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Degrees of Success

Bachelor's Degree Completion Rates among Initial STEM Majors

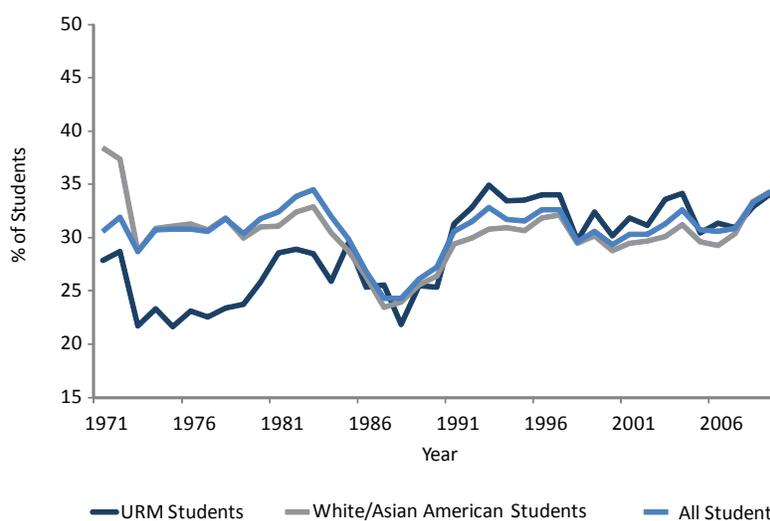
Over the decades, colleges and universities in the U.S. have seen substantial volatility in the proportions of students initially reporting aspirations to major in an undergraduate science, technology, engineering, or mathematics (STEM) related discipline (see Figure 1). Nearly 31% of all students who entered college in 1971 reported plans to major in a STEM discipline on the Freshman Survey, an annual survey administered by the Cooperative Institutional Research Program (CIRP) at the Higher Education Research Institute (HERI) at the University of California, Los Angeles. Since 1986, when the lowest proportion of CIRP Freshman Survey respondents (below 25%) indicated plans to pursue a STEM-related major, we have seen relative increases in students' interest in pursuing a STEM degree. More than 35 years later, in 2009, approximately the same proportion of students reported intentions to major in STEM on the 2009 CIRP Freshman Survey as in 1971.

Although the proportions of students interested in STEM in 1971 and 2009 are relatively similar, the breakdown across race has changed substantially. In 1971, White and Asian American students far outpaced their underrepresented racial minority (URM) peers in STEM major interest, as 38.4% of White and Asian American students indicated plans to pursue a STEM major for their bachelor's degree program compared to just 27.9% of their

URM peers. In 2009, these two groups of students are nearly identical in their proportionate interest in STEM, as 34.1% of URM students and 34.3% of White and Asian American students indicated on the 2009 Freshman Survey that they planned to pursue a STEM major.

Students' initial academic interests have been relatively easy to track over the last several decades because of instruments like the CIRP Freshman Survey; however, college students' success in their academic programs have proven more difficult to examine, as just two studies in the last 10 years have provided figures for undergraduate STEM degree completion rates. An NCES study authored by Huang (2000) found that 46% of White and Asian American college students

Figure 1. Trends in Students' Aspiration to Major in a STEM Discipline by Racial Identification, 1971-2009



finished their STEM degree programs within five years of initial enrollment, which far outpaced the 26.8% of their URM peers. Huang's study also found that, five years after initial college enrollment, 15.4% of initial White and Asian American STEM students and 20.7% of initial URM STEM majors were still enrolled in STEM programs. Furthermore, slightly more than 22% of both URM STEM and White and Asian American STEM majors dropped out of higher education entirely five years after beginning post-secondary programs. Huang's (2000) analysis, however, included certificate, associate, and bachelor's degree programs and was based on a sample of only 859 students in the Beginning Postsecondary Study (BPS: 89/94).

The Center for Data Exchange and Analysis (2001) followed students who entered STEM bachelor's degree programs in the 1993-1994 academic year and concluded that 38% of these students earned a STEM bachelor's degree within six years of enrollment. Additionally, the researchers found that 18% of initial STEM majors earned a bachelor's degree in a non-STEM discipline. Disaggregating the data by race, C-IDEA (2001) found that 23% of URM STEM students earned a STEM bachelor's degree within six years of enrollment compared to 41% of initial White and Asian American STEM majors.

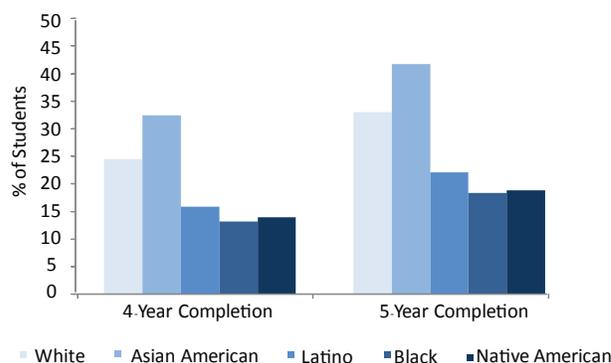
Given that URM students have reached parity with their White and Asian American counterparts in terms of their proportional interest in majoring in STEM disciplines at the beginning of their undergraduate studies, it is important to provide an updated analysis of STEM retention and degree completion rates. Using data from the 2004 CIRP Freshman Survey and enrollment and completion data collected by the National Student Clearinghouse (NSC) for students who completed degrees in 2008 and 2009, we calculated STEM completion rates for students who entered college for the first time in the fall of 2004. In all, we had an analytic sample of 201,588 students across 326 four-year, non-profit colleges and universities. Within this sample are 62,115 students who initially reported plans to major in a STEM field. Data were weighted to represent the original population of freshmen entering in 2004 (see Methodology at the end of this report).

Using NSC data, we also determined students' academic major four and five years after college entry, as NSC provides major information for students who complete their degrees. Using freshman major, degree major, and degree status, we calculated degree completion rates for students who started and stayed in STEM, for individuals who started in STEM and switched

out of STEM, and for students who started in non-STEM fields and earned a degree in any discipline. We calculated these rates for White, Asian American, Latino, Black, and Native American students.

Figure 2 presents STEM degree completion rates for 2004 freshman STEM degree aspirants who completed their degrees in 2008 (four years) and 2009 (five years). White and Asian American students who started as STEM majors have four-year STEM degree completion rates of 24.5% and 32.4% respectively. In comparison, Latino, Black, and Native American students who initially began college as a STEM major had four-year STEM degree completion rates of 15.9%, 13.2%, and 14.0%, respectively. The difference between White and Asian American STEM majors and their URM counterparts is even more pronounced when considering five-year STEM completion rates. Approximately 33% and 42% of White and Asian American STEM majors, respectively, completed their bachelor's degree in STEM within five years of college entry. In contrast, five-year STEM completion rates for Latino, Black, and Native American students were 22.1%, 18.4%, and 18.8%, respectively. Although six year completion rates will be obtained in summer 2010, it is already clear that students are taking longer to complete their degrees and many others opt for a non-STEM major, and/or leave the institution they entered as a freshmen.

Figure 2. Percentage of 2004 STEM Aspirants Who Completed STEM Degrees in Four and Five Years, by Race/Ethnicity



Perhaps more alarming than the low STEM degree completion rates across all racial groups and the large difference in STEM graduation rates between URM students and their White and Asian peers is the low overall completion rates of students who start in STEM compared to their counterparts who enter college in non-STEM disciplines, as shown in Figure 3. Less than 42% of White students who started college as a STEM major completed a bachelor's degree in any

field in four years, and this figure increased to just under 56% after five years. In comparison, White students who entered college in 2004 and decided to major in a non-STEM field had a four-year degree completion rate of 61.3%, and this figure increased to 73.5% after five years. Approximately 46% of Asian American STEM majors earned a bachelor's degree within four years, which was sharply below the 65% graduation rate of Asian American students who entered college in non-STEM fields.

Among Latino students who entered college as a STEM major, 30.1% of them earned a bachelor's degree in any discipline within four years, and this rate increased to 41.6% after five years. In comparison, 56.1% of Latino students who entered college in non-STEM disciplines completed a bachelor's degree in four years, and 67.6% of them completed a degree in five years. Slightly more than 23% of Black initial STEM aspirants earned a bachelor's degree in four years compared to 32.2% within five years. Among Black students who entered college in non-STEM disciplines, nearly 49% of them completed a bachelor's degree in four years and 58% of them earned a degree within five years. Similar trends are demonstrated by Native American students, as 28.2% of initial STEM aspirants within this group earned a bachelor's degree in four years compared to 38.1% in five years. In contrast, nearly 51% of Native Americans who chose majors outside of STEM earned a bachelor's degree in four years, and 60.5% completed their undergraduate program within five years of college entry.

Although the findings from the descriptive analyses suggest that substantial disparities across racial classifications persist, of equal importance is that

students who initially enter undergraduate STEM programs have substantially lower degree completion rates than their same-race peers who enter other academic disciplines. Future studies within HERI are planned to examine the specific student characteristics and experiences that affect individuals' likelihood to complete degrees both within STEM disciplines and outside of these fields. Researchers at HERI also will collect six-year degree completion data on this cohort during the summer of 2010.

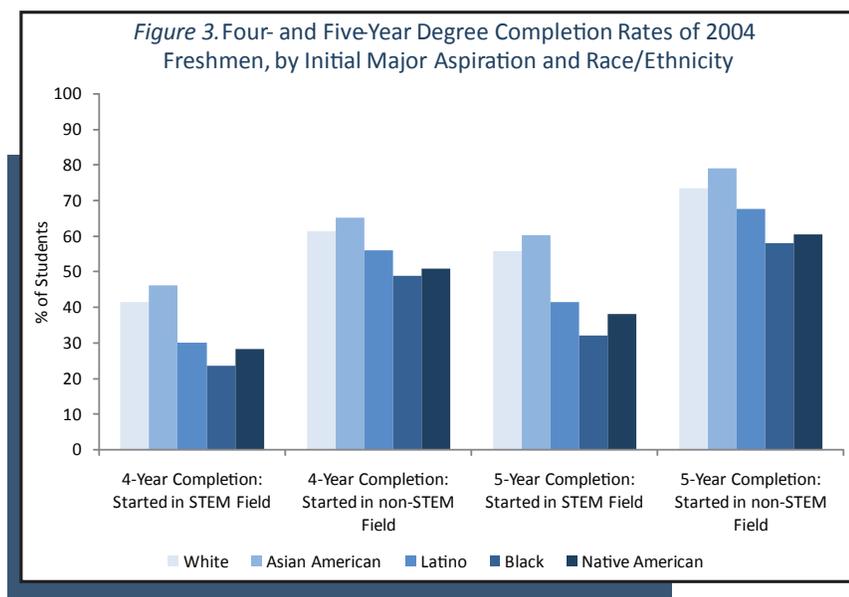
METHODOLOGY

Using data from the 2004 CIRP Freshman Survey and enrollment and completion data collected by the National Student Clearinghouse (NSC) for students who completed degrees in 2008 and 2009, we calculated STEM completion, retention, and withdrawal rates of students who entered college for the first time in the fall of 2004. Following a weighting design used at HERI, we weighted the sub-sample of students for whom we had NSC data to look like the original population of entering college freshman in 2004 (see Sax, Hurtado, Lindholm, Astin, Korn, & Mahoney, 2005, for weighting methodology). In all, we had an analytic sample of 201,588 students across 326 four-year, non-profit colleges and universities. Within this sample are 62,115 students who initially reported plans to major in a STEM field.

In 2004, HERI collected data on more than 420,000 freshman students from 720 colleges and universities across the U.S. The National Institutes of Health (NIH) and the National Science Foundation (NSF) provided funds to study degree and enrollment information on this cohort of students. With federal funding support and also support from the Ford Foundation, HERI partnered with the National Student Clearinghouse in the summer of 2009 to collect degree and enrollment information on this cohort of students. Nearly half of the institutions that participated in the 2004 Freshman Survey also report data to the National Student Clearinghouse, which explains the difference in the number of students and institutions once the data were merged for analysis for this research brief.

Given the reduced numbers of students and institutions, HERI researchers re-weighted the data to best approximate the national population of first-time, full-time students who entered college in 2004 (see Sax et al., 2005, for complete weighting methodology).

Figure 3. Four- and Five-Year Degree Completion Rates of 2004 Freshmen, by Initial Major Aspiration and Race/Ethnicity



Completion rates were calculated as a simple quotient of the number of students who completed a degree within a given category (e.g., aspired to a STEM degree and completed a STEM degree) divided by the number of students who initially aspired for that type of degree. The following majors were included in our definition of STEM: general biology, biochemistry/biophysics, botany, environmental science, marine (life) science, microbiology/bacterial biology, zoology, other biological sciences, aeronautical/astronautical engineering, civil engineering, chemical engineering, computer engineering, electrical engineering, industrial engineering, mechanical engineering, other engineering, astronomy, atmospheric science, chemistry, earth science, marine science, mathematics, physics, statistics, other physical science, health technology, medicine/dentistry/veterinary medicine, nursing, pharmacy, agriculture, and computer science.

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Sax, L.J., Hurtado, S., Lindholm, J.A., Astin, A.W., Korn, W.S., & Mahoney, K.M. (2005). *The American freshman: National norms for fall 2004*. Los Angeles, CA: Higher Education Research Institute, UCLA.



Since 2004, the post-Baccalaureate Experiences, Success, and Transition (BEST) project aims to understand the barriers to and facilitators of underrepresented racial minority students' pathways toward research careers in STEM fields. We have followed the entering freshman cohort from the fall of 2004 with three national student surveys and have supplemented the student survey data with transcript and degree information. The project will continue to follow these students into graduate and professional schools as well as their transition into the work force. The project is led by principal investigators Dr. Sylvia Hurtado and Dr. Mitch Chang and postdoctoral research fellows Dr. Kevin Eagan and Dr. Josephine Gasiewski.

For more information on

The Project on Becoming Scientists: Practices in Undergraduate Education that Contribute to Degree Completion and Advanced Study in STEM Disciplines, please email keagan@ucla.edu or visit BEST at: www.heri.ucla.edu/nih



The Higher Education Research Institute (HERI) is based in the Graduate School of Education & Information Studies at the University of California, Los Angeles. The Institute serves as an interdisciplinary center for research, evaluation, information, policy studies, and research training in postsecondary education.



The Cooperative Institutional Research Program (CIRP) is a national longitudinal study of the American higher education system. It is regarded as the most comprehensive source of information on college students. Established in 1966 at the American Council on Education, the CIRP is the nation's largest and oldest empirical study of higher education, involving data on some 1,900 institutions and over 15 million college students. The Higher Education Research Institute has administered the CIRP since 1973. The CIRP longitudinal program consists of The Freshman Survey, Your First College Year Survey, the College Senior Survey, and the triennial Faculty Survey. Information on the CIRP Freshman Survey, research and publications based on these data, and other research projects conducted by the Higher Education Research Institute can be found on the HERI website at: www.heri.ucla.edu

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