



National Center for Science and
Engineering Statistics

InfoBrief

2021 Graduate Enrollment in Science, Engineering, and Health Fields at All-Time High as Postdocs Continue to Decline

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Enrollment patterns for students pursuing graduate degrees in science, engineering, and selected health (SEH) fields have been disrupted by the COVID-19 pandemic. The enrollment declines seen in 2020 among temporary visa holders and first-time, full-time master's and doctoral students were reversed in 2021 by matriculation increases in doctoral and especially master's students. Enrollment increases were driven by a 44.3% increase in first-time, full-time master's students and by a 13.4% increase in first-time, full-time doctoral students between 2020 and 2021. Full-time master's enrollment in 2021 was 287,022, while full-time doctoral enrollment was 256,980. These numbers represent the highest enrollments reported since separate data for master's and doctoral students became available in 2017 ([figure 1](#), [table 1](#)). Conversely, overall postdoctoral (postdoc) appointments declined by 3.6% since 2020 and by 2.2% since 2017. Postdoc declines were seen across all broad field groups between 2020 and 2021: -4.1% in science fields, -1.3% in engineering fields, and -3.8% in health fields. These data align with 5-year trends reported by the 2020 Survey of Earned Doctorates, which showed declines in the percentage of recent doctorate recipients committing to postdoc positions, and support several recent anecdotal accounts documented by journalists of postdoc recruiting challenges and position vacancies across science and engineering (S&E) disciplines.¹

Figure 1**Graduate enrollment, by citizenship and enrollment status: 2017–21****Source(s):**

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

Table 1**Graduate enrollment in science, engineering, and health, by degree level, enrollment status, citizenship, sex, ethnicity, and race: 2017–21**

(Number and percent change)

Characteristic	Master's							Doctoral						
	2017	2018	2019	2020	2021	Percent change		2017	2018	2019	2020	2021	Percent change	
						2017–21	2020–21						2017–21	2020–21
Part-time students	133,577	142,659	153,696	170,619	179,799	34.6	5.4	34,747	34,199	33,979	35,679	36,702	5.6	2.9
U.S. citizens and permanent residents ^a	110,575	121,757	133,180	146,539	158,959	43.8	8.5	25,508	25,133	25,327	25,818	27,417	7.5	6.2
Male	59,703	64,500	69,495	75,037	78,751	31.9	4.9	13,000	12,752	12,952	12,934	13,457	3.5	4.0
Female	50,872	57,257	63,685	71,502	80,208	57.7	12.2	12,508	12,381	12,375	12,884	13,960	11.6	8.4
Hispanic or Latino	12,306	13,912	16,182	19,314	21,819	77.3	13.0	2,064	2,152	2,302	2,550	2,662	29.0	4.4
Not Hispanic or Latino														
American Indian or Alaska Native	430	534	581	562	612	42.3	8.9	168	133	137	158	175	4.2	10.8
Asian	11,268	12,675	14,401	16,531	18,935	68.0	14.5	1,960	1,961	2,127	2,061	2,220	13.3	7.7
Black or African American	11,420	12,584	13,615	14,853	16,227	42.1	9.3	2,140	2,199	2,478	2,503	2,869	34.1	14.6
Native Hawaiian or Other Pacific Islander	228	228	257	284	280	22.8	-1.4	45	44	43	40	42	-6.7	5.0
White	64,088	69,311	75,359	81,476	86,935	35.6	6.7	17,056	16,482	16,121	16,204	17,075	0.1	5.4
More than one race	3,123	3,665	4,045	4,692	5,316	70.2	13.3	604	697	741	784	913	51.2	16.5
Unknown race and ethnicity	7,712	8,848	8,740	8,827	8,835	14.6	0.1	1,471	1,465	1,378	1,518	1,461	-0.7	-3.8
Temporary visa holders	23,002	20,902	20,516	24,080	20,840	-9.4	-13.5	9,239	9,066	8,652	9,861	9,285	0.5	-5.8
Male	15,148	13,357	12,888	14,819	12,525	-17.3	-15.5	6,103	6,010	5,719	6,374	5,894	-3.4	-7.5
Female	7,854	7,545	7,628	9,261	8,315	5.9	-10.2	3,136	3,056	2,933	3,487	3,391	8.1	-2.8
Full-time students	245,010	248,552	254,532	243,859	287,022	17.1	17.7	235,778	242,897	247,910	247,656	256,980	9.0	3.8
U.S. citizens and permanent residents ^a	141,321	149,533	154,190	167,766	178,932	26.6	6.7	139,077	142,158	143,807	146,928	150,604	8.3	2.5
Male	60,203	62,052	62,191	66,803	69,806	16.0	4.5	73,517	73,849	73,699	74,278	74,443	1.3	0.2
Female	81,118	87,481	91,999	100,963	109,126	34.5	8.1	65,560	68,309	70,108	72,650	76,161	16.2	4.8
Hispanic or Latino	17,316	19,011	20,595	24,436	26,901	55.4	10.1	12,935	14,009	15,388	16,379	17,829	37.8	8.9
Not Hispanic or Latino														
American Indian or Alaska Native	706	685	746	722	742	5.1	2.8	546	580	613	600	574	5.1	-4.3
Asian	14,825	15,882	16,900	18,544	21,707	46.4	17.1	13,992	14,789	15,416	15,958	17,384	24.2	8.9
Black or African American	11,846	13,294	13,983	15,989	16,933	42.9	5.9	7,343	7,866	7,972	8,571	9,318	26.9	8.7
Native Hawaiian or Other Pacific Islander	240	269	285	294	319	32.9	8.5	190	189	159	160	153	-19.5	-4.4
White	83,943	86,699	88,477	93,614	97,765	16.5	4.4	92,215	93,243	92,588	92,761	92,560	0.4	-0.2
More than one race	4,996	5,455	5,548	6,377	6,987	39.9	9.6	4,816	5,047	5,279	5,726	6,257	29.9	9.3
Unknown race and ethnicity	7,449	8,238	7,656	7,790	7,578	1.7	-2.7	7,040	6,435	6,392	6,773	6,529	-7.3	-3.6
Temporary visa holders	103,689	99,019	100,342	76,093	108,090	4.2	42.0	96,701	100,739	104,103	100,728	106,376	10.0	5.6
Male	65,694	61,405	61,194	45,489	65,825	0.2	44.7	63,079	65,408	66,857	64,179	66,712	5.8	3.9
Female	37,995	37,614	39,148	30,604	42,265	11.2	38.1	33,622	35,331	37,246	36,549	39,664	18.0	8.5

Table 1**Graduate enrollment in science, engineering, and health, by degree level, enrollment status, citizenship, sex, ethnicity, and race: 2017–21**

(Number and percent change)

Characteristic	Master's						Doctoral							
	2017	2018	2019	2020	2021	Percent change		2017	2018	2019	2020	2021	Percent change	
						2017–21	2020–21						2017–21	2020–21
First-time, full-time students	110,980	114,214	116,507	102,096	147,302	32.7	44.3	45,177	45,510	46,525	41,173	46,696	3.4	13.4
U.S. citizens and permanent residents ^a	64,513	67,821	68,897	79,715	82,497	27.9	3.5	26,902	27,009	27,177	27,744	27,533	2.3	-0.8
Male	27,523	28,480	28,005	32,396	32,825	19.3	1.3	13,859	13,558	13,366	13,419	12,706	-8.3	-5.3
Female	36,990	39,341	40,892	47,319	49,672	34.3	5.0	13,043	13,451	13,811	14,325	14,827	13.7	3.5
Hispanic or Latino	7,694	8,618	9,034	11,483	12,208	58.7	6.3	2,823	2,921	3,267	3,383	3,670	30.0	8.5
Not Hispanic or Latino														
American Indian or Alaska Native	285	291	314	306	335	17.5	9.5	89	100	115	96	85	-4.5	-11.5
Asian	7,445	7,966	8,487	9,685	11,202	50.5	15.7	2,701	2,954	3,008	3,153	3,328	23.2	5.6
Black or African American	5,429	5,789	6,188	7,664	7,609	40.2	-0.7	1,522	1,593	1,637	1,726	2,041	34.1	18.3
Native Hawaiian or Other Pacific Islander	102	138	136	135	151	48.0	11.9	24	39	24	27	33	37.5	22.2
White	37,642	38,837	39,055	44,007	44,465	18.1	1.0	17,503	17,291	17,067	16,886	16,070	-8.2	-4.8
More than one race	2,440	2,480	2,498	3,063	3,295	35.0	7.6	1,099	1,062	1,047	1,160	1,196	8.8	3.1
Unknown race and ethnicity	3,476	3,702	3,185	3,372	3,232	-7.0	-4.2	1,141	1,049	1,012	1,313	1,110	-2.7	-15.5
Temporary visa holders	46,467	46,393	47,610	22,381	64,805	39.5	189.6	18,275	18,501	19,348	13,429	19,163	4.9	42.7
Male	28,944	28,372	28,568	12,678	40,053	38.4	215.9	11,693	11,676	12,035	8,193	11,709	0.1	42.9
Female	17,523	18,021	19,042	9,703	24,752	41.3	155.1	6,582	6,825	7,313	5,236	7,454	13.2	42.4

^a Race and ethnicity data are available for U.S. citizens and permanent residents only.**Source(s):**

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

These and other findings in this report are from the 2021 Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS), with comparisons to data from 2017 to 2021. Data from the GSS provide insight into the composition of the current and future S&E workforce by collecting data on graduate students in SEH fields, postdocs, and doctorate-holding nonfaculty researchers (NFRs). The GSS is sponsored by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation and by the National Institutes of Health (NIH).

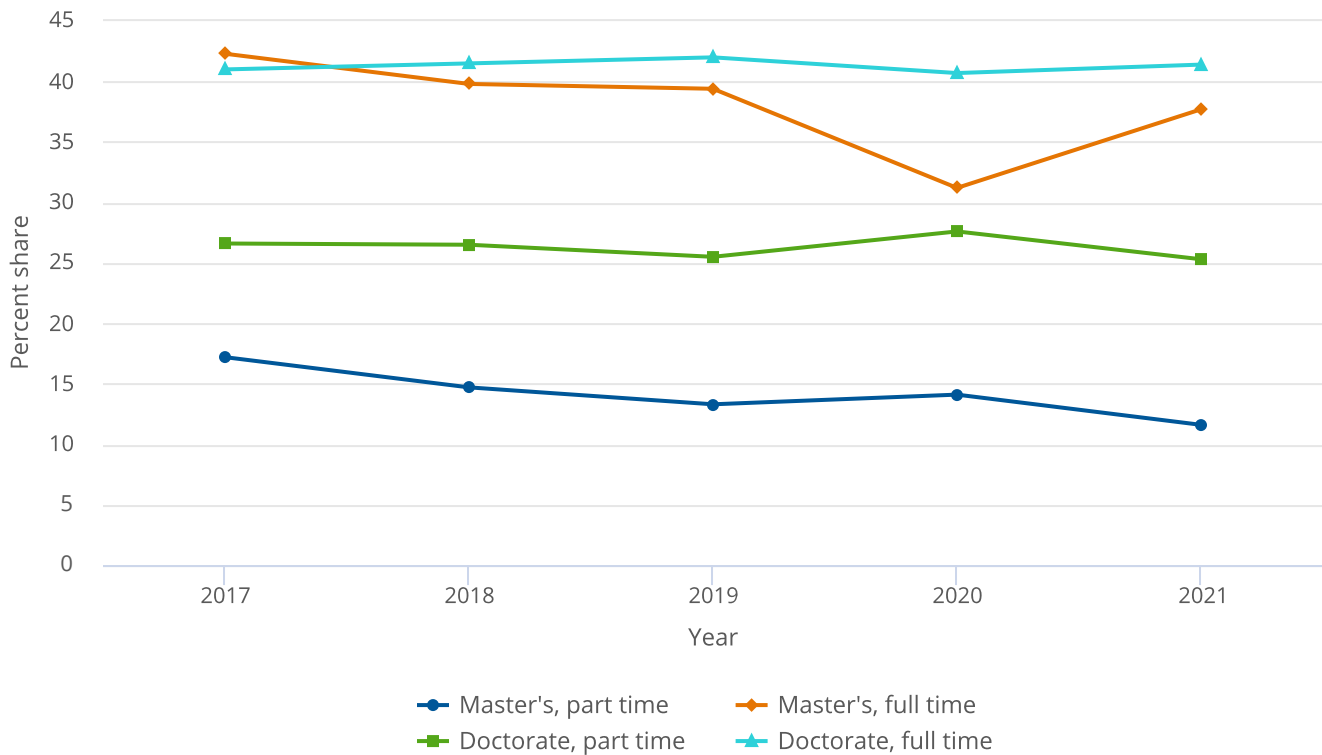
Trends in Enrollment, by Citizenship

The declines in master's full-time enrollment between 2019 and 2020 reversed in 2021, with enrollment growing from 243,859 in 2020 to 287,022 in 2021, a 17.7% increase. Full-time doctoral enrollment, which was stable between 2019 and 2020, increased by 3.8%, from 247,656 in 2020 to 256,980 in 2021. Part-time enrollment increased by 5.4% over the same period (to 179,799) for master's students and by 2.9% (to 36,702) for doctoral students. The 5-year trend for part-time master's students shows an increase of more than a third—with enrollments up 34.6% from 2017 to 2021—while doctoral part-time enrollment increased 5.6% over the same period ([table 1](#), [figure 1](#)).

Temporary Visa Holders

The enrollment of temporary visa holders in SEH master's and doctoral programs declined between 2019 and 2020. However, enrollments of students on a temporary visa recovered in 2021, led by a 42.0% increase in full-time master's students (to 108,090 students), and a 5.6% increase in full-time doctoral students (to 106,373 students). First-time, full-time enrollments of temporary visa holders increased considerably between 2020 and 2021, with a 189.6% increase for first-time, full-time master's students (from 22,381 to 64,805 students), and a 42.7% increase (from 13,429 to 19,163) for first-time, full-time doctoral students.

Despite this larger-than-average recent growth, over the past 5 years temporary visa holders as a percentage of all master's and doctoral students have declined for full- and part-time master's students and for part-time doctoral students. The percentage of full-time doctoral students with temporary visas was stable (41.0% in 2017 and 41.4% in 2021) ([table 1](#), [figure 2](#)).

Figure 2**Temporary visa holders' share of graduate enrollment, by degree level and enrollment status: 2017–21****Source(s):**

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

U.S. Citizens and Permanent Residents

Enrollment of U.S. citizens and permanent residents increased from 2020 to 2021 for both degree levels (master's and doctoral) and enrollment status (part time and full time). Among U.S. citizen and permanent residents with first-time, full-time enrollment between 2020 and 2021, the number of master's students increased 3.5% (from 79,715 to 82,497) but the number of doctoral students declined slightly (from 27,744 to 27,533, or -0.8%) ([table 1](#)).

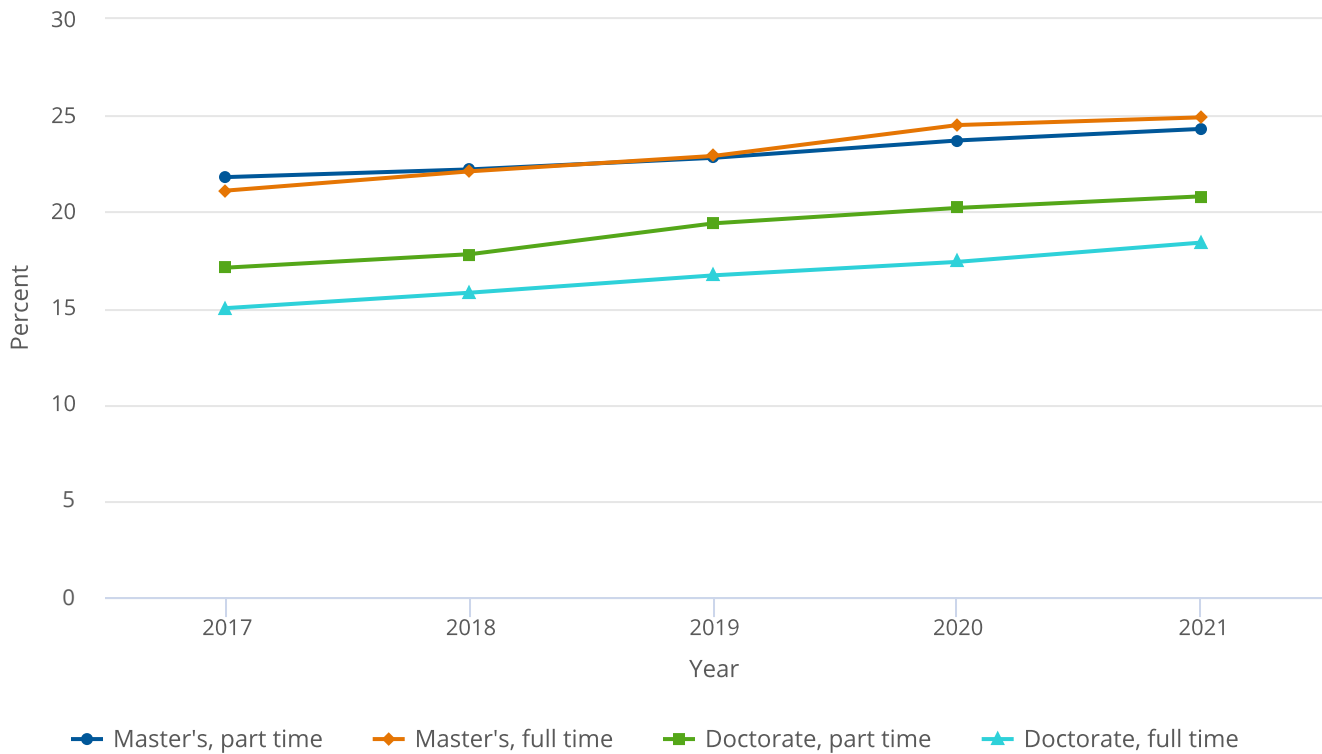
Year-over-year enrollment patterns by sex, race, and ethnicity were variable. Enrollment of female full-time master's and doctoral students increased by 8.1% (8,163 students) and 4.8% (3,511 students), respectively. Meanwhile, male full-time master's and doctoral student enrollment increased by a more modest 4.5% (3,003 students) and 0.2% (165 students), respectively ([table 1](#)).

Enrollment among Hispanic or Latino and Black or African American graduate students showed continued annual growth. Hispanic or Latino full-time master's enrollment increased by 10.1% (2,465 students) from 2020 to 2021, while doctoral enrollment increased by 8.9% (1,450 students). Over the same period, Black or African American full-time enrollment increased by 5.9% for master's students (944 students) and by 8.7% for doctoral students (747 students). Asian full-time master's and doctoral enrollments increased by 17.1% (3,163 students) and by 8.9% (1,426 students), respectively. Meanwhile, White enrollment increased by 4.4% (4,151 students) for full-time master's students but declined by 0.2% (-201 students) for full-time doctoral students ([table 1](#)).

Viewed over a 5-year period, students who are underrepresented minorities (URM)—Hispanic or Latino, Black or African American, and American Indian or Alaska Native—have increased their overall representation among all U.S. citizen and permanent resident graduate students regardless of degree level or enrollment status. For example, URM constituted 15.0% of all full-time doctoral students in 2017 and 18.4% in 2021. For full-time master’s students, URM represented 21.1% of the total enrollment in 2017 and 24.9% in 2021 ([table 1](#), [figure 3](#)).

Figure 3

Underrepresented minorities' share of graduate enrollment, by degree level and enrollment status: 2017–21

**Note(s):**

Analysis limited to U.S. citizens and permanent residents.

Source(s):

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

Field of Study Trends for Master’s and Doctoral Students

Master’s and doctoral enrollment in SEH fields increased to an all-time high of 760,503 students in 2021. Enrollment grew between 2020 and 2021 across nearly all broad fields at both degree levels—master’s enrollment increased in every broad field, while doctoral enrollment increased in all but two fields (mathematics and statistics; electrical, electronics, communications and computer engineering) ([table 2](#)).

In 2020, the GSS revised its field taxonomy to align with an updated NCSES Taxonomy of Disciplines (TOD) and National Center for Education Statistics’ (NCES) Classification of Instructional Programs (CIP). The revisions resulted in some disciplines moving between broad fields; in these cases, the changes in broad field counts in 2020 reflect the updated taxonomy rather than change in enrollment or employment. See “[Data Sources and Limitations](#)” for more information.

Table 2**Graduate enrollment in science, engineering, and health, by degree level and field: 2017–21**

(Number and percent change)

Characteristic	Master's							Doctoral						
	2017	2018	2019	2020	2021	Percent change		2017	2018	2019	2020	2021	Percent change	
						2017–21	2020–21						2017–21	2020–21
All graduate students	378,587	391,211	408,228	414,478	466,821	23.3	12.6	270,525	277,096	281,889	283,335	293,682	8.6	3.7
Science and engineering	325,925	334,391	351,734	354,354	401,059	23.1	13.2	255,224	261,165	265,961	268,021	277,022	8.5	3.4
Science	229,169	241,327	259,795	267,904	305,949	33.5	14.2	186,399	190,928	193,896	196,742	204,077	9.5	3.7
Agricultural and veterinary sciences	5,603	5,658	5,629	6,487	6,801	21.4	4.8	3,744	3,880	3,889	4,313	4,443	18.7	3.0
Biological and biomedical sciences	33,926	35,306	38,078	39,920	42,775	26.1	7.2	51,291	52,627	53,915	54,905	58,213	13.5	6.0
Computer and information sciences	75,618	77,351	84,092	80,690	102,232	35.2	26.7	14,291	16,127	17,192	18,174	19,574	37.0	7.7
Geosciences, atmospheric sciences, and ocean sciences	6,006	5,629	5,327	5,277	5,520	-8.1	4.6	6,539	6,704	6,551	6,515	6,773	3.6	4.0
Mathematics and statistics	16,568	18,073	19,594	18,284	20,639	24.6	12.9	13,101	13,388	13,565	13,687	13,619	4.0	-0.5
Multidisciplinary and interdisciplinary studies	6,923	7,414	8,203	10,980	11,997	73.3	9.3	2,931	2,924	2,978	3,553	3,775	28.8	6.2
Natural resources and conservation	7,311	7,691	8,066	8,793	10,021	37.1	14.0	3,568	3,716	3,677	3,705	3,911	9.6	5.6
Physical sciences	6,368	6,075	6,361	6,275	6,404	0.6	2.1	35,461	36,000	36,506	36,341	37,747	6.4	3.9
Psychology	29,638	35,404	40,838	47,279	51,936	75.2	9.9	20,395	20,303	20,231	21,115	21,445	5.1	1.6
Social sciences	41,208	42,726	43,607	43,919	47,624	15.6	8.4	35,078	35,259	35,392	34,434	34,577	-1.4	0.4
Engineering	96,756	93,064	91,939	86,450	95,110	-1.7	10.0	68,825	70,237	72,065	71,279	72,945	6.0	2.3
Aerospace, aeronautical, and astronautical engineering	3,322	3,342	3,701	4,326	5,065	52.5	17.1	2,386	2,506	2,554	2,645	2,776	16.3	5.0
Biological, biomedical, and biosystems engineering	4,108	4,282	4,424	4,536	5,194	26.4	14.5	7,008	7,481	7,934	8,239	8,879	26.7	7.8
Chemical, petroleum, and chemical-related engineering	4,208	3,815	3,274	2,942	2,983	-29.1	1.4	7,536	7,599	7,664	7,612	7,718	2.4	1.4
Civil, environmental, transportation and related engineering fields	13,506	12,729	11,873	10,819	11,730	-13.1	8.4	7,626	7,732	7,752	7,485	7,880	3.3	5.3
Electrical, electronics, communications and computer engineering	29,816	28,108	28,177	25,312	27,687	-7.1	9.4	17,936	18,119	18,577	17,720	17,572	-2.0	-0.8
Industrial, manufacturing, systems engineering and operations research	12,272	12,389	11,912	11,030	11,949	-2.6	8.3	3,633	3,598	3,762	3,839	3,920	7.9	2.1
Mechanical engineering	16,279	15,434	14,861	14,305	15,710	-3.5	9.8	11,149	11,159	11,247	11,477	11,539	3.5	0.5
Metallurgical, mining, materials and related engineering fields	2,427	2,395	2,266	2,299	2,516	3.7	9.4	4,655	4,821	4,817	4,882	4,904	5.3	0.5
Other engineering	10,818	10,570	11,451	10,881	12,276	13.5	12.8	6,896	7,222	7,758	7,380	7,757	12.5	5.1
Health	52,662	56,820	56,494	60,124	65,762	24.9	9.4	15,301	15,931	15,928	15,314	16,660	8.9	8.8
Clinical medicine	25,283	27,494	26,251	29,748	34,068	34.7	14.5	4,410	4,508	4,571	4,796	5,623	27.5	17.2

Table 2**Graduate enrollment in science, engineering, and health, by degree level and field: 2017–21**

(Number and percent change)

Characteristic	Master's							Doctoral						
	2017	2018	2019	2020	2021	Percent change		2017	2018	2019	2020	2021	Percent change	
						2017–21	2020–21						2017–21	2020–21
Other health	27,379	29,326	30,243	30,376	31,694	15.8	4.3	10,891	11,423	11,357	10,518	11,037	1.3	4.9

Note(s):

In 2020, the GSS revised its field taxonomy, and the revisions resulted in some disciplines moving between broad fields; see [“Data Sources and Limitations”](#) for details. For more information about fields collected in this survey, please see table A-17 in *Survey of Graduate Students and Postdoctorates in Science and Engineering: Fall 2021*.

Source(s):

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

Master's Enrollment Trends, by Field

Master's enrollment in SEH fields soared to a record high of 466,821 students, an increase of 12.6% over 2020 and of 23.3% over 2017. Over the past academic year, master's enrollment grew in SEH fields by 14.2% (38,045 students), 10.0% (8,660 students), and 9.4% (5,638 students), respectively. Master's enrollment in engineering fields increased in 2021 for the first time in 4 years. Between 2017 and 2021, master's enrollment in science and health both grew (by 33.5% and 24.9%, respectively), while engineering enrollment contracted by 1.7% (table 2).

Computer and information sciences had the largest numeric and percentage increase in master's enrollment between 2020 and 2021 at 26.7% (21,542 students). This field accounted for 41.2% of the 1-year growth in master's enrollment and remains the largest field for master's enrollment, with 102,232 students enrolled in 2021, or over a fifth of the master's students reported to the GSS. In terms of percentage growth, the next three largest-growing fields were aerospace, aeronautical, and astronautical engineering (17.1%, or 739 students); clinical medicine (14.5%, or 4,320 students); and biological, biomedical, and biosystems engineering (14.5%, or 658 students) (table 2).

Master's enrollment increased across all GSS broad fields from 2020 to 2021. Over a 5-year time span, six fields had declining enrollment—with all but one of these within the broad field of engineering. Chemical, petroleum, and chemical-related engineering had the smallest 1-year growth (1.4%, or 41 students) and the largest 5-year percentage decline (-29.1%, or -1,225 students). Master's enrollment in electrical, electronics, communications and computer engineering experienced the largest numeric decline from 2017 to 2021 (-2,129 students, or 7.1%) (table 2).

Doctoral Enrollment Trends, by Field

Similar to master's enrollment, doctoral enrollment rose to a record high in 2021 (293,682 students), growing 3.7% (10,347 students) compared to the larger percentage increase in master's enrollment 12.6% (52,343 students). Among SEH fields from 2020 to 2021, health grew the most in percentage terms (8.8%, or 1,346 students), followed by science (3.7%, or 7,335 students) and engineering (2.3%, or 1,666 students). The trends between 2017 and 2021 were slightly different: science fields experienced the greatest percentage increase (9.5%, or 17,678 students), followed by health (8.9%, or 1,359 students) and engineering (6.0%, or 4,120 students) (table 2).

Measured in percentage terms, the top three growing S&E detailed fields between 2020 and 2021 were biological, biomedical, and biosystems engineering (7.8%, or 640 students); computer and information sciences (7.7%, or 1,400 students); and multidisciplinary and interdisciplinary studies (6.2%, or 222 students). Biological and biomedical sciences had the largest numeric increase from 2020 to 2021 (3,308 students) and remains the largest academic field (58,213 students) (table 2).

Trends in Postdocs and Nonfaculty Researchers

Annual trends in postdocs and doctorate-holding NFRs diverged in 2021. Postdoc appointments declined overall and within each broad field group—science, engineering, and health—while NFRs increased in these same areas. Among all surveyed fields, postdocs declined by 3.6% (-2,385) from 2020 to 2021 and by 2.2% (-1,437) since 2017. Conversely, NFRs increased by 3.6% (1,064) between 2020 and 2021 and by 9.0% (2,545) between 2017 and 2021 (table 3).

Table 3

Postdoctoral appointees and nonfaculty researchers, by field: 2017–21

(Number and percent change)

Characteristic	Postdoctoral appointees							Nonfaculty researchers						
	2017	2018	2019	2020	2021	Percent change		2017	2018	2019	2020	2021	Percent change	
						2017–21	2020–21						2017–21	2020–21
All surveyed fields	64,733	64,783	66,247	65,681	63,296	-2.2	-3.6	28,180	29,284	30,349	29,661	30,725	9.0	3.6

Table 3**Postdoctoral appointees and nonfaculty researchers, by field: 2017–21**

(Number and percent change)

Characteristic	Postdoctoral appointees							Nonfaculty researchers						
	2017	2018	2019	2020	2021	Percent change		2017	2018	2019	2020	2021	Percent change	
						2017–21	2020–21						2017–21	2020–21
Science and engineering	46,080	45,478	46,769	47,203	45,526	-1.2	-3.6	20,542	21,848	22,728	22,133	22,890	11.4	3.4
Science	38,241	37,564	38,503	38,741	37,171	-2.8	-4.1	17,268	18,278	18,819	18,212	18,809	8.9	3.3
Agricultural and veterinary sciences	1,024	1,072	1,079	1,678	1,595	55.8	-4.9	496	565	645	964	906	82.7	-6.0
Biological and biomedical sciences	21,781	21,533	21,847	21,902	20,182	-7.3	-7.9	8,203	8,250	8,229	8,112	8,208	0.1	1.2
Computer and information sciences	854	879	878	823	878	2.8	6.7	476	515	510	458	457	-4.0	-0.2
Geosciences, atmospheric sciences, and ocean sciences	2,089	1,726	1,778	1,790	1,799	-13.9	0.5	1,794	2,106	2,177	2,150	2,310	28.8	7.4
Mathematics and statistics	991	982	1,070	1,076	1,121	13.1	4.2	240	266	305	201	243	1.3	20.9
Multidisciplinary and interdisciplinary studies	1,131	980	972	832	881	-22.1	5.9	806	832	820	679	816	1.2	20.2
Natural resources and conservation	731	764	806	845	908	24.2	7.5	364	580	582	573	625	71.7	9.1
Physical sciences	7,211	6,976	7,159	6,937	6,825	-5.4	-1.6	2,871	3,056	3,316	2,890	2,935	2.2	1.6
Psychology	1,082	1,145	1,152	1,312	1,337	23.6	1.9	494	507	576	749	803	62.6	7.2
Social sciences	1,347	1,507	1,762	1,546	1,645	22.1	6.4	1,524	1,601	1,659	1,436	1,506	-1.2	4.9
Engineering	7,839	7,914	8,266	8,462	8,355	6.6	-1.3	3,274	3,570	3,909	3,921	4,081	24.6	4.1
Aerospace, aeronautical, and astronautical engineering	196	207	227	233	279	42.3	19.7	102	115	124	149	149	46.1	0.0
Biological, biomedical, and biosystems engineering	1,476	1,529	1,602	1,696	1,615	9.4	-4.8	451	491	545	525	597	32.4	13.7
Chemical, petroleum, and chemical-related engineering	1,262	1,205	1,229	1,157	1,167	-7.5	0.9	340	337	410	330	327	-3.8	-0.9
Civil, environmental, transportation and related engineering fields	804	739	865	1,006	968	20.4	-3.8	422	414	492	488	481	14.0	-1.4
Electrical, electronics, communications and computer engineering	1,170	1,197	1,305	1,302	1,273	8.8	-2.2	557	588	637	706	763	37.0	8.1

Table 3**Postdoctoral appointees and nonfaculty researchers, by field: 2017–21**

(Number and percent change)

Characteristic	Postdoctoral appointees							Nonfaculty researchers						
	2017	2018	2019	2020	2021	Percent change		2017	2018	2019	2020	2021	Percent change	
						2017–21	2020–21						2017–21	2020–21
Industrial, manufacturing, systems engineering and operations research	127	156	167	194	137	7.9	-29.4	119	105	137	155	140	17.6	-9.7
Mechanical engineering	1,089	1,069	1,142	1,149	1,200	10.2	4.4	458	489	531	469	537	17.2	14.5
Metallurgical, mining, materials and related engineering fields	565	575	665	630	562	-0.5	-10.8	233	267	303	299	259	11.2	-13.4
Other engineering	1,150	1,237	1,064	1,095	1,154	0.3	5.4	592	764	730	800	828	39.9	3.5
Health	18,653	19,305	19,478	18,478	17,770	-4.7	-3.8	7,638	7,436	7,621	7,528	7,835	2.6	4.1
Clinical medicine	16,100	16,563	16,650	16,287	15,565	-3.3	-4.4	6,448	6,159	6,273	6,500	6,758	4.8	4.0
Other health	2,553	2,742	2,828	2,191	2,205	-13.6	0.6	1,190	1,277	1,348	1,028	1,077	-9.5	4.8

Note(s):

In 2020, the GSS revised its field taxonomy, and the revisions resulted in some disciplines moving between broad fields; see [“Data Sources and Limitations”](#) for details. For more information about fields collected in this survey, please see table A-17 in *Survey of Graduate Students and Postdoctorates in Science and Engineering: Fall 2021*.

Source(s):

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

Demographics of Postdocs

The declines in postdoc appointments are unevenly distributed among U.S. citizens and permanent residents and temporary visa holders. Postdocs holding temporary visas declined by 7.0% (-2,493) between 2020 and 2021 and by 3.8% (-1,325) since 2017. Postdocs among U.S. citizens and permanent residents increased by 0.4% (108) between 2020 and 2021, while declining by 0.4% (-112) since 2017. Among U.S. citizens and permanent residents, Hispanic or Latino postdocs increased by 5.7% (115) from 2020 to 2021 and by 29.1% (483) since 2017. Black or African American postdocs in 2021 increased by 6.6% (71) over the previous year and by 13.1% (133) since 2017 ([table 4](#)).

Table 4**Postdoctoral appointees, by citizenship, sex, ethnicity, and race: 2017–21**

(Number and percent change)

Characteristic	2017	2018	2019	2020	2021	Percent change	
						2017–21	2020–21
All surveyed fields	64,733	64,783	66,247	65,681	63,296	-2.2	-3.6
U.S. citizens and permanent residents ^a	30,110	29,622	29,452	29,890	29,998	-0.4	0.4
Male	16,378	15,934	15,570	15,579	15,623	-4.6	0.3
Female	13,732	13,688	13,882	14,311	14,375	4.7	0.4
Hispanic or Latino	1,659	1,856	1,924	2,027	2,142	29.1	5.7

Table 4**Postdoctoral appointees, by citizenship, sex, ethnicity, and race: 2017–21**

(Number and percent change)

Characteristic	2017	2018	2019	2020	2021	Percent change	
						2017–21	2020–21
Not Hispanic or Latino							
American Indian or Alaska Native	125	81	69	72	80	-36.0	11.1
Asian	6,045	6,020	5,891	5,696	6,152	1.8	8.0
Black or African American	1,019	1,104	1,088	1,081	1,152	13.1	6.6
Native Hawaiian or Other Pacific Islander	112	55	52	52	38	-66.1	-26.9
White	17,313	17,232	16,972	17,123	16,422	-5.1	-4.1
More than one race	730	506	519	555	695	-4.8	25.2
Unknown race and ethnicity	3,107	2,768	2,937	3,284	3,317	6.8	1.0
Temporary visa holders	34,623	35,161	36,795	35,791	33,298	-3.8	-7.0
Male	22,492	22,727	23,603	22,660	20,877	-7.2	-7.9
Female	12,131	12,434	13,192	13,131	12,421	2.4	-5.4

^a Race and ethnicity data are available for U.S. citizens and permanent residents only.

Source(s):

National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

Field of Research

From 2020 to 2021, trends in postdocs and NFRs continued to diverge with respect to field of research. Postdoc appointments declined in SEH, while NFR employment increased.

From 2020 to 2021, postdocs declined by 4.1% (-1,570) in science, by 3.8% (-708) in health, and by 1.3% (-107) in engineering. However, several individual broad fields had notable 1-year percentage gains. The top three growing fields for postdoc appointments by percentage were aerospace, aeronautical, and astronautical engineering (19.7%, or 46), natural resources and conservation (7.5%, or 63), and computer and information sciences (6.7%, or 55). Biological and biomedical sciences remained the largest field for postdoc appointments with 20,182 postdocs, but it reported the largest numeric loses across all fields from both 2017 (-1,599 postdocs) and 2020 (-1,720 postdocs). From 2017 to 2021, only engineering had an increase (6.6%, or 516 postdocs), led by a 20.4% (164 postdocs) increase in civil, environmental, transportation and related engineering fields ([table 3](#)).

In 2021, NFR employment increased from both 2017 (9.0%, or 2,545 NFRs) and 2020 (3.6%, or 1,064 NFRs). From 2020 to 2021, mathematics and statistics had the largest 1-year percentage increase (20.9%, or 42 NFRs), while clinical medicine had the largest numeric increase (4.0%, or 258 NFRs). Similar to postdoc employment, biological and biomedical sciences remained the largest field for NFR employment, with 8,208 NFRs reported. From 2017 to 2021, notable 5-year gains were seen in agricultural and veterinary sciences (up 82.7%, or 410 NFRs), natural resources and conservation (up 71.7%, or 261 NFRs), and psychology (up 62.6%, or 309 NFRs) ([table 3](#)).

Data Sources and Limitations

Conducted since 1966, the GSS is an annual survey of all academic institutions in the United States that grant research-based master's or doctoral degrees in SEH fields. The 2021 GSS collected data from 21,365 organizational units (departments, programs, affiliated research centers, and health care facilities) at 699 eligible institutions and their affiliates in the United States, Puerto Rico, and Guam. The unit response rate was 98.2%. An overview of the survey is available at <https://www.nsf.gov/statistics/srvygradpostdoc/>.

In 2020, the GSS amended its taxonomy to align with a revised NCSES TOD and 2020 NCES CIP. The 2017 to 2019 GSS counts were not reclassified using the 2020 CIP. Unlike the taxonomy changes in 2017, the only newly ineligible CIP codes were those dropped by the 2020 CIP. As such, these changes did not lead to a large shift in overall reported GSS counts, and data remain comparable to data from 2017 to 2019. Additionally, new CIP codes, such as data science and medical clinical sciences, were added, along with other codes in GSS-eligible series; while these CIP codes are newly eligible, a review of unit names from prior years indicates that many of them were being reported prior to 2020. Some additional adjustments to allow for further detail in some fields were made to the GSS taxonomy based on the 2020 CIP codes reported to GSS. Finally, similar to the science and health groups, broad fields were added to the engineering group.

At the field level, there were some notable changes that may impact trends. First, consistent with the 2020 CIP and TOD, veterinary biomedical and clinical sciences moved from the health sciences to agricultural sciences (which was then renamed agricultural and veterinary sciences). Human development is now reported under psychology, rather than social sciences, to align with the 2020 TOD. Finally, 22 new 2020 CIP codes were added to multidisciplinary and interdisciplinary studies; the addition of these CIP codes likely moved units that were already reported (i.e., many units named data science are now reported with new CIP codes that map to the new data science and data analytics GSS code). For more information about the 2020 GSS taxonomy change, see tables A-17, A-18a, and A-18b in the 2020 data tables (<https://nces.nsf.gov/pubs/nsf22319>).

In 2017, the GSS was redesigned to collect demographic and financial support data separately for master's and doctoral students so as to prioritize electronic data interchange (EDI) as the primary means of data submission and to utilize the Department of Education's CIP codes to report fields of study for graduate student enrollment data.² More information regarding the 2017 GSS redesign is available in the "Technical Notes" for the 2019 data tables (<https://nces.nsf.gov/pubs/nsf21318#technical-notes>). Due to these changes, the data for 2017 and beyond are not directly comparable to previously collected GSS data. Trend comparisons can be made using the "2017old" estimates in the 2017 data tables, which are available at <https://ncesdata.nsf.gov/gradpostdoc/2017/>.

GSS health fields are collected under the advisement of NIH. These GSS fields are about a third of all health fields in the Department of Education's CIP taxonomy. NIH information on trends seen within these selected health fields can be found at <https://report.nih.gov/nihdatabook/>.

The full set of data tables from the 2021 survey is available at <https://www.nsf.gov/statistics/srvygradpostdoc/>. Data are also available in NCSES's interactive data tool (<https://ncesdata.nsf.gov/ids/gss>). For more information about the survey, contact the GSS Survey Manager, Michael Yamaner.

A related InfoBrief based on the 2020 COVID Impact Module that was conducted as part of the 2020 GSS is available at <https://nces.nsf.gov/pubs/nsf22313>.

Notes

1 Between 2015 and 2020, the percentage of SED respondents stating that their immediate postgraduate plan was a postdoc position declined in five out of six S&E broad fields. See 2020 SED Digest, figure 23 (<https://nces.nsf.gov/pubs/nsf22300/report/postgraduation-trends>, accessed 26 August 2022) and table 44 (<https://nces.nsf.gov/pubs/nsf22300/data-tables>, accessed 26 August 2022). See also Langin K. 2022. U.S. Labs Face Severe Postdoc Shortage. *Science* 376(6600):1369–70. <https://www.science.org/content/article/professors-struggle-recruit-postdocs-calls-structural-change-academia-intensify>. Accessed 24 August 2022.

2 EDI is a method for transferring data between computer systems or networks using a standardized format. CIP is a taxonomy used for reporting postsecondary fields to the Department of Education for the Integrated Postsecondary Education Data System, a mandatory survey for institutions receiving federal financial aid. Most institutions in the GSS already use CIP codes to report data on graduate students. The CIP taxonomy was developed by NCES, which updates the taxonomy about once a decade; CIP was last revised in 2020. For more information, see <https://nces.ed.gov/ipeds/cipcode/>.

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