethnic groups: 72 percent in 2003 and 73 percent in 2014.



Benchmark 1.3: Women

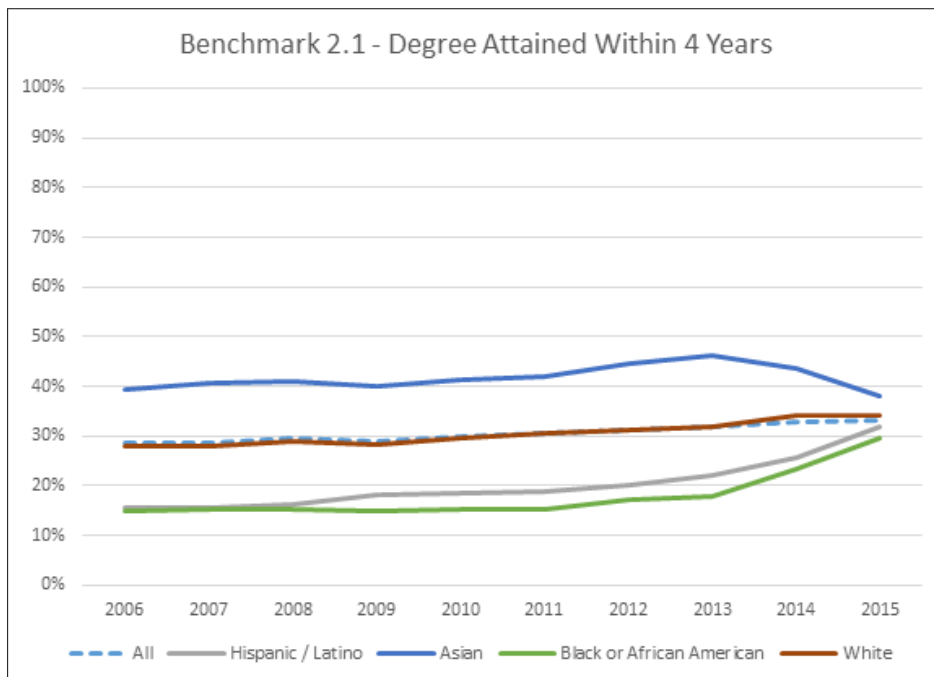
In ASEE's retention and time-to-graduation survey, female students are reported separately. Around 20 percent of the students included in the survey are women, mirroring their percentage in engineering programs nationally. The female persistence rate to the second year was consistently one percent higher than the national average of all students: 79 percent in 2002 and rising to 82 percent in 2014.



BENCHMARK 2 - STUDENT GRADUATION WITHIN FOUR YEARS

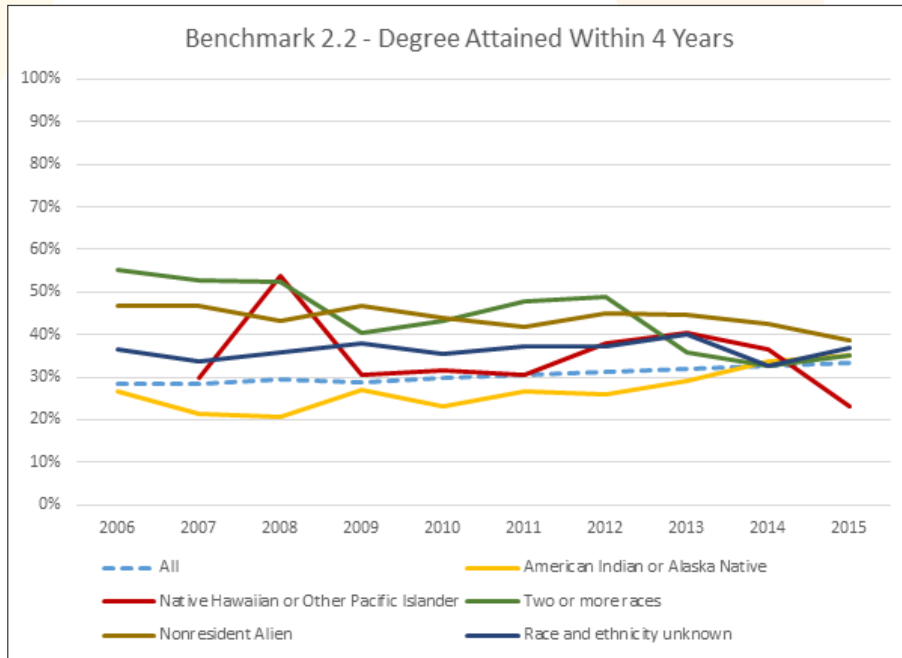
Benchmark 2.1: Large Racial and Ethnic Groups

Benchmark 2.1 shows the four-year graduation rate of students who enter an engineering program or express interest in studying engineering in their first year and graduate with a degree in engineering in four years. The rate does not include students who start in engineering but then graduate with a degree in another discipline, such as physics or mathematics. The overall four-year graduation rate increased from 29 percent in 2006 to 33 percent in 2011. Asian-American graduation rates were highest of all groups, around 10 percent above the national rate. White students graduated at around the same rate as the national average. Black or African-American students and Hispanic or Latin American students' graduation rates were lower. Both were 15 percent in 2006 and increased to 20 percent and 22 percent in 2015, respectively. As noted previously, we are not sure if the convergence in graduation rates shown from 2013 to 2015 is due to school efforts to increase the graduation rates of students less represented in engineering, a smaller number of schools reporting student retention data during those years, or another explanation, such as students being better prepared in high school to complete an undergraduate engineering program. Data from more schools during the next administration of the survey would help us understand the reasons for this trend.



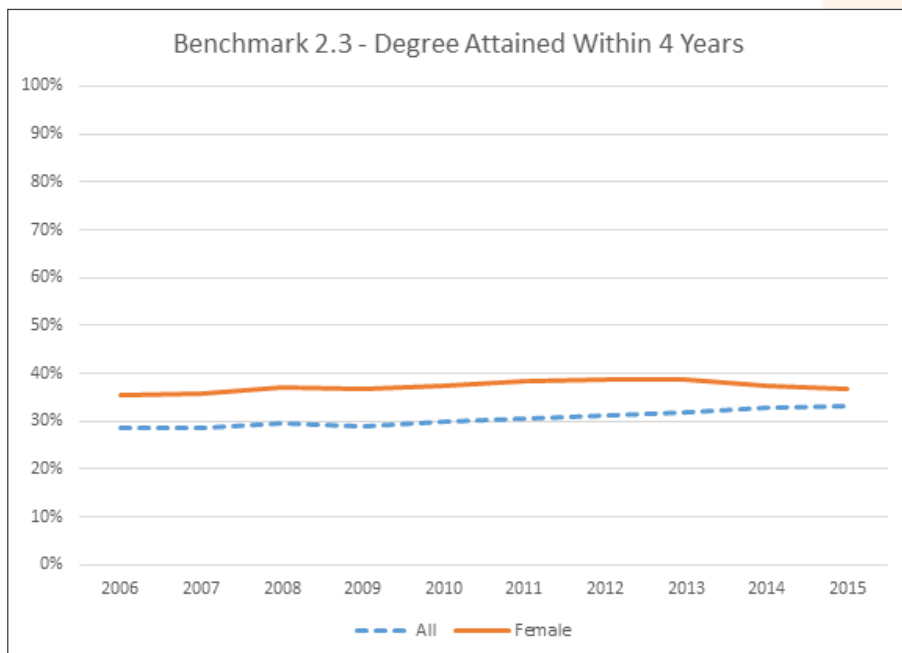
Benchmark 2.2: Smaller Racial and Ethnic Groups

The four-year graduation rate of students from racial and ethnic groups that make up a smaller percentage of engineering students in the survey bounced around due to the smaller number of students in these groups. Rates vary from as high as 56 percent to as low as 20 percent.



Benchmark 2.3: Women

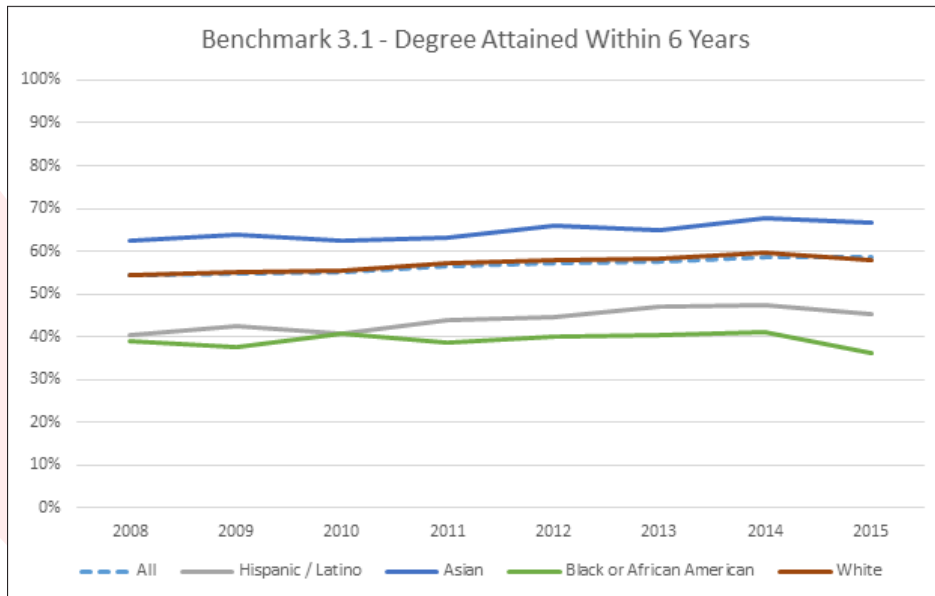
Female four-year graduation rates were consistently three to five percentage points higher than the average four-year graduation rates of all students included in the survey. They ranged from 35 percent in 2006 to a high point of 39 percent in 2012 and 2013.



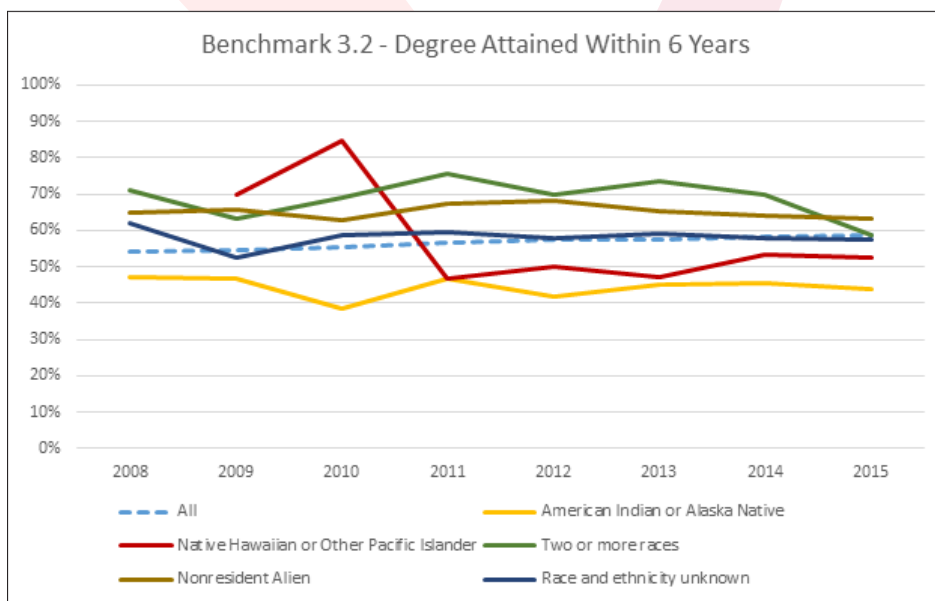
BENCHMARK 3 - DEGREE ATTAINED WITHIN SIX YEARS

Overall, six-year graduation rates were 20 percent to 25 percent higher than the rates for students who attained a degree in four years. (As a reminder, the graduation benchmarks represent students who start in an engineering program or declare their intention to study engineering as first-time, full-time students and then graduate with an engineering degree from the same university.)

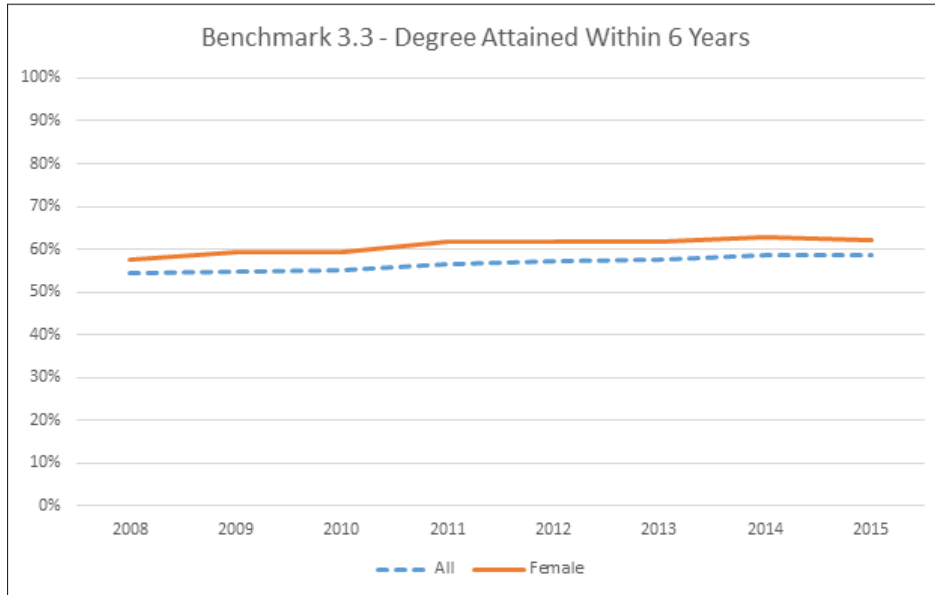
Benchmark 3.1



Benchmark 3.2



Benchmark 3.3

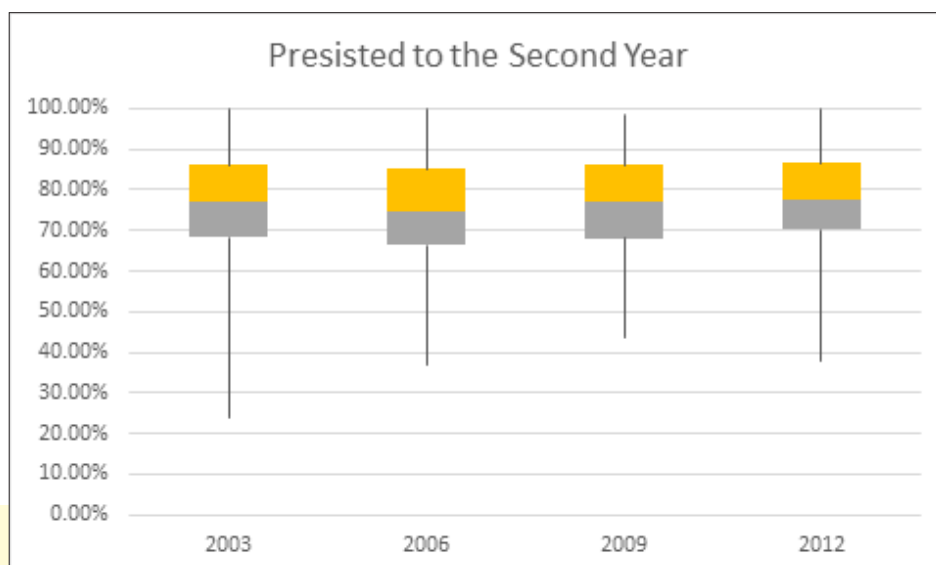


BENCHMARK 4: INTERQUARTILE RANGE OF ENGINEERING SCHOOLS' RETENTION AND GRADUATION RATES

Another benchmark ASEE produces is the interquartile range of engineering schools' retention and graduation rates. In this benchmark, we calculate the retention and graduation rate of each school (the number of students remaining in a cohort during a given year divided by the number of students in the original cohort), rank order the schools, identify the maximum and minimum, upper and lower deciles, and upper and lower quartiles, and find the average and the median. The following benchmarks are simplified and show the median, the upper and lower quartiles, and the minimum and maximum. All interquartile range information is available on-line to participating schools.

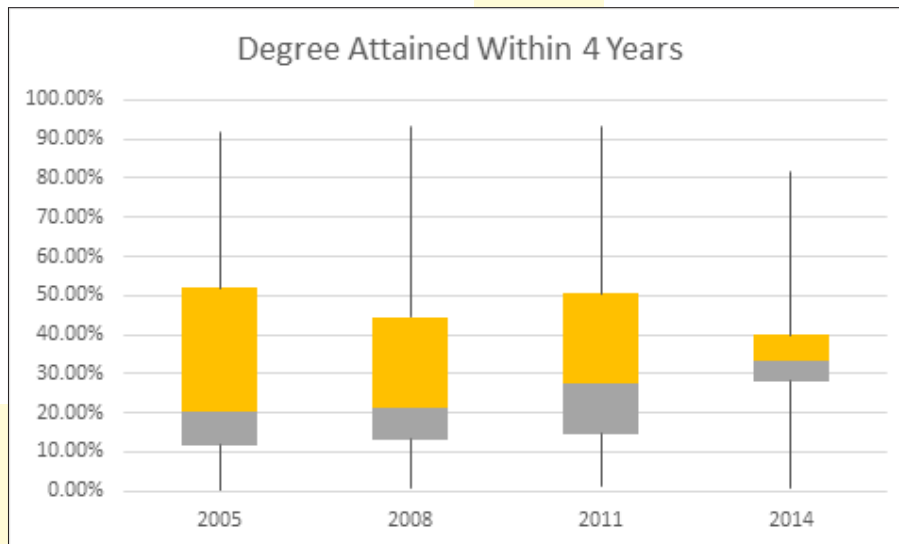
Benchmark 4.1 - Interquartile Range of Engineering Schools Retention to Second Year

The following benchmark shows the ranges of retention rates to the second year for all schools and all students in 2003, 2006, 2009, and 2012. In 2003, the school with the lowest retention to the second year had a rate of about 25 percent and the school with the highest had a 100 percent rate. The retention rates of schools have risen over-time; in 2012, the lowest retention rate was 38 percent and the highest was 100 percent.



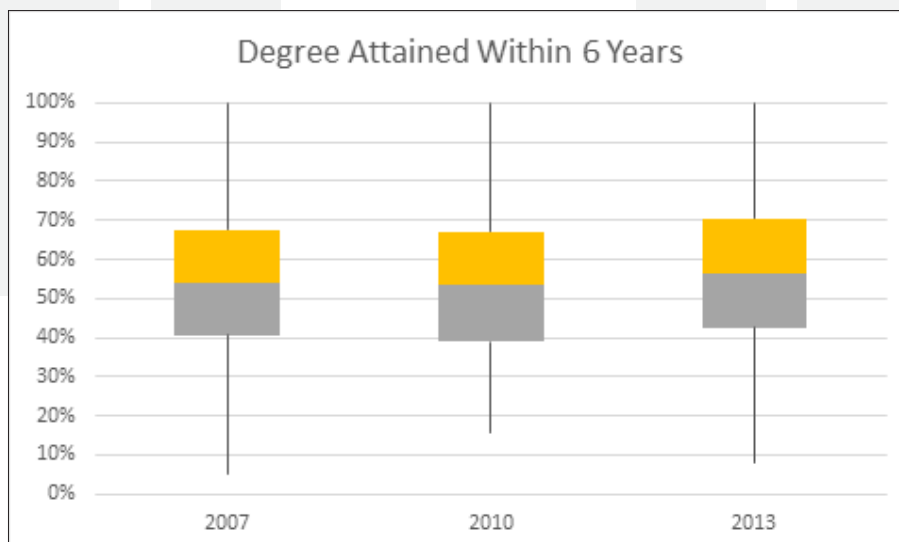
Benchmark 4.2 - Interquartile Range of Engineering Schools' Graduation within Four Years

The following benchmark shows the range of schools' rate of graduation within four years. The period from 2005 to 2011 showed an upward shift overall. The maximum and the minimum remained roughly constant - around 90 percent at the high end and close to zero at the low end. The lower quartile and the median rose from just above 10 percent and 20 percent, respectively, in 2005 to 15 percent and close to 30 percent in 2011. The range of schools in 2014 shifted upward again, with the exception of the maximum, which decreased by 10 percent. We cannot say for sure if the shift in 2014 is reflective of a national trend or a changing number of schools that provided data during a given year.



Benchmark 4.3 - Interquartile Range of Engineering Schools' Graduation within Six Years

The following benchmark shows the range of six-year graduation rates at engineering schools. (Again, these rates represent students who started as freshmen in an engineering program or declared their intention to study engineering in their first year and graduated from an engineering program at the same university within six years. Students who started in engineering their first year and graduated from the same university with a non-engineering degree are not included in this benchmark.) The range among schools is large, spanning from 100 percent to as low five percent. The range shifted upward over time; in 2013 the upper quartile was 70 percent, the median was 54 percent, and the lower quartile was 41 percent.



The data that support the graphic benchmarks in this report, plus additional information, are available to engineering schools, departments, and programs that participate in the ASEE Retention and Time-to-Graduation survey. The next administration of the survey will be during the summer 2017. ASEE also collects data from schools, departments, and programs on students entering an engineering school during their sophomore year and junior year. If you have any questions about the retention survey, please do not hesitate to reach out to Brian Yoder, Director of Assessment, Evaluation and Institutional Research at the American Society for Engineering Education. Phone 202-331-3535 or email b.yoder@asee.org

CITATIONS

American Society for Engineering Education (2012). *Best Practices and Strategies for Retaining Engineering, Engineering Technology and Computing Students*. Washington, D. C.

American Society for Engineering Education (2016). *Profiles of Engineering and Engineering Technology Colleges*. Washington, D. C.



Questions or comments?

Contact Brian L. Yoder
Director of Assessment, Evaluation and Institutional Research
American Society for Engineering Education
b.yoder@asee.org 202-331-3535



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