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Students Who Study Science, Technology, Engineering, and Mathematics (STEM) in Postsecondary Education

Introduction

Rising concern about America's ability to maintain its competitive position in the global economy has renewed interest in STEM education. In 2005, for example, three preeminent U.S. scientific groups—the National Academy of Science, the National Academy of Engineering, and the Institute of Medicine—jointly issued a report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, that called for strengthening the STEM pipeline from primary through postsecondary education (National Academy of Science 2005). This report recommended increasing investment in STEM programs, enhancing the STEM teaching force, and enlarging the pool of students pursuing degrees and careers in STEM fields. Similar policy recommendations have come from other organizations and government agencies (Government Accountability Office 2006; National Science Board 2007; U.S. Department of Education 2006).

Although information about the number of students completing degrees in STEM fields is available (Goan and Cunningham 2006; U.S. Department of Education 2008), less is known about students' undergraduate progress through the STEM pipeline (Anderson and Kim 2006). This Statistics in Brief focuses on undergraduate students, examining students' entrance into and persistence toward degree completion in STEM fields. It is designed to provide a profile of undergraduates who pursue and complete STEM degrees. It addresses three questions: (1) Who enters STEM fields? (2) What are their educational outcomes (i.e., persis-

tence and degree completion) several years after beginning postsecondary education? (3) Who persisted in and completed a STEM degree after entrance into a STEM field of study?

Definition of STEM Fields and Entrance

What Are STEM Fields? STEM fields can include a wide range of disciplines. For example, the National Science Foundation (NSF) defines STEM fields broadly, including not only the common categories of mathematics, natural sciences, engineering, and computer and information sciences, but also such social/behavioral sciences as psychology, economics, sociology, and political science (Green 2007). Many recent federal and state legislative efforts, however, are aimed at improving STEM education mainly in mathematics, natural sciences, engineering, and technologies (Kuenzi, Matthews, and Mangan 2006; National Governors Association 2007). For this reason, this Statistics in Brief excludes social/behavioral sciences from the definition of STEM fields. STEM fields, as defined here, include mathematics; natural sciences (including physical sciences and biological/agricultural sciences); engineering/engineering technologies; and computer/information sciences. For more details about classifications of STEM fields, see the crosswalk in the Technical Notes section.

How Is Entrance Into a STEM Field Defined? To identify students entering STEM fields, this Statistics in Brief uses their reported major field of study and considers anyone a STEM entrant if that student has reported a major (first or second major if that information is available) in a STEM field at any time during his or her postsecondary enrollment (to the extent that the data allow). This definition attempts to capture all students who enter STEM fields, including early entrants, later entrants, those who changed majors, and those with a second major in a STEM field. For example, in the 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01) (the major data source for this study), STEM entrance is identified by students' major field as reported in the base-year survey of 1995–96 and in the 1998 and 2001 follow-up surveys. Students reporting a STEM major field of study at one or more of these three times are considered STEM entrants between 1995–96 and 2001.[1] In the 2003–04 National Postsecondary Student Aid Study (NPSAS:04) and the Education Longitudinal Study of 2002/06 (ELS:02/06) (two additional data sources for this study), STEM entrance is identified by students' major and secondary major field reported at the time of interview. For brevity, this study refers to students who entered STEM fields as *STEM entrants* and those who never entered (including those with only non-STEM majors and those with an undeclared major[2]) as *non-STEM entrants*.

Data Sources and Analysis Samples

This study primarily uses longitudinal data from the 1995–96 Beginning Postsecondary Students Longitudinal Study (BPS:96/01). This survey began in 1995–96 with a nationally representative sample of approximately 12,000 first-time students who enrolled in postsecondary education in 1995–96. These students were interviewed again in 1998 and, for the last time, in 2001, about 6 years after their initial college entry. The longitudinal design of BPS permits examination of student entrance, persistence, and attainment in STEM fields over the period of time in which most students complete a bache-

[1] This definition draws upon longitudinal data available through BPS:96/01, but it has limitations. BPS:96/01 did not collect comprehensive historical data on students' major field during their enrollment between 1995–96 and 2001. Rather, data on students' major were collected at each data collection point: 1995–96, 1998, and 2001. Because students could have had an unreported STEM major between the data collection points, the number of STEM entrants may be underestimated.

[2] This study treated students who did not declare a major differently from those who did not report a major. The former group consisted of students who were still exploring and undecided about the field of study at the time of interview, whereas the latter group consisted of those who may have a major but declined to report it. Thus, students who did not declare a major are included in the analysis of this study, whereas students who did not report a major were treated as "missing" and therefore, excluded from the analysis.

lor's degree. To examine students' paths to STEM degrees, this study used a sample of about 9,000 BPS students who participated in the initial survey in 1996 and the two follow-up surveys in 1998 and 2001 and who reported a major (including "undeclared major") in at least one of three data collections.

This study also draws data from two other surveys to provide information about STEM participation among different undergraduate populations. The first is the 2003–04 National Postsecondary Student Aid Study (NPSAS:04), a cross-sectional survey of undergraduate and graduate/first-professional students enrolled in U.S. postsecondary institutions in 2003–04. Focusing on all undergraduates (a sample of about 80,000), NPSAS:04 provides information about the prevalence of STEM majors among U.S. undergraduates in 2003–04. The second data source is the Education Longitudinal Study of 2002/06 (ELS:02/06). Unlike BPS and NPSAS, which include postsecondary students of all ages, ELS represents a more homogeneous group: high school graduates from the senior class of 2004. Using a subsample of these graduates who were enrolled in postsecondary education in 2006 (about 8,500), this study examines STEM entrance among a more traditional college-age population. For details on the BPS:96/01, NPSAS:04, and ELS:02/06 data, see the Technical Notes below.

All findings reported below are descriptive and do not imply any causal relationship. All comparisons in this study were tested for statistical significance using Student's *t* statistic to ensure that differences were larger than might be expected due to sampling variation. All differences cited are statistically significant at the .05 level. Adjustments were not made for multiple comparisons. Consequently, some differences noted here might not be significant if a multiple comparison procedure was used. Standard errors for all estimates are available at http://nces.ed.gov/das/library/reports.asp.

Organization of the Statistics in Brief

This Statistics in Brief is organized into four major sections. The first section provides an overview of STEM entrance among various undergraduate populations. The next section looks at the demographic and academic characteristics of students who entered STEM fields in postsecondary education. The third section examines rates of overall persistence and degree completion for both students who entered STEM fields and those who did not. The last section focuses on only STEM entrants and examines their rates of persistence and degree completion in STEM fields.

Entrance Into STEM Fields: An Overall Picture

How many postsecondary students entered STEM fields? Answers to this question depend on the undergraduate population and period of enrollment examined. Based on a nationally representative undergraduate sample from NPSAS:04, some 14 percent of all undergraduates enrolled in U.S. postsecondary institutions in 2003–04 were enrolled in a STEM field, including 5 percent in computer/information sciences, 4 percent in engineering/engineering technologies, 3 percent in biological/agricultural sciences, and less than 1 percent each in physical sciences and mathematics (table 1).

Although NPSAS:04 covers undergraduates of all ages, ELS:02/06 looked at students who were of traditional college age: some 15 percent of 2003–04 high school graduates enrolled in postsecondary education in 2006 reported a STEM major. Compared to students in NPSAS:04, the traditional college-age students of ELS:02/06 enrolled in mathematics and natural sciences (including physical sciences and biological/agricultural sciences) at higher rates and enrolled in computer/information sciences at a lower rate.

Table 1. Percentage of undergraduates who entered STEM fields, by undergraduate population

Undergraduate population	Students who entered STEM field[1]							Students who did not enter STEM field	
			Natural sciences						
	Total	Mathematics	Total	Physical sciences	Biological/ agricultural sciences	Engineering/ engineering technologies	Computer/ information sciences	Non-STEM field	Major undeclared
2003–04 undergraduates	13.7	0.5	4.2	0.7	3.1	4.2	4.9	65.0	21.3
2003–04 high school graduates who were enrolled in postsecondary education in 2006	14.7	0.9	7.1	1.3	5.4	4.7	2.3	60.8	24.5
1995–96 beginning postsecondary students	22.8	1.2	8.3	1.5	7.1	8.3	6.6	72.5	4.7

[1] A student entered a STEM field if his or her major or secondary major field of study was in a STEM field. STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences. In NPSAS:2004, STEM entrance is identified by undergraduates' major and secondary major field as reported in 2003–04. In ELS:02/06, STEM entrance is identified by the major and secondary major field as reported by 2003–04 high school graduates who were enrolled in postsecondary education in 2006. In BPS:96/01, STEM entrance is identified by students' major field as reported in 1995–96, 1998, and 2001, and students who reported a STEM major at one or more of these interview times are considered to have entered a STEM field between 1995–96 and 2001. Estimates for entering specific STEM fields do not sum to the total because some students had a major and a secondary major in different STEM fields or entered more than one STEM field during their postsecondary education.

NOTE: Standard error tables are available at http://nces.ed.gov/das/library/reports.asp.

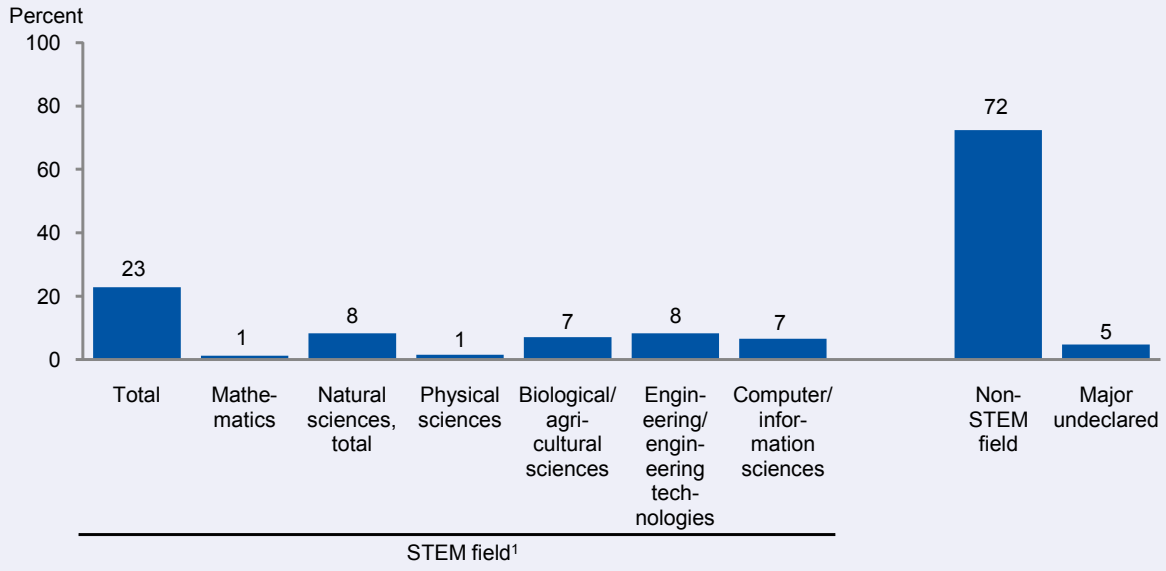
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003–04 National Postsecondary Student Aid Study (NPSAS:04); Education Longitudinal Study of 2002 (ELS:2002), Second Follow-up, 2006; and 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

Unlike the one-time snapshots provided by NPSAS:04 and ELS:02/06, BPS:96/01 follows the enrollment of beginning postsecondary students over 6 years, thereby offering a fuller picture of STEM entrance. Based on BPS:96/01, a total of 23 percent of beginning postsecondary students entered a STEM field at some time during their postsecondary enrollment from 1995–96 to 2001 (figure 1 and table 1). Overall, 77 percent of 1995–96 beginning postsecondary students never entered a STEM field during their enrollment through 2001, including 72 percent who entered only non-STEM fields and 5 percent who never declared a major. In STEM fields, a higher percentage of students entered biological/agricultural sciences, engineering/engineering technologies, and computer/information sciences (7–8 percent) than mathematics and physical sciences (less than 2 percent for each).

Students entering STEM fields had enrollment patterns different from those who did not enter STEM fields. Based on BPS:96/01,[3] 52 percent of STEM entrants started their postsecondary education at a 4-year institution, compared to 38 percent of their non-STEM counterparts (table 2). Further, about one-third of STEM entrants who started in a 4-year institution (33 percent) began in a very selective institution, compared to 21 percent among their non-STEM counterparts. A higher percentage of STEM entrants started in a bachelor's degree program (48 percent vs. 35 percent) and a lower percentage attended classes exclusively part time (8 percent vs. 13 percent) when compared to their non-STEM counterparts.

[3] Similar tables were also run with NPSAS:04 and ELS:02/06 data. The findings are consistent, but only results from BPS:96/01 are reported here because BPS provides a better measure of STEM entrance than do ELS and NPSAS data.

Figure 1. Percentage of 1995–96 beginning postsecondary students who entered STEM fields between 1995–96 and 2001



[1] STEM entrance is identified by students' major field as reported in 1995–96, 1998, and 2001. Students who reported a STEM major at one or more of these interview times are considered to have entered a STEM field between 1995–96 and 2001. STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences. Estimates for entering specific STEM fields do not sum to total because some students entered more than one STEM field between 1995–96 and 2001.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

Students entering specific STEM fields generally differed from non-STEM entrants in terms of type of institution attended, degree program, and attendance, but those entering computer/information sciences were an exception. No measurable differences were found between students entering computer/information sciences and their non-STEM counterparts in terms of the type of institution and level of degree program in which they first enrolled. Compared to their non-STEM counterparts, a lower percentage of students entering computer/information sciences attended classes exclusively full time and a higher percentage had mixed full- and part-time enrollment. Further, compared to students who entered natural sciences (more specifically, the physical sciences and biological/agricultural sciences), a higher percentage of students entering computer/information sciences started postsecondary education at public 2-year colleges and less selective institutions, enrolled in sub-baccalaureate programs such as certificate or associate's degree programs, and attended school exclusively part time. In addition, compared to students entering mathematics and engineering/engineering technologies, those entering computer/information sciences attended 4-year institutions and enrolled in bachelor's degree programs at lower rates.

Table 2. Percentage distributions of 1995–96 beginning postsecondary students' first institution type and selectivity, first degree program level, and enrollment intensity through 2001, by STEM entrance between 1995–96 and 2001

STEM entrance between 1995–96 and 2001[2]	First institution type			First institution selectivity[1]		
	4-year	Public 2-year	Other	Less selective	Selective	Very selective
All students	**41.2**	**45.5**	**13.3**	**57.9**	**17.7**	**24.4**
Students who entered STEM field, total	51.7	39.8	8.5	48.1	19.3	32.6
Mathematics	53.0	46.4	0.6 !	44.8	25.1	30.1
Natural sciences, total	70.9	26.7	2.4 !	42.6	21.1	36.3
Physical sciences	75.9	23.4	0.7 !	43.8	19.7	36.4
Biological/agricultural sciences	70.2	27.1	2.6 !	42.2	21.3	36.4
Engineering/engineering technologies	47.8	42.0	10.2 !	43.5	19.5	37.0
Computer/information sciences	33.2	51.2	15.6	68.5	12.2	19.3
Students who did not enter STEM field, total	38.1	47.2	14.7	61.9	17.0	21.1
Students who entered only non-STEM fields	39.4	45.2	15.4	61.3	17.2	21.5
Students who did not declare a major	18.4	77.5	4.1 !	79.9	10.6 !	9.5 !

STEM entrance between 1995–96 and 2001[2]	First degree program level			Enrollment intensity through 2001		
	Certificate	Associate's degree	Bachelor's degree	Always full-time	Always part-time	Mixed
All students	**18.3**	**43.5**	**38.2**	**46.9**	**12.2**	**40.9**
Students who entered STEM field, total	11.2	40.6	48.2	47.9	8.3	43.8
Mathematics	0.9 !	47.3	51.8	50.7	11.0 !	38.3
Natural sciences, total	3.5	29.5	67.0	57.1	3.1	39.8
Physical sciences	0.9 !	24.8	74.3	46.8	#	53.2
Biological/agricultural sciences	4.0	30.1	65.9	59.0	3.7	37.3
Engineering/engineering technologies	13.7	42.5	43.7	46.4	9.3	44.3
Computer/information sciences	18.8	50.7	30.5	38.0	11.2	50.8
Students who did not enter STEM field, total	20.4	44.4	35.3	46.7	13.3	40.1
Students who entered only non-STEM fields	20.2	43.1	36.7	48.5	10.3	41.2
Students who did not declare a major	22.9	62.9	14.3	19.2	58.5	22.3

Rounds to zero.

! Interpret data with caution (estimates are unstable).

[1] This variable only applies to 4-year institutions. The "very selective" institutions are those in which the 25th percentile of SAT/ACT scores of incoming freshman exceeded 1000. The "selective" institutions are research universities I and II, baccalaureate I institutions, and private not-for-profit doctoral universities I and II that do not meet the "very selective" criteria. The "least selective" institutions are all other 4-year institutions.

[2] STEM entrance is identified by students' major field as reported in 1995–96, 1998, and 2001. Students who reported a STEM major at one or more of these interview times are considered to have entered a STEM field between 1995–96 and 2001. STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences.

NOTE: Detail may not sum to totals because of rounding. Standard error tables are available at http://nces.ed.gov/das/library/reports.asp.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

Who Enters STEM Fields?

To address the question of who enters STEM fields, this section looks at various characteristics of beginning postsecondary students who entered STEM fields between 1995 and 2001. The percentage of men entering STEM fields was higher than that of women (33 percent vs. 14 percent) (table 3), especially in the fields of mathematics, engineering/engineering technologies, and computer/information sciences. Nearly half of Asian/Pacific Islander students (47 percent) entered STEM fields, compared to 19–23 percent of students in each of the other racial/ethnic groups. No measurable differences were found among White, Black, and Hispanic students.[4]

Percentages of students entering STEM fields were higher for younger (age 19 or younger) and dependent students than for older (age 24 or older) and independent students. Compared to their U.S.-born counterparts, a higher percentage of foreign students entered STEM fields overall (34 percent vs. 22 percent), and computer/information sciences in particular (16 percent vs. 6 percent). Compared to students whose family income fell in the bottom 25 percent or whose parents had a high school education or less, a higher percentage of students from families with income in the top 25 percent or whose parents had at least some college education entered natural sciences, including the biological/agricultural sciences and physical sciences.

Various academic indicators are associated with STEM entrance as well. For example, the percentage of students entering STEM fields was higher among students who took trigonometry, precalculus, or calculus in high school; earned a grade point average (GPA) of B or higher; had college entrance exam scores in the highest quarter; and expected to attain a graduate degree in the future than among students without these characteristics.

Students entering most STEM fields had similar demographic and academic characteristics, but those entering computer/information sciences were somewhat different. For example, a higher percentage of students age 30 or older, from families with income in the bottom 25 percent, and with an average high school GPA of below B entered the computer/information science fields than did students age 19 or younger, from families with income in the top 25 percent, and with an average high school GPA of B or higher.

Postsecondary Outcomes After 6 Years

Students take many different paths through postsecondary education. Some attend college full time continuously until they obtain a degree or other credential; others take longer to complete their studies, taking breaks or attending part time. Still others choose to leave college without obtaining a degree or credential. This section compares the overall outcomes of STEM and non-STEM entrants 6 years after their initial college enrollment.[5] In general, STEM entrants had better outcomes than their non-STEM counterparts (table 4). For example, compared to students who never entered STEM fields or who entered only non-STEM fields, those entering STEM fields had a higher rate of completing a bachelor's degree program (35 percent vs. 27–29 percent) and a lower rate of leaving college without earning any degree (27 percent vs. 33–36 percent).

[4] This was consistent with the 2006 American Council on Education study that found that Black and Hispanic students entering 4-year institutions majored in STEM fields at rates similar to those of White students (Anderson and Kim 2006).

[5] The associations among postsecondary outcomes and various student characteristics are described in *Descriptive Summary of 1995–96 Beginning Postsecondary Students: Six Years Later* (Berkner, He, and Cataldi 2002).

Table 3. Percentage of 1995–96 beginning postsecondary students who entered STEM fields between 1995–96 and 2001, by selected student characteristics

	STEM entrance[1]						
			Natural sciences				
Selected student characteristic	Total	Mathematics	Total	Physical sciences	Biological/ agricultural sciences	Engineering/ engineering technologies	Computer/ information sciences
All students	**22.8**	**1.2**	**8.3**	**1.5**	**7.1**	**8.3**	**6.6**
Sex							
Male	32.9	1.7	9.5	1.7	8.0	15.1	9.3
Female	14.5	0.7	7.3	1.3	6.3	2.7	4.3
Race/ethnicity[2]							
White	21.5	1.1	7.8	1.6	6.5	8.4	5.7
Black	20.8	1.8 !	6.5	0.5 !	6.1	6.4	7.6
Hispanic	22.8	1.3 !	9.2	0.7 !	8.7	6.8	6.7
Asian/Pacific Islander	47.4	1.1 !	19.1	4.3	15.9	15.0	14.9
American Indian/Alaska Native	19.1 !	#	4.3 !	3.4	0.9	7.1 !	8.5 !
Age when first enrolled							
19 or younger	24.7	1.5	10.4	1.9	8.9	8.7	5.8
20–23	23.5	0.6 !	5.5 !	0.7 !	5.0 !	10.5	7.1
24–29	14.3	0.6 !	3.4 !	0.6 !	2.8 !	4.3 !	7.2
30 or older	17.1	0.3 !	1.4 !	0.2 !	1.2 !	6.3	10.2
Dependency status when first enrolled							
Dependent	25.6	1.5	10.6	1.9	9.1	9.4	6.0
Independent	15.8	0.4 !	2.7	0.4 !	2.3	5.7	7.9
Immigrant status when first enrolled							
Foreign students/resident aliens	34.2	1.8	8.1	1.5 !	7.3	10.6	16.1
Naturalized citizen	30.3	2.1 !	10.8	2.8 !	8.3 !	13.0 !	7.4 !
U.S. native	21.6	1.2	8.3	1.5	7.0	7.8	5.9
Language spoken as a child							
Non-English	33.9	3.1 !	9.3	1.6	8.0	11.1	13.5
English	21.5	1.0	8.2	1.6	7.0	7.9	5.7
Parents' highest education							
High school diploma or less	20.3	0.9 !	5.6	0.9	4.8	7.7	7.3
Some college	24.2	1.6 !	9.9	1.9	8.6	7.5	6.6
Bachelor's degree or higher	25.2	1.4	11.1	2.1	9.3	9.4	5.6
Family income (of dependent students)							
Lowest quarter	25.6	2.1 !	9.0	1.1	8.1	8.7	7.9
Middle two quarters	24.4	0.8	10.3	2.3	8.4	8.9	6.0
Highest quarter	27.6	2.2	12.6	2.0	11.2	10.8	3.7
Highest level of mathematics completed in high school[3]							
None of the following	16.8	#	5.7	0.3 !	5.4	6.8 !	5.1
Algebra 2	18.1	0.6 !	8.3	0.6 !	7.8	4.7	5.0
Trigonometry or precalculus	25.5	1.2	11.4	2.1	9.8	9.0	5.1
Calculus	45.0	3.3	23.1	5.4	18.3	17.0	5.2

See notes at end of table.

Table 3. Percentage of 1995–96 beginning postsecondary students who entered STEM fields between 1995–96 and 2001, by selected student characteristics—Continued

	STEM entrance[1]						
			Natural sciences				
Selected student characteristic	Total	Mathematics	Total	Physical sciences	Biological/ agricultural sciences	Engineering/ engineering technologies	Computer/ information sciences
High school GPA[3]							
Below B	18.3	0.5 !	5.6	0.4	5.3	5.8	7.3
At least B	31.1	1.7	15.9	3.2	13.3	11.3	4.0
Type of high school diploma							
Regular diploma	23.3	1.3	8.9	1.5	7.7	8.4	6.3
No regular diploma	17.9	#	2.5 !	1.1 !	1.4 !	7.3 !	8.9
College entrance exam scores							
Not taken or scores unknown	18.7	1.1 !	3.3	0.6	2.8	7.5	8.4
Lowest quarter	20.8	0.7 !	6.7	0.4 !	6.5	6.6	6.9
Middle two quarters	25.0	1.0	11.9	2.3	10.1	8.8	4.8
Highest quarter	51.0	5.2 !	28.5	6.0	23.9	16.4	4.8 !
Highest degree expected when first enrolled							
No degree or below bachelor's degree	14.7	0.4 !	3.1	#	3.1 !	4.3	7.8
Bachelor's degree	18.9	0.9 !	4.0	0.3 !	3.7	8.7	6.7
Graduate/professional degree	28.4	2.0	13.3	2.9	11.0	9.7	5.6

Rounds to zero.

! Interpret data with caution (estimates are unstable).

[1] STEM entrance is identified by students' major field as reported in 1995–96, 1998, and 2001. Students who reported a STEM major at one or more of these interview times are considered to have entered a STEM field between 1995–96 and 2001. STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences. Estimates for entering specific STEM fields do not sum to the total because some students entered more than one STEM field between 1995–96 and 2001.

[2] The racial/ethnic category of "other" is included in the total but not presented as an individual group due to small sample sizes. Black includes African American, Hispanic includes Latino, and Asian/Pacific Islander includes Native Hawaiian.

[3] This variable only applies to students who took college entrance exams such as the Scholastic Achievement Test (SAT) or the American College Test (ACT).

NOTE: Standard error tables are available at http://nces.ed.gov/das/library/reports.asp.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

Students who entered computer/information sciences and engineering/engineering technologies did not do as well as students in other STEM fields with respect to attaining a bachelor's degree. On the other hand, the percentage of students earning an associate's degree was higher among these two groups than among those who entered biological/agricultural sciences. The percentage of students earning a certificate was higher among students who entered computer/information sciences than among those who entered mathematics, biological/agricultural sciences, and physical sciences. A higher percentage of students who entered computer/information sciences and engineering/engineering technologies left college without earning any credential, compared to students entering physical sciences and biological/agricultural sciences.

Table 4. Percentage distribution of 1995–96 beginning postsecondary students' degree attainment and persistence as of 2001, by STEM entrance between 1995–96 and 2001

STEM entrance between 1995–96 and 2001[1]	Attained a degree/certificate as of 2001				Did not attain a degree/certificate as of 2001	
		Highest degree				
	Total	Bachelor's	Associate's	Certificate	No degree, still enrolled	No degree, not enrolled
All students	**51.6**	**28.9**	**10.3**	**12.3**	**14.4**	**34.0**
Students who entered STEM field, total	54.9	34.8	11.1	8.9	18.6	26.6
Mathematics	61.4	49.7	11.0 !	0.6 !	15.2	23.4 !
Natural sciences, total	63.5	52.7	6.5	4.3 !	18.1	18.4
Physical sciences	68.4	55.2	10.6 !	2.6 !	18.6	13.0
Biological/agricultural sciences	62.3	52.2	5.5 !	4.5 !	18.4	19.4
Engineering/engineering technologies	53.0	29.7	15.0	8.4 !	19.3	27.6
Computer/information sciences	46.4	14.8	15.3	16.4	18.4	35.2
Students who did not enter STEM field, total	50.6	27.2	10.1	13.4	13.2	36.2
Students who entered only non-STEM fields	53.3	28.9	10.8	13.6	13.9	32.8
Students who did not declare a major	10.0 !	0.2 !	0.3 !	9.5 !	2.2 !	87.8

! Interpret data with caution (estimates are unstable).

[1] STEM entrance is identified by students' major field as reported in 1995–96, 1998, and 2001. Students who reported a STEM major at one or more of these interview times are considered to have entered a STEM field between 1995–96 and 2001. STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences.

NOTE: Detail may not sum to totals because of rounding. Standard error tables are available at http://nces.ed.gov/das/library/reports.asp.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

Persistence in STEM Fields

While a majority of STEM entrants either completed a degree or remained enrolled over 6 years (73 percent, table 4), not all remained in the STEM field they had entered. This section examines students' persistence in STEM fields from several perspectives. Table 5 shows changes among majors; table 6 shows persistence and degree attainment in STEM fields; table 7 focuses on bachelor's degree completion in STEM fields; and table 8 shows the characteristics of students who persisted in STEM fields.

Change in Majors

Are college students who start out in STEM fields likely to change to a major outside of STEM? Table 5, which compares students' majors when they first enrolled in 1995–96 with their majors when they were last enrolled through 2001, indicates that 36 percent were no longer in STEM fields when last enrolled through 2001.[6] On the other hand, about 7 percent of students who began with a non-STEM major switched to a STEM field, and 16 percent of those with undeclared majors initially later declared a STEM major.

Students who first majored in various STEM fields shifted their majors out of STEM fields at various rates, ranging from 28 percent for physical sciences to 46 percent for biological/agricultural sciences. Students changed majors within STEM fields as well. For example, 24 percent of initial mathematics majors switched to another STEM field later (with about 17 percent

[6] To put this in context, 43 percent of students who initially began with an education major and 30 percent of those who initially began with a business/management major had changed to another field when last enrolled through 2001 (BPS:96/01).

Table 5. Percentage distribution of 1995–96 beginning postsecondary students' major field when last enrolled through 2001, by major field in 1995–96

	Major field when last enrolled through 2001[1]								
	STEM field[2]								
			Natural sciences						
Major field in 1995–96	Total	Mathematics	Total	Physical sciences	Biological/ agricultural sciences	Engineering/ engineering technologies	Computer/ information sciences	Non-STEM field	Major undeclared
All students	**17.1**	**0.7**	**5.8**	**1.0**	**4.8**	**5.3**	**5.4**	**78.1**	**4.8**
STEM field, total	64.1	2.5	19.9 !	3.2 !	16.6 !	28.5 !	13.2 !	35.9	#
Mathematics	67.7	43.7 !	3.1	2.6	0.5	16.7 !	4.2	32.3	#
Natural sciences, total	56.8	1.0 !	52.2	7.5	44.7	1.8 !	1.8 !	43.2	#
Physical sciences	72.1	3.3 !	59.7	44.1	15.6	5.2 !	4.0 !	27.9	#
Biological/agricultural sciences	54.5	0.7 !	51.1	2.0	49.1	1.3 !	1.5	45.5	#
Engineering/engineering technologies	69.2	1.4 !	2.3	1.1	1.3	59.7	5.7	30.8	#
Computer/information sciences	65.1	#	0.8 !	#	0.8 !	3.0 !	61.3	34.9	#
Non-STEM field	7.1	0.4 !	2.4	0.3 !	2.1	1.2	3.1	92.9	#
No major declared	15.8	0.4	6.3	1.5	4.8	3.1	6.0	65.9	18.4

Rounds to zero.

! Interpret data with caution (estimates are unstable).

[1] Student's major field of study for the undergraduate program last enrolled through 2001.

[2] STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences.

NOTE: Detail may not sum to totals because of rounding. Standard error tables are available at http://nces.ed.gov/das/library/reports.asp.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

switching to engineering/engineering technologies, for example). Similarly, 28 percent of initial physical sciences majors switched to another STEM field later (notably to biological/agricultural sciences—16 percent). Between 4 and 9 percent of those initially entering computer/information sciences, biological/agricultural sciences, and engineering/engineering technologies later changed to another STEM field.

Degree Attainment and Persistence in STEM Fields

Among students entering a STEM field during their first year of enrollment (table 6), 37 percent completed a degree or certificate in a STEM field (*STEM completers*) over the next 6 years; some 7 percent maintained enrollment in a STEM field, but had not yet completed a degree in a STEM field (*STEM persisters*); and 55 percent left STEM fields (*STEM leavers*) by either switching to a non-STEM field (27 percent)[7] or leaving postsecondary education without earning any credential (28 percent).[8]

[7] This group includes students who had obtained one or more degrees only in non-STEM fields and were last enrolled in a non-STEM field as of 2001, or those who had not yet attained a degree and were enrolled in a non-STEM field in 2001.

[8] This group includes all students who left postsecondary education without earning any credential, regardless of whether their last major was in a STEM field.

Table 6. Among 1995–96 beginning postsecondary students who entered STEM fields between 1995–96 and 2001, percentage distribution of degree attainment and persistence in STEM fields as of 2001

	Degree attainment and persistence in STEM field as of 2001			
	STEM completers	STEM persisters	STEM leavers	
STEM entrance	Attained a degree or certificate in a STEM field	No STEM degree or certificate but were still enrolled in a STEM field	No STEM degree or certificate and changed to a non-STEM field[1]	Left post-secondary education without a degree or certificate
Students who entered STEM field in 1995–96,[2] total	37.1	7.5	27.1	28.3
Mathematics	27.0	1.5 !	32.3	39.1 !
Natural sciences, total	35.4	6.4	34.9	23.3
Physical sciences	41.7	15.3 !	21.0	22.0 !
Biological/agricultural sciences	34.4	5.0	37.0	23.5
Engineering/engineering technologies	40.8	8.6	23.1	27.5
Computer/information sciences	32.6	7.9 !	20.0	39.5
Students who entered STEM field between 1995–96 and 2001,[3] total	40.7	12.0	20.6	26.7
Mathematics	46.9	7.2 !	22.5 !	23.3 !
Natural sciences, total	47.3	9.7	24.5	18.5
Physical sciences	58.9	10.3 !	17.8	13.0
Biological/agricultural sciences	45.3	9.5	25.9	19.4
Engineering/engineering technologies	39.9	11.5	20.8	27.8
Computer/information sciences	36.2	17.1	11.4	35.2

! Interpret data with caution (estimates are unstable).

[1] This group includes students who had attained one or more degrees only in non-STEM fields and were last enrolled in a non-STEM field as of 2001, or those who had not attained a degree yet and were enrolled in a non-STEM field in 2001.

[2] STEM entrance is identified by students' major field as reported in 1995–96, the first year they were enrolled in postsecondary education. STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences.

[3] STEM entrance is identified by students' major field as reported in 1995–96, 1998, and 2001. Students who reported a STEM major at one or more of these interview times are considered to have entered a STEM field between 1995–96 and 2001.

NOTE: Detail may not sum to totals because of rounding. Standard error tables are available at http://nces.ed.gov/das/library/reports.asp.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

Of all STEM entrants between 1995–96 and 2001, some 41 percent had earned a STEM degree or certificate by 2001, and 12 percent remained enrolled in a STEM field as of 2001. About 47 percent had either switched to a non-STEM field (21 percent) or left postsecondary education without a degree or certificate by 2001 (27 percent).

Attainment and persistence rates varied among STEM fields.[9] Taking all STEM entrants between 1995–96 and 2001 as an example, compared to the total percentage for all STEM entrants, a higher percentage of students entering the physical sciences completed a degree in a STEM field (59 percent vs. 41 percent), and a lower per-

[9] Some apparent differences are not found to be measurably different due to large standard errors.

centage left college without earning a degree or certificate (13 percent vs. 27 percent). Students entering computer/information sciences and engineering/engineering technologies, on the other hand, completed a STEM degree at lower rates than those who entered physical sciences, and they left postsecondary education without a degree at a higher rate than students who entered natural sciences, including physical sciences and biological/agricultural sciences.

Bachelor's Degree Attainment in STEM Fields

A total of 35 percent of all STEM entrants had attained a bachelor's degree by 2001 (table 7). Among these bachelor's degree recipients, 27 percent earned a degree in a STEM field and 8 percent did so in a non-STEM field (figure 2). The bachelor's degree attainment rate in a STEM field was highest for students who entered physical sciences (47 percent) and lowest for those who entered computer/information sciences (12 percent).

A majority of students earned their bachelor's degree in the STEM field they entered. For example, among students who entered the physical sciences between 1995–96 and 2001 and had earned a bachelor's degree by 2001, some 68 percent earned their bachelor's degree in the physical sciences. The percentage of students earning a bachelor's degree in the STEM field they entered ranged from 65 percent for mathematics to 77 percent for computer/information sciences.

Table 7. Among 1995–96 beginning postsecondary students who entered STEM fields between 1995–96 and 2001, percentage who attained a bachelor's degree in various fields, by STEM entrance between 1995–96 and 2001

		Bachelor's degree in STEM field								
				Natural sciences						
STEM entrance between 1995–96 and 2001[1]	Bachelor's degree in any field	Total	Mathematics	Total	Physical sciences	Biological/ agricultural sciences	Engineering/ engineering technologies	Computer/ information sciences	Bachelor's degree in the same STEM field entered[2]	Bachelor's degree in non-STEM field
Students who entered STEM field, total	34.8	26.5	1.7	14.0	2.5	11.6	7.5	3.3	—	8.3
Mathematics	49.7	36.0	32.5	1.4 !	1.4 !	#	0.5 !	1.6 !	65.4	13.7 !
Natural sciences, total	52.7	40.3	0.7 !	38.5	6.8	31.7	0.7 !	0.3 !	73.1	12.4
Physical sciences	55.2	47.2	2.2 !	43.3	37.6	5.8	1.2 !	0.4 !	68.1	8.0
Biological/agricultural sciences	52.2	39.3	0.4 !	37.9	0.8 !	37.1	0.7 !	0.3 !	71.1	12.9
Engineering/engineering technologies	29.7	23.2	0.9 !	1.0 !	0.4 !	0.6 !	20.8 !	0.6 !	70.0	6.5
Computer/information sciences	14.8	11.8	#	0.1 !	#	0.1 !	0.3 !	11.4	77.4	3.0 !

— Not applicable.

Rounds to zero.

! Interpret data with caution (estimates are unstable).

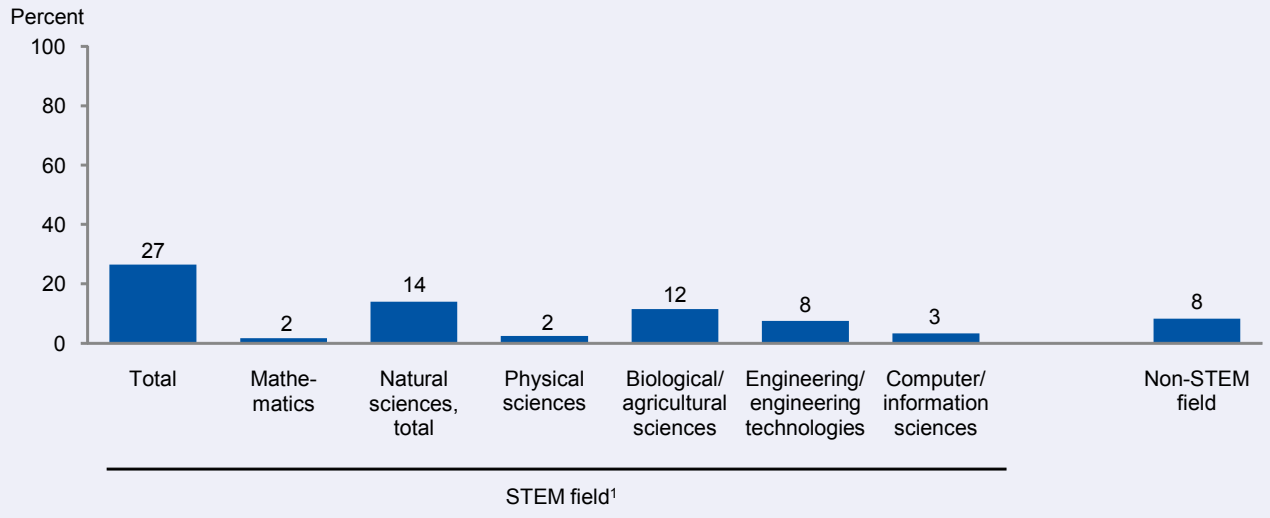
[1] STEM entrance is identified by students' major field as reported in 1995–96, 1998, and 2001. Students who reported a STEM major at one or more of these interview times are considered to have entered a STEM field between 1995–96 and 2001. STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences.

[2] Among students who earned a bachelor's degree, the percentage who earned the degree in the same STEM field as they entered.

NOTE: Detail may not sum to totals because of rounding. Standard error tables are available at http://nces.ed.gov/das/library/reports.asp.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

Figure 2. Among 1995–96 beginning postsecondary students who entered a STEM field between 1995–96 and 2001, percentage who attained a bachelor's degree in a STEM or non-STEM field: 2001



[1] STEM entrance is identified by students' major field as reported in 1995–96, 1998, and 2001. Students who reported a STEM major at one or more of these interview times are considered to have entered a STEM field between 1995–96 and 2001. STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences. Estimates for specific STEM fields may not sum to total because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

Who Is Likely to Complete a Degree or Remain Enrolled in STEM Fields?

The data in table 8 show the associations among various student characteristics and degree completion and persistence in STEM fields. The table focuses only on STEM entrants (non-STEM entrants are excluded). No gender difference was evident in persistence and attainment rates in STEM fields between 1995–96 and 2001. Some racial/ethnic differences were observed, however. Although there were no measurable differences in STEM entrance among White, Black, and Hispanic students (table 3), White students had a higher STEM bachelor's degree completion rate than did Black and Hispanic students. Asian students also had a higher STEM bachelor's degree completion rate than did Black and Hispanic students.

Students' age and dependency status were not only related to STEM entrance (table 3) but also to STEM degree completion. For example, a higher percentage of students who first enrolled in postsecondary education at age 19 or younger completed a bachelor's degree in a STEM field than did those who entered at age 20 or older. Similarly, a higher percentage of dependent students than of independent students completed a STEM bachelor's degree. Differences were also observed in how students left STEM fields. In general, a higher percentage of younger (age 19 or younger) and dependent students left by changing to a non-STEM field, while a higher percentage of their older (age 20–30 or 30 years and older when first enrolled) and independent peers left postsecondary education without earning any credential.

Table 8. Among 1995–96 beginning postsecondary students who entered STEM fields between 1995–96 and 2001, percentage who earned STEM degrees, persisted in STEM fields, or left STEM fields as of 2001, by selected student characteristics

	Degree attainment and persistence in STEM field as of 2001				
	STEM completers		STEM persisters	STEM leavers	
Selected student characteristic	Attained a degree or certificate in a STEM field	Attained a bachelor's degree in a STEM field	No STEM degree or certificate but were still enrolled in a STEM field	No STEM degree or certificate and changed to a non-STEM field[1]	Left post-secondary education without a degree or certificate
Total	**40.7**	**26.5**	**12.0**	**20.6**	**26.7**
Gender					
Male	40.8	25.5	12.3	20.3	26.6
Female	40.6	28.4	11.4	21.2	26.8
Race/ethnicity[2]					
White	43.9	29.5	12.1	19.4	24.6
Black	31.7	15.5	9.4	23.8	35.2
Hispanic	33.1	16.3	15.7	19.7	31.6
Asian/Pacific Islander	39.9	31.2	9.4 !	27.0	23.8
Age when first enrolled					
19 or younger	43.0	33.2	11.5	23.4	22.1
20–23	37.8	8.9 !	13.0 !	12.2	37.0
24–29	37.1	3.4 !	13.2 !	18.5	31.3
30 or older	26.6	3.5 !	14.6 !	7.8	51.0
Dependency status when first enrolled					
Dependent	42.3	31.7	11.2	22.5	24.0
Independent	35.5	5.5 !	15.6	13.0	35.9
Immigrant status when first enrolled					
Foreign students/resident aliens	40.2	23.8	15.1	15.3	29.5
Naturalized citizen	43.6	30.3	7.5 !	28.9 !	20.0 !
U.S. native	41.1	27.3	12.5	20.7	25.7
Language spoken as a child					
Non-English	39.8	22.3	11.7	21.7	26.9
English	41.5	28.1	12.4	20.6	25.6
Parents' highest education					
High school diploma or less	36.1	15.5	10.9	17.2	35.8
Some college	32.9	19.4	13.9	25.3	27.9
Bachelor's degree or higher	50.8	42.0	11.4	22.2	15.5
Type of high school diploma					
High school regular diploma	41.3	28.5	11.9	21.0	25.7
No high school regular diploma	33.6	2.1	13.1 !	15.5 !	37.7
College entrance exam scores					
Lowest quarter	26.3	15.0 !	13.2	22.8	37.8
Middle two quarters	40.5	30.2	12.7	25.7	21.1
Highest quarter	59.1	57.7	9.0	21.0	10.9
Highest level of mathematics completed in high school[3]					
None of the following	28.1	20.3 !	5.5 !	35.1	31.3
Algebra 2	23.5	12.8	15.3	19.8	41.4
Trigonometry or precalculus	47.4	37.5	10.8	23.4	18.4
Calculus	61.0	58.6	9.1	20.2	9.7

See notes at end of table.

Table 8. Among 1995–96 beginning postsecondary students who entered STEM fields between 1995–96 and 2001, percentage who earned STEM degrees, persisted in STEM fields, or left STEM fields as of 2001, by selected student characteristics—Continued

	Degree attainment and persistence in STEM field as of 2001				
	STEM completers		STEM persisters	STEM leavers	
Selected student characteristic	Attained a degree or certificate in a STEM field	Attained a bachelor's degree in a STEM field	No STEM degree or certificate but were still enrolled in a STEM field	No STEM degree or certificate and changed to a non-STEM field[1]	Left post-secondary education without a degree or certificate
High school GPA[3]					
Below B	27.9	13.1	12.9	14.8	44.4
At least B	52.1	47.3	9.7	24.7	13.4
Highest degree expected when first enrolled					
No degree or degree below bachelor's	36.1	4.2 !	4.7 !	10.8 !	48.4
Bachelor's degree	31.1	15.6	12.8	25.2	30.9
Graduate/professional degree	45.8	36.2	13.6	21.5	19.2
First institution type					
4-year	48.9	45.4	11.4	21.5	18.2
Public 2-year	29.2	7.3	14.0	19.8	37.1
Other	44.9	1.8 !	6.9 !	18.6	29.7
First institution selectivity[4]					
Less selective	36.1	30.0	16.4	22.1	25.5
Selective	51.8	49.1	8.1	24.4	15.6
Very selective	66.2	65.6	5.8	19.2	8.8
First degree program type					
Certificate	39.3	5.4 !	5.4 !	15.7	39.7
Associate's	30.0	7.5	14.2	21.0	34.8
Bachelor's	50.1	47.5	11.7	21.4	16.8
Enrollment intensity between 1995–96 and 2001					
Always full-time	51.0	41.4	6.7	21.3	20.9
Always part-time	17.8 !	#	14.8 !	10.7 !	56.8
Mixed	34.0	15.3	17.3	21.7	27.0

Rounds to zero.

! Interpret data with caution (estimates are unstable).

[1] This group includes students who had attained one or more degrees only in non-STEM fields and were last enrolled in a non-STEM field as of 2001, or those who had not attained a degree yet and were enrolled in a non-STEM field in 2001.

[2] American Indian/Alaska Native and "other" students are included in the total but not presented as an individual group due to small sample sizes. Black includes African American, Hispanic includes Latino, and Asian/Pacific Islander includes Native Hawaiian.

[3] This variable only applies to students who took college entrance exams such as the Scholastic Achievement Test (SAT) or the American College Test (ACT).

[4] This variable only applies to 4-year institutions. The "very selective" institutions are those in which the 25th percentile of SAT/ACT scores of incoming freshman exceeded 1000. The "selective" institutions are research universities I and II, baccalaureate I institutions, and private not-for-profit doctoral universities I and II that do not meet the "very selective" criteria. The "least selective" institutions are all other 4-year institutions.

NOTE: STEM entrance is identified by students' major field as reported in 1995–96, 1998, and 2001. Students who reported a STEM major at one or more of these interview times are considered to have entered a STEM field between 1995–96 and 2001. STEM fields include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences. Standard error tables are available at http://nces.ed.gov/das/library/reports.asp.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

Although a higher percentage of foreign students and students who spoke a language other than English as a child entered STEM fields than did their U.S.-born and English-speaking counterparts (table 3), no measurable differences were found in rates of completion of STEM degrees or persistence in STEM fields.

Parents' education levels were related to STEM degree attainment. The overall STEM degree completion rates as well as STEM bachelor's degree completion rates were higher among students whose parents had at least a 4-year college degree than among those whose parents did not attain that level of education. In addition, a lower percentage of students whose parents had a bachelor's or higher degree left postsecondary education without earning a credential than did their counterparts whose parents did not have a bachelor's degree.

Strong academic preparation in high school was associated with a higher STEM degree completion rate. For example, students who took trigonometry, precalculus, or calculus in high school; earned a high school GPA of B or higher; obtained college entrance exam scores in the highest quarter; and expected to attain a graduate degree in the future all had higher rates of STEM degree completion (including STEM bachelor's degrees) and lower rates of leaving college without earning any credential than did their peers without these characteristics.

Student outcomes in STEM fields also were related to the type of institution in which they first enrolled, their degree program, and full- or part-time attendance. STEM entrants who started their postsecondary education in a 4-year or selective institution, who initially enrolled in a bachelor's degree program, and who attended school either exclusively full time or mixed full- and part-time attendance generally had higher STEM degree completion rates (including completing bachelor's degrees in STEM fields) than did their counterparts without these characteristics.

Summary

To understand who enters into and completes undergraduate programs in STEM fields, this Statistics in Brief examined data from three major national studies: the 1995–96 Beginning Postsecondary Students Longitudinal Study (BPS:96/01); the 2003–04 National Postsecondary Student Aid Study (NPSAS:04); and the Education Longitudinal Study of 2002/06 (ELS:02/06). STEM fields, as defined in this study, include mathematics, natural sciences (including physical sciences and biological/agricultural sciences), engineering/engineering technologies, and computer/information sciences. This study used students' reported major field of study to identify STEM entrants and considered a STEM entrant anyone who reported a major in a STEM field at any time during his or her postsecondary enrollment.

Looking only at single points in time, STEM majors accounted for 14 percent of all undergraduates enrolled in U.S. postsecondary education in 2003–04 and 15 percent of 2003–04 high school graduates who were enrolled in postsecondary education in 2006. The STEM entrance rate increased, however, when estimated over students' postsecondary careers with longitudinal data. For example, 23 percent of 1995–96 first-time beginning postsecondary students majored in a STEM field at some point between 1995–96 and 2001. In general, the percentage of students entering STEM fields was higher among male students, younger and dependent students, Asian/Pacific Islander students, foreign students or those who spoke a language other than English as a child, and students with more advantaged family background characteristics and strong academic preparation than among their counterparts who did not have these characteristics.

After 6 years of initial college enrollment, STEM entrants generally did better than non-STEM entrants in terms of bachelor's degree attainment and overall persistence. However, not all STEM entrants stayed in their fields. Roughly one-third of students who entered a

STEM field during the first year switched to a non-STEM field over the next 6 years. Among all STEM entrants between 1995–96 and 2001, 53 percent persisted in a STEM field by either completing a degree in a STEM field or staying enrolled in a STEM field, and a total of 47 percent left STEM fields by either switching to a non-STEM field or leaving postsecondary education without earning any credential.

STEM entrants with different characteristics had different STEM completion rates. For example, STEM bachelor's degree completion rates were higher among younger students (age 19 or younger when first enrolled in postsecondary education), White or Asian/Pacific Islander students, students with at least one parent who had a 4-year college degree, and those who demonstrated a high level of academic preparation for postsecondary education, chose a 4-year or a selective institution, enrolled in a bachelor's degree program when they began college, and attended school either full time or mixed full-time with part-time attendance.

Although students in various STEM fields were generally alike in terms of their demographic, academic, and enrollment characteristics and their outcomes, those entering computer/information sciences differed in many respects. According to the BPS data, older students, students from low-income families, and those less academically prepared enrolled in computer/information sciences more often than did their peers who were younger, from high-income families, or more academically prepared. Moreover, compared to other STEM students, a larger percentage of computer/information sciences majors attended public 2-year institutions, enrolled in subbaccalaureate programs, and attended classes exclusively part time. These findings are consistent with trends reported in the *Digest of Education Statistics* (U.S. Department of Education 2008) indicating that the number of associate's degrees awarded in computer/information sciences has increased 155 percent from 1994–95 to 2005–06, accounting for about one-third of all degrees awarded in the field of computer/information sciences in 2005–06. In the fields of biological/agricultural sciences, physical sciences, mathematics, and engineering, the number of associate's degrees accounted for 2–9 percent of all degrees awarded. In other words, more students seem to be seeking subbaccalaureate opportunities in computer/information sciences than in other STEM fields.

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Technical Notes

This section describes data sources, study samples, weights, and derived variables used for this Statistics in Brief. It also includes a crosswalk for the specific contents of the STEM categorization for various major fields of study.

Data Sources

The 1995–96 Beginning Postsecondary Students Longitudinal Study. The 1995–96 Beginning Postsecondary Students Longitudinal Study (BPS:96) is composed of a subset of the students who participated in the 1995–96 National Postsecondary Student Aid Study (NPSAS:96). NPSAS:96 consisted of a nationally representative sample of students enrolled in all levels of postsecondary education during the 1995–96 academic year. The BPS:96 initial sample (approximately 12,400 students) was derived from that sample and is a nationally representative sample of students who began postsecondary education for the first time in 1995–96. The first follow-up of the BPS cohort (BPS:96/98) was conducted in 1998, approximately 3 years after these students first enrolled. About 10,300 of the students who first began in 1995–96 were located and interviewed in the 1998 follow-up, for an overall weighted response rate of 80 percent. The second BPS follow-up (BPS:96/01) was conducted in 2001, approximately 6 years after initial college entry. All respondents to the first follow-up and a sample of nonrespondents in 1998 were eligible to be interviewed. More than 9,100 students were located and interviewed in the 2001 follow-up, for an overall weighted response rate of 76 percent. Information about beginning students in BPS:96/01 was obtained from student interviews conducted in the base year and follow-ups and from various sources used for NPSAS data collection. For further details on the BPS:96/01 data, refer to the report *Beginning Postsecondary Students Longitudinal Study: 1996–2001 (BPS:96/01) Methodology Report* (Wine et al. 2002).

The 2003–04 National Postsecondary Student Aid Study. The 2003–04 National Postsecondary Student Aid Study (NPSAS:04) provides comprehensive data for the undergraduate and graduate/first-professional student populations in the academic year 2003–04 and determines how students and their families pay for postsecondary education. The target population consists of all eligible students enrolled at any time between July 1, 2003, and June 30, 2004, in Title IV postsecondary institutions in the United States or Puerto Rico. A two-

stage sampling design was used to collect the data for NPSAS:04. The first stage involved selecting eligible institutions, and the second stage involved selecting eligible respondents within each eligible institution. More than 90,000 undergraduate, graduate, and first-professional students participated in the survey. Upon the completion of data collection, the weighted institutional response rate was 80 percent, and the weighted student response rate was 91 percent, resulting in an overall response rate of 72 percent. For further details on the NPSAS:04 data, refer to the report *2004 National Postsecondary Study Aid Study (NPSAS:04) Full-Scale Methodology Report* (Cominole et al. 2006).

***The Education Longitudinal Study of* 2002/06.** The Education Longitudinal Study of 2002/06 (ELS:02/06) provides data about the critical transitions experienced by high school students as they proceed through high school and into postsecondary education or their early careers. Currently, this survey has four major data components: the base-year interview, the first follow-up interview, the high school transcript data collection, and the second follow-up interview. The base-year interview was carried out in a nationally representative probability sample of about 750 participating public, Catholic, and other private schools in the spring term of the 2001–02 academic year. Of about 17,600 eligible selected sophomores, about 15,400 completed a base-year questionnaire, for a weighted response rate of 87 percent. The first follow-up interview took place in the spring of 2004, when most sample members were seniors in high school. Seniors in 2004 who were not in the base-year sampling frame were eligible for selection into the sample. Of about 16,500 eligible sample members, about 15,000 participated in an interview, for a weighted response rate of 89 percent. The second follow-up interview took place in 2006, when most sample members were 2 years past high school graduation and had entered the labor force or postsecondary education. Of about 15,900 eligible sample members, about 14,200 completed an interview, for a weighted response rate of 88 percent. For further details on the design and structure of ELS:02/06, refer to the report *Education Longitudinal Study of 2002 (ELS:02) Base-Year to Second Follow-up Public Use Data File Documentation* (Ingels et al. 2007).

Analysis Samples and Weights

Three analysis samples were used for this Statistics in Brief. For analyses of the BPS:96/01 data, the sample consisted of all 1995–96 beginning postsecondary students who participated in the two follow-up surveys in 1998 and 2001 and who reported a major, including "undeclared major," in at least one of three data collections (about 9,000 students selected). Less than 1 percent of students had missing information about their undergraduate major. For analyses of the NPSAS:04 data, the sample consisted of all undergraduates enrolled in all types of postsecondary institutions during the 2003–04 academic year (about 80,000 selected). For analyses of the ELS:02/06 data, the sample consisted of all 2003–04 high school graduates who were enrolled in postsecondary education and who also reported a major (including "undeclared major") in the 2006 interview (about 8,400 selected). Less than 1 percent of high school graduates did not report their major field of study. High school graduates are students who completed high school with a regular or honors diploma.

All estimates in this Statistics in Brief were weighted to compensate for unequal probability of selection into the survey sample and to adjust for nonresponse. The weight variable used for analysis of the BPS data is WTC00, a longitudinal weight designed for 1995–96 beginning postsecondary students who also participated in the two follow-up surveys. The weight variable used for analysis of the NPSAS data is WTA00, a cross-sectional weight applied to all undergraduates in NPSAS:04. The weight variable used for analysis of the ELS data is WTF000, which was designed for an analysis involving all second follow-up respondents in 2006.

Variables Used in the Analyses

All variables used in this Statistics in Brief were from the BPS:96/01, NPSAS:04, and ELS:02/06 Data Analysis System (DAS), a software application developed by NCES to generate tables from the survey data. The DAS can be accessed electronically at http://nces.ed.gov/das. This section provides detailed information on the STEM-related variables constructed specifically for this study. All other variables used in this study were taken directly from the surveys. Interested readers can obtain detailed descriptions of these variables from previous reports online.

STEM Related Variables

Major field of study with a focus on STEM fields (STEMMAJ): This variable was constructed in all three datasets. In NPSAS:04, it indicates undergraduates' major field of study (including secondary major) during the 2003–04 academic year with a focus on STEM fields and was constructed from students' major field of study (MAJORS) and secondary major field of study (N4MAJ2B). In ELS:02/06, this variable indicates the postsecondary enrollee's major field of study (including secondary major) in 2006 with a focus on STEM fields and was constructed from students' responses regarding their declared major (F2B22), major field of study (F2MAJOR2), and secondary major field of study (F2B24). In BPS:96/01, this variable indicates whether 1995–96 beginning postsecondary students ever majored in a STEM field through 2001 and was constructed from students' major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B).

The individual STEM fields described below are dichotomous variables (yes/no) constructed from one or more variables in each of the three datasets. In NPSAS:04, the variables indicate STEM majors in 2003–04; in ELS:02/06, variables indicate STEM majors in 2006; and in BPS:96/01, variables indicate STEM majors at any time during enrollment up to 6 years after first enrolling in 1995–06.

Major in mathematics (MAJMATH): In NPSAS:04, this variable indicates whether a student's major field of study (including secondary major) in 2003–04 was in mathematics and was constructed from students' major field of study (MAJORS) and secondary major field of study (N4MAJ2B). In ELS:02/06, it indicates whether a postsecondary enrollee's major field (including secondary major field) in 2006 was in mathematics and was constructed from students' responses regarding their declared major (F2B22), major field of study (F2MAJOR2), and secondary major field of study (F2B24). In BPS:96/01, it indicates whether 1995–96 beginning postsecondary students ever majored in mathematics through 2001 and was constructed from students' major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B).

Major in science (MAJSCI): In NPSAS:04, this variable indicates whether a student's major field of study (including secondary major) in 2003–04 was in science and was constructed from students' major field of study (MAJORS) and secondary major field of study (N4MAJ2B). In ELS:02/06, it indicates whether a postsecondary enrollee's major field (including secondary major field) in 2006 was in science and was constructed from students' responses regarding their declared major (F2B22), major field of study (F2MAJOR2), and secondary major field of study (F2B24). In BPS:96/01, it indicates whether 1995–96 beginning postsecondary students ever majored in science through 2001 and was constructed from students' major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B).

Major in physical sciences (MAJPHY): In NPSAS:04, this variable indicates whether a student's major field of study (including secondary major) in 2003–04 was in physical sciences and was constructed from students' major field of study (MAJORS) and secondary major field of study (N4MAJ2B). In ELS:02/06, it indicates whether a postsecondary enrollee's major field (including

secondary major field) in 2006 was in physical sciences and was constructed from students' responses regarding their declared major (F2B22), major field of study (F2MAJOR2), and secondary major field of study (F2B24). In BPS:96/01, it indicates whether 1995–96 beginning postsecondary students ever majored in physical sciences through 2001 and was constructed from students' major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B).

Major in biological/agricultural sciences (MAJBIO): In NPSAS:04, this variable indicates whether a student's major field of study (including secondary major) in 2003–04 was in biological/agricultural sciences and was constructed from students' major field of study (MAJORS) and secondary major field of study (N4MAJ2B). In ELS:02/06, it indicates whether a postsecondary enrollee's major field (including secondary major field) in 2006 was in biological/agricultural sciences and was constructed from students' responses regarding their declared major (F2B22), major field of study (F2MAJOR2), and secondary major field of study (F2B24). In BPS:96/01, it indicates whether 1995–96 beginning postsecondary students ever majored in biological/agricultural sciences through 2001 and was constructed from students' major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B).

Major in engineering/engineering technologies (MAJENG): In NPSAS:04, this variable indicates whether a student's major field of study (including secondary major) in 2003–04 was in engineering/engineering technologies and was constructed from students' major field of study (MAJORS) and secondary major field of study (N4MAJ2B). In ELS:02/06, it indicates whether a postsecondary enrollee's major field (including secondary major field) in 2006 was in engineering/engineering technologies and was constructed from students' responses regarding their declared major (F2B22), major field of study (F2MAJOR2), and secondary major field of study (F2B24). In BPS:96/01, it indicates whether 1995–96 beginning postsecondary students ever majored in engineering/engineering technologies through 2001 and was constructed from students' major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B).

Major in computer/information sciences (MAJCOMP): In NPSAS:04, this variable indicates whether a student's major field of study (including secondary major) in 2003–04 was in computer/information sciences and was constructed from students' major field of study (MAJORS) and secondary major field of study (N4MAJ2B). In ELS:02/06, it indicates whether a postsecondary enrollee's major field (including secondary major field) in 2006 was in computer/information sciences and was constructed from students' responses regarding their declared major (F2B22), major field of study (F2MAJOR2), and secondary major field of study (F2B24). In BPS:96/01, it indicates whether 1995–96 beginning postsecondary students ever majored in computer/information sciences through 2001 and was constructed from students' major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B).

Degree attainment in STEM field as of 2001 (STEMDEG): This variable was constructed from BPS:96/01. It indicates whether a 1995–96 beginning postsecondary student had attained a degree/credential in a STEM field by 2001. The variable was constructed from students' major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B), and the dates of completing a certification (DGDTCT2B), associate's degree (DGDTAA2B), and bachelor's degree (DGDTBA2B).

Bachelor's degree attainment in STEM field as of 2001 (BAMAJ): This variable was constructed from BPS:96/01. It indicates whether a 1995–96 beginning postsecondary student had attained a bachelor's degree

in a STEM field by 2001. The variable was constructed from students' major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B), and the date of completing a bachelor's degree (DGDTBA2B).

Persistence in STEM field as of 2001 (STEMPER1): This variable was constructed from BPS:96/01. It indicates 1995–96 beginning postsecondary students' persistence in STEM fields as of 2001, including whether or not they had attained a degree/credential in a STEM field and whether or not they were enrolled in a STEM field as of 2001. The variable was constructed from students' attainment and enrollment as of 2001 (PRENLV2B), major field of study as reported in 1995–96 (SEMAJ1Y1), 1998 (SEMAJ1B1), and 2001 (SEMAJ2B), and the dates of completing a certification (DGDTCT2B), associate's degree (DGDTAA2B), and bachelor's degree (DGDTBA2B).

Other Variables

Variables from BPS:96/01:

Type of first institution enrolled (ITNPSAS)
Selectivity of first institution (INSTSEL)
Degree program when first enrolled (DGPGMY1)
Enrollment intensity through 2001 (ENIPTT2B)
Gender (SBGENDER)
Race/ethnicity (SBRACECI)
Dependency status when first enrolled (SBDEP1Y1)
Age when first enrolled (SBAGFM)
Immigrant status when first enrolled (ORIGIN)
Language spoken as a child (SBLANG)
Parents' highest level of education (PBEDHI3)
Family income (of dependent students) (PCTDEP)
Highest level-math in high school (HCMATHHI)
High school GPA (HCGPAREP)
Type of high school diploma (HSDIPLOM)
College entrance exam score (TESATDER)
Highest degree expected when first enrolled (EPHDEGY1)
Persistence and degree attainment as of 2001 (PRENRL2B)
Major field when first enrolled (SEMAJ1Y1)
Major field when last enrolled 2001 (SEMAJ2B)

Information on these variables can be accessed from previous reports online at
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2003151
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2001163
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2003157

Crosswalk of STEM Categorization and Major Fields of Study in BPS:96/01, NSPAS:04, and ELS:02/06

	Major Field of Study		
STEM Categorization	BPS:96/01	NPSAS:04	ELS:02/06
Mathematics	Mathematics and statistics	Mathematics and statistics	Mathematics and statistics
Natural sciences	Agriculture Agricultural sciences Natural resources Forestry Biological sciences Physical sciences	Agricultural/related sciences Natural resources/conservation Biological/biomedical sciences Physical sciences Other natural sciences Science technologies/technicians	Agricultural/natural resources/related Biological/biomedical sciences Physical sciences Science technologies/technicians
Physical sciences	Physical sciences	Physical sciences	Physical sciences
Biological/agricultural sciences	Agriculture Agricultural sciences Natural resources Forestry Biological sciences	Agricultural/related sciences Natural resources/conservation Biological/biomedical sciences	Agricultural/natural resources/related Biological/biomedical sciences
Engineering/engineering technologies	Electrical engineering Chemical engineering Civil engineering Mechanical engineering Other engineering Engineering technology	Engineering Engineering technologies/ technicians	Engineering technologies/technicians
Computer/information sciences	Computer programming Data processing Computer/information sciences	Computer/information sciences	Computer/information sciences/ support technicians


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