National Center for Science and Engineering Statistics

InfoBrief

Graduate Enrollment and Postdoctoral Appointments in Science, Engineering, and Health Rise, Driven Largely by Increases in the Number of Women and Temporary Visa Holders

NSF 25-316 | January 2025

Bethany Smith, Caren A. Arbeit, Herbert Thompson, and Michael I. Yamaner

Between 2022 and 2023, the enrollment of graduate students in science, engineering, and health (SEH) fields continued its multi-year increase. The combined total of full-time and part-time students in master's and doctoral degree SEH programs increased by 2.4%, from 798,534 in 2022 to 818,095 in 2023. Full-time SEH master's degree enrollment in 2023 was 329,971, whereas full-time doctoral degree enrollment was 268,617 (**table 1**). The number of postdoctoral appointees (postdocs) rose 4.9% between 2022 and 2023, from 62,750 to 65,850, a recovery in counts following several years of consistent decline. These and other findings in this report are from the 2023 Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS). Data from the GSS provides insight into the composition of the current and future science and engineering (S&E) workforce by collecting data on graduate students, postdocs, and doctorate-holding nonfaculty researchers (NFRs) in SEH fields. This survey is funded by the National Center for Science and Engineering Statistics (NCSES) within the U.S. National Science Foundation and by the National Institutes of Health (NIH).

Table 1

Enrollment of master's students and doctoral students in science, engineering, and health, by enrollment intensity, sex, citizenship status, race, and ethnicity: 2019–23

(Number and percent change)

Characteristic	Master's students							Doctoral students						
						Percent change							Percent change	
	2019	2020	2021	2022	2023	2019–23	2022–23	2019	2020	2021	2022	2023	2019–23	2022–23
Part-time students	153,696	170,619	179,659	181,693	180,895	17.7	-0.4	33,979	35,679	36,674	37,540	38,612	13.6	2.9
U.S. citizens and permanent residents[a]	133,180	146,539	158,843	153,345	149,590	12.3	-2.4	25,327	25,818	27,403	28,145	29,589	16.8	5.1
Male	69,495	75,037	78,723	76,439	74,444	7.1	-2.6	12,952	12,934	13,447	13,515	13,572	4.8	0.4
Female	63,685	71,502	80,120	76,906	75,146	18.0	-2.3	12,375	12,884	13,956	14,630	16,017	29.4	9.5
Hispanic or Latino	16,182	19,314	21,809	22,200	22,074	36.4	-0.6	2,302	2,550	2,666	2,978	3,064	33.1	2.9
Not Hispanic or Latino														
American Indian or Alaska Native	581	562	612	537	517	-11.0	-3.7	137	158	175	174	181	32.1	4.0
Asian	14,401	16,531	18,932	19,522	19,350	34.4	-0.9	2,127	2,061	2,218	2,359	2,487	16.9	5.4
Black or African American	13,615	14,853	16,213	15,518	15,939	17.1	2.7	2,478	2,503	2,858	2,977	3,757	51.6	26.2
Native Hawaiian or Other Pacific Islander	257	284	280	269	296	15.2	10.0	43	40	42	38	53	23.3	39.5
White	75,359	81,476	86,873	81,680	77,898	3.4	-4.6	16,121	16,204	17,071	17,081	17,301	7.3	1.3
More than one race	4,045	4,692	5,316	5,079	5,212	28.9	2.6	741	784	913	874	937	26.5	7.2
Unknown race and ethnicity	8,740	8,827	8,808	8,540	8,304	-5.0	-2.8	1,378	1,518	1,460	1,664	1,809	31.3	8.7
Temporary visa holders	20,516	24,080	20,816	28,348	31,305	52.6	10.4	8,652	9,861	9,271	9,395	9,023	4.3	-4.0
Male	12,888	14,819	12,508	17,573	19,254	49.4	9.6	5,719	6,374	5,885	5,943	5,614	-1.8	-5.5
Female	7,628	9,261	8,308	10,775	12,051	58.0	11.8	2,933	3,487	3,386	3,452	3,409	16.2	-1.2
Full-time students	254,532	243,859	286,954	319,618	329,971	29.6	3.2	247,910	247,656	256,869	259,683	268,617	8.4	3.4
U.S. citizens and permanent residents[a]	154,190	167,766	178,812	168,660	164,019	6.4	-2.8	143,807	146,928	150,539	150,149	152,610	6.1	1.6
Male	62,191	66,803	69,780	64,543	63,296	1.8	-1.9	73,699	74,278	74,407	73,050	72,972	-1.0	-0.1
Female	91,999	100,963	109,032	104,117	100,723	9.5	-3.3	70,108	72,650	76,132	77,099	79,638	13.6	3.3
Hispanic or Latino	20,595	24,436	26,872	26,103	26,025	26.4	-0.3	15,388	16,379	17,827	18,340	19,265	25.2	5.0
Not Hispanic or Latino														

Table 1

Enrollment of master's students and doctoral students in science, engineering, and health, by enrollment intensity, sex, citizenship status, race, and ethnicity: 2019–23

(Number and percent change)

Characteristic	Master's students							Doctoral students						
	2019	2020	2021	2022	2023	Percent change 2019–23	Percent change 2022–23	2019	2020	2021	2022	2023	Percent change 2019–23	Percent change 2022–23
American Indian or Alaska Native	746	722	744	794	694	-7.0	-12.6	613	600	574	577	592	-3.4	2.6
Asian	16,900	18,544	21,675	21,351	21,580	27.7	1.1	15,416	15,958	17,378	18,194	19,132	24.1	5.2
Black or African American	13,983	15,989	16,916	15,880	15,825	13.2	-0.3	7,972	8,571	9,315	9,641	10,755	34.9	11.6
Native Hawaiian or Other Pacific Islander	285	294	317	272	248	-13.0	-8.8	159	160	153	159	157	-1.3	-1.3
White	88,477	93,614	97,735	90,532	85,349	-3.5	-5.7	92,588	92,761	92,519	90,364	88,929	-4.0	-1.6
More than one race	5,548	6,377	6,985	6,923	6,908	24.5	-0.2	5,279	5,726	6,257	6,455	6,947	31.6	7.6
Unknown race and ethnicity	7,656	7,790	7,568	6,805	7,390	-3.5	8.6	6,392	6,773	6,516	6,419	6,833	6.9	6.4
Temporary visa holders	100,342	76,093	108,142	150,958	165,952	65.4	9.9	104,103	100,728	106,330	109,534	116,007	11.4	5.9
Male	61,194	45,489	65,845	92,976	101,681	66.2	9.4	66,857	64,179	66,682	68,070	71,488	6.9	5.0
Female	39,148	30,604	42,297	57,982	64,271	64.2	10.8	37,246	36,549	39,648	41,464	44,519	19.5	7.4
First-time, full-time students	116,507	102,096	147,266	147,317	153,545	31.8	4.2	46,525	41,173	46,670	47,416	50,253	8.0	6.0
U.S. citizens and permanent residents[a]	68,897	79,715	82,441	72,404	75,236	9.2	3.9	27,177	27,744	27,515	26,758	27,049	-0.5	1.1
Male	28,005	32,396	32,799	28,218	30,058	7.3	6.5	13,366	13,419	12,694	12,294	12,456	-6.8	1.3
Female	40,892	47,319	49,642	44,186	45,178	10.5	2.2	13,811	14,325	14,821	14,464	14,593	5.7	0.9
Hispanic or Latino	9,034	11,483	12,193	10,881	11,666	29.1	7.2	3,267	3,383	3,669	3,579	3,677	12.5	2.7
Not Hispanic or Latino														
American Indian or Alaska Native	314	306	337	353	307	-2.2	-13.0	115	96	85	108	86	-25.2	-20.4
Asian	8,487	9,685	11,187	10,072	10,810	27.4	7.3	3,008	3,153	3,329	3,384	3,532	17.4	4.4
Black or African American	6,188	7,664	7,606	6,717	7,360	18.9	9.6	1,637	1,726	2,038	1,850	2,053	25.4	11.0
Native Hawaiian or Other Pacific Islander	136	135	150	113	100	-26.5	-11.5	24	27	33	26	24	0.0	-7.7
White	39,055	44,007	44,446	38,316	38,430	-1.6	0.3	17,067	16,886	16,060	15,407	15,137	-11.3	-1.8

Table 1

Enrollment of master's students and doctoral students in science, engineering, and health, by enrollment intensity, sex, citizenship status, race, and ethnicity: 2019–23

(Number and percent change)

Characteristic	Master's students							Doctoral students						
						Percent change							Percent change	
	2019	2020	2021	2022	2023	2019–23	2022–23	2019	2020	2021	2022	2023	2019–23	2022–23
More than one race	2,498	3,063	3,293	3,141	3,207	28.4	2.1	1,047	1,160	1,195	1,276	1,392	33.0	9.1
Unknown race and ethnicity	3,185	3,372	3,229	2,811	3,356	5.4	19.4	1,012	1,313	1,106	1,128	1,148	13.4	1.8
Temporary visa holders	47,610	22,381	64,825	74,913	78,309	64.5	4.5	19,348	13,429	19,155	20,658	23,204	19.9	12.3
Male	28,568	12,678	40,068	45,912	48,178	68.6	4.9	12,035	8,193	11,704	12,405	13,908	15.6	12.1
Female	19,042	9,703	24,757	29,001	30,131	58.2	3.9	7,313	5,236	7,451	8,253	9,296	27.1	12.6

[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.

Trends in Enrollment, by Citizenship Status

Enrollment in full-time master's programs has been increasing for the past several years. Between 2022 and 2023, the number of students grew 3.2%, from 319,618 to 329,971 (table 1). Full-time doctoral enrollment also rose by 3.4% over the same period, from 259,683 to 268,617.

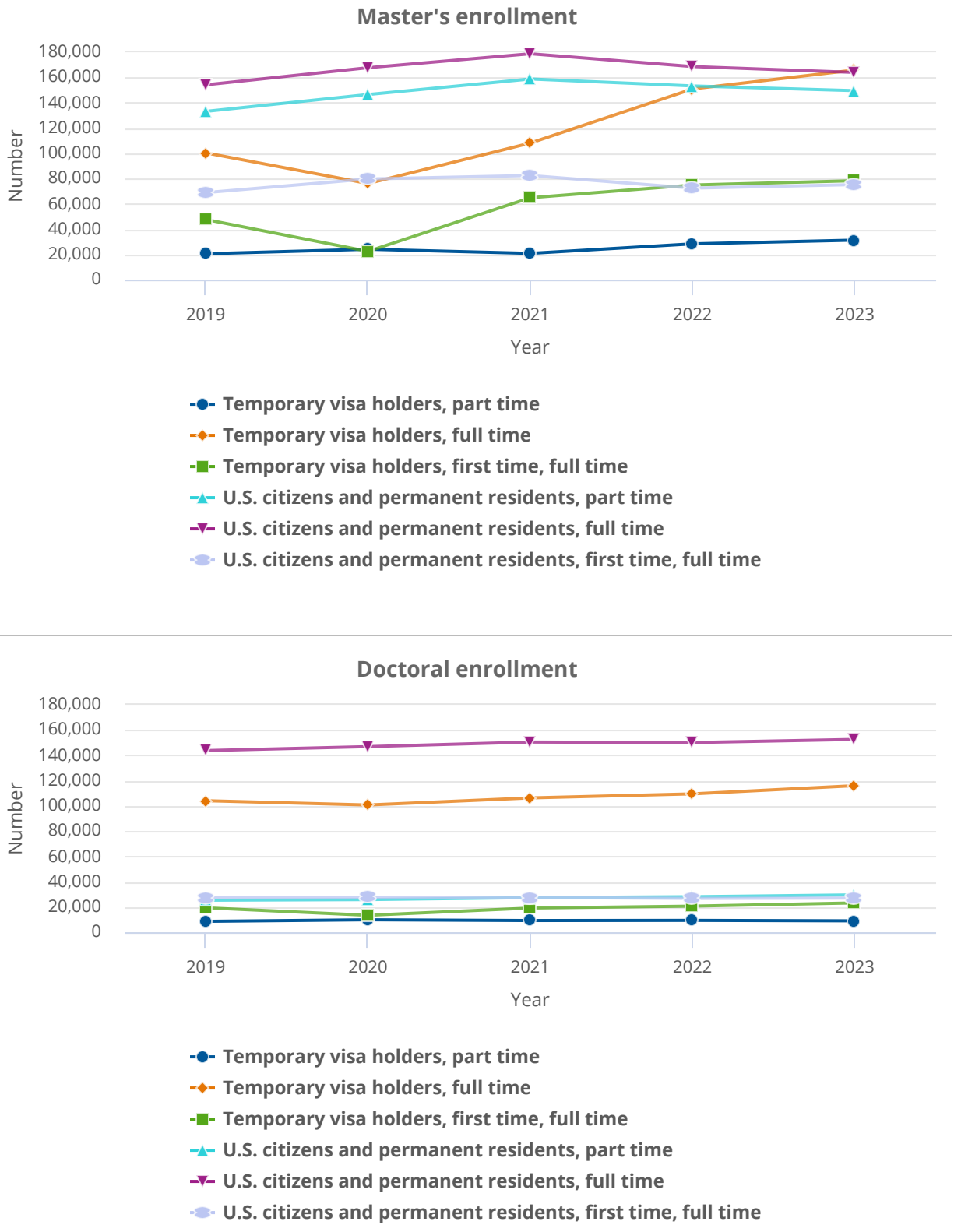
Between 2022 and 2023, part-time enrollment of master's students declined slightly to 180,895 (0.4%), whereas part-time enrollment of doctoral students rose from 37,540 to 38,612 (2.9%). Over the previous 5 years, from 2019 to 2023, enrollment of part-time master's students increased by 27,199 (17.7%), whereas doctoral part-time enrollment increased 4,633 (13.6%).

Temporary Visa Holders

Much of the increases in the overall SEH graduate student enrollment noted above were driven by students with temporary visas. The enrollment of temporary visa holders in SEH full-time master's and doctoral programs increased between 2022 and 2023 (figure 1 and table 1). Among temporary visa holders enrolled full time, there was a 14,994 (9.9%) increase in master's students and a 6,473 (5.9%) increase in doctoral students during this period. First-time, full-time enrollment of students with temporary visas increased 3,396 (4.5%) for master's students and 2,546 (12.3%) for doctoral students between 2022 and 2023.

Figure 1

Enrollment of master's and doctoral students in science, engineering, and health fields, by citizenship status and enrollment type: 2019–23



Note(s):
Graduate student data in this table include master's students in health sciences. For more information on the survey fields and comparability of these counts to other data from the National Center for Science and Engineering Statistics, see the survey's "Technical Notes" and table A-17 at https://ncses.nsf.gov/surveys/graduate-students-postdoctorates-s-e/2023#methodology.

Source(s):
National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

Among temporary visa holders in SEH, female graduate enrollment at both the master's and doctoral levels grew slightly faster than male graduate enrollment. Specifically, part-time master's enrollment for temporary visa holders between 2022 and 2023 increased by 1,681 (9.6%) for men, compared with 1,276 (11.8%) for women (table 1). Similarly, full-time enrollment in master's programs for temporary visa holders increased by 8,705 (9.4%) for men, compared with 6,289 (10.8%) for women. For doctoral enrollments of temporary visa holders between 2022 and 2023, part-time enrollment decreased by 43 (1.2%) for women and by 329 (5.5%) for men; however, full-time enrollment increased by 3,055 (7.4%) for women and 3,418 (5.0%) for men.

U.S. Citizens and Permanent Residents

Graduate SEH enrollment of U.S. citizens and permanent residents decreased overall between 2022 and 2023, although these numbers are still higher than they were in 2019. Among master's students, there was a decline of 3,755 (2.4%) between 2022 and 2023 for part-time enrollment and a decline of 4,641 (2.8%) for full-time enrollment (table 1). First-time, full-time master's enrollment for this group increased by 2,832 (3.9%) over this period. The trends among doctoral students who were U.S. citizens and permanent residents differed. In this group, part-time doctoral enrollment rose by 1,444 (5.1%), whereas full-time doctoral enrollment increased by 2,461 (1.6%).

Demographic Trends in Enrollment for U.S. Citizens and Permanent Residents

Year-over-year enrollment patterns varied by sex, race, and ethnicity (table 1). Among female full-time graduate students who were U.S. citizens and permanent residents, master's-level enrollment decreased by 3,394 (3.3%); doctoral-level enrollment increased by 2,539 (3.3%). Meanwhile, among a comparable group of men, enrollment of full-time master's students decreased by 1,247 (1.9%), and full-time doctoral enrollment saw a very modest decline of 78 (0.1%). However, first-time, full-time doctoral enrollment for U.S. citizens and permanent residents increased by 162 (1.3%) for males and increased by 129 (0.9%) for females.

Enrollment trends by race and ethnicity for U.S. citizens and permanent residents also varied (table 1). Among Hispanic and Latino students enrolled full time, master's enrollment dipped slightly by 78 (0.3%) between 2022 and 2023 and doctoral enrollment increased by 925 (5.0%). Among Asian students enrolled full time, master's enrollment increased by 229 (1.1%), and doctoral enrollment increased by 938 (5.2%).

Five-year enrollment trends also show consistent growth for several racial and ethnic groups. Between 2019 and 2023, full-time enrollment in master's programs increased by 5,430 (26.4%) for Hispanic and Latino students, by 4,680 (27.7%) for Asian students, by 1,842 (13.2%) for Black and African American students, and by 1,360 (24.5%) for those of more than one race. For all other racial and ethnic groups, full-time master's enrollment either declined or remained stable.

Full-time doctoral enrollment for each of these groups followed similar patterns of increase over the past 5 years, with Black or African American enrollment increasing by 2,783 (34.9%). Full-time doctoral enrollment increased for all racial and ethnic groups except for American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and White; these three groups saw slight decreases. Among part-time SEH graduate enrollment, almost every racial and ethnic group saw increases over the past 5 years, although the growth tended to be larger among master's students than among doctoral students (table 1).

Field of Study Trends for Master's and Doctoral Students

Master's and doctoral enrollment in SEH fields continued increasing, reaching an all-time high of 818,095 in 2023 (510,866 master's students and 307,229 doctoral students) (table 2). Between 2022 and 2023, growth in master's student enrollment was driven by increases in science fields of study, which grew by 16,537 (5.0%). In contrast, enrollment for master's students decreased in engineering by 2,453 (2.4%) and health by 4,529 (6.8%). Conversely, doctoral enrollment grew for all three fields during this time: science by 6,786 (3.3%), engineering by 2,012 (2.8%), and health by 1,208 (6.7%) (table 2).

Table 2

Enrollment of master's students and doctoral students in science, engineering, and health, by field: 2019–23

(Number)

Characteristic	Master's students							Doctoral students						
						Percent change							Percent change	
	2019	2020	2021	2022	2023	2019–23	2022–23	2019	2020	2021	2022	2023	2019–23	2022–23
All graduate students	408,228	414,478	466,613	501,311	510,866	25.1	1.9	281,889	283,335	293,543	297,223	307,229	9.0	3.4
Science and engineering	351,734	354,354	400,922	435,003	449,087	27.7	3.2	265,961	268,021	276,912	279,163	287,961	8.3	3.2
Science	259,795	267,904	305,796	331,983	348,520	34.2	5.0	193,896	196,742	203,988	206,183	212,969	9.8	3.3
Agricultural and veterinary sciences	5,629	6,487	6,801	6,949	6,901	22.6	-0.7	3,889	4,313	4,443	4,647	4,854	24.8	4.5
Biological and biomedical sciences	38,078	39,920	42,728	43,062	44,703	17.4	3.8	53,915	54,905	58,155	59,638	60,863	12.9	2.1
Computer and information sciences	84,092	80,690	102,199	129,972	143,530	70.7	10.4	17,192	18,174	19,531	20,583	22,484	30.8	9.2
Geosciences, atmospheric sciences, and ocean sciences	5,327	5,277	5,520	5,186	4,793	-10.0	-7.6	6,551	6,515	6,770	6,784	6,801	3.8	0.3
Mathematics and statistics	19,594	18,284	20,639	20,798	20,105	2.6	-3.3	13,565	13,687	13,619	13,589	13,788	1.6	1.5
Multidisciplinary and interdisciplinary sciences	8,203	10,980	11,994	16,931	21,928	167.3	29.5	2,978	3,553	3,774	4,014	4,501	51.1	12.1
Natural resources and conservation	8,066	8,793	10,012	9,807	9,486	17.6	-3.3	3,677	3,705	3,910	3,955	4,004	8.9	1.2
Physical sciences	6,361	6,275	6,409	6,256	6,000	-5.7	-4.1	36,506	36,341	37,732	37,836	38,329	5.0	1.3
Psychology	40,838	47,279	51,878	48,321	49,474	21.1	2.4	20,231	21,115	21,447	21,121	24,354	20.4	15.3
Social sciences	43,607	43,919	47,616	44,701	41,600	-4.6	-6.9	35,392	34,434	34,607	34,016	32,991	-6.8	-3.0
Engineering	91,939	86,450	95,126	103,020	100,567	9.4	-2.4	72,065	71,279	72,924	72,980	74,992	4.1	2.8
Aerospace, aeronautical, and astronautical engineering	3,701	4,326	5,065	5,263	5,380	45.4	2.2	2,554	2,645	2,773	2,832	2,884	12.9	1.8
Biological, biomedical, and biosystems engineering	4,424	4,536	5,192	5,177	5,204	17.6	0.5	7,934	8,239	8,867	9,265	9,999	26.0	7.9
Chemical, petroleum, and chemical-related engineering	3,274	2,942	2,983	3,011	2,658	-18.8	-11.7	7,664	7,612	7,713	7,590	7,888	2.9	3.9
Civil, environmental, transportation, and related engineering fields	11,873	10,819	11,730	12,621	12,082	1.8	-4.3	7,752	7,485	7,878	7,754	7,852	1.3	1.3
Electrical, electronics, communications, and computer engineering	28,177	25,312	27,695	32,316	31,093	10.3	-3.8	18,577	17,720	17,570	17,585	17,706	-4.7	0.7

Table 2

Enrollment of master's students and doctoral students in science, engineering, and health, by field: 2019–23

(Number)

Characteristic	Master's students							Doctoral students						
						Percent change							Percent change	
	2019	2020	2021	2022	2023	2019–23	2022–23	2019	2020	2021	2022	2023	2019–23	2022–23
Industrial, manufacturing, systems engineering, and operations research	11,912	11,030	11,949	12,579	11,873	-0.3	-5.6	3,762	3,839	3,921	3,856	3,889	3.4	0.9
Mechanical engineering	14,861	14,305	15,718	16,029	15,335	3.2	-4.3	11,247	11,477	11,540	11,523	11,679	3.8	1.4
Metallurgical, mining, materials, and related engineering fields	2,266	2,299	2,518	2,545	2,462	8.6	-3.3	4,817	4,882	4,904	4,573	4,782	-0.7	4.6
Other engineering	11,451	10,881	12,276	13,479	14,480	26.5	7.4	7,758	7,380	7,758	8,002	8,313	7.2	3.9
Health	56,494	60,124	65,691	66,308	61,779	9.4	-6.8	15,928	15,314	16,631	18,060	19,268	21.0	6.7
Clinical medicine	26,251	29,748	34,021	33,251	28,484	8.5	-14.3	4,571	4,796	5,612	5,966	6,174	35.1	3.5
Other health	30,243	30,376	31,670	33,057	33,295	10.1	0.7	11,357	10,518	11,019	12,094	13,094	15.3	8.3

Note(s):
For more information on the mapping of fields and codes in the Survey of Graduate Students and Postdoctorates in Science and Engineering, see table A-17 at https://ncses.nsf.gov/surveys/graduate-students-postdoctorates-s-e/2023#technical-tables.

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 reached a record high of 510,866 in 2023, an increase of 1.9% over 2022 and of 25.1% over 2019 (table 2). As noted above, these gains were primarily the result of increases in science enrollment, although numbers of both engineering and health graduate students decreased during this period. However, all three fields have grown over the past 5 years. Since 2019, master's enrollment in science fields increased by 34.2%, and the gains in engineering (9.4%) and health (9.4%) were notable though more modest.

For master's students, multidisciplinary and interdisciplinary sciences had the largest percentage increases in enrollment between 2022 and 2023 (29.5%, or 4,997 students), based on the increase in students in data science and analytics (table 2 and full set of data tables: table 1-11a). However, the computer and information sciences field had the largest numeric increase (rising by 13,558 to a total of 143,530 students, an increase of 10.4% from 2022). At the master's level, this is the largest broad field in the GSS, enrolling over a quarter of master's students.[1] Among engineering broad fields, only two areas of study saw increased enrollment between 2022 and 2023: other engineering[2] increased by 1,001 (7.4%), and aerospace, aeronautical, and astronautical engineering increased by 117 (2.2%). All of the remaining engineering and health subfields either decreased or remained stable.

These declines in engineering and health fields diverge from a pattern of year-to-year increases in most of these areas of study over the previous 5 years. Over a 5-year time span, the 2 health subfields and all but 1 of the 9 engineering subfields had either stable or increasing master's enrollment (chemical, petroleum, and chemical-related engineering enrollment declined 18.8%, down from 3,274 students in 2019 to 2,658 students in 2023; table 2). Master's enrollment in 3 of the 10 science subfields have also declined over the past 5 years: geosciences, atmospheric sciences, and ocean sciences (10.0%), physical sciences (5.7%), and social sciences (4.6%).

Doctoral Enrollment Trends, by Field

As with master's enrollment, doctoral enrollment also rose to a record high in 2023 of 307,229 (table 2). From 2022 to 2023, health fields (6.7%) grew the most percentagewise, followed by science (3.3%) and engineering (2.8%). Similarly, over the past 5 years, health fields (21.0%) had the largest growth, followed by science (9.8%) and engineering (4.1%).

Growth from 2022 to 2023 shows psychology (15.3%), multidisciplinary and interdisciplinary sciences (12.1%), computer and information sciences (9.2%), and other health (8.3%) were the top four fastest-growing doctoral fields percentagewise.[3]

Trends in Postdoc and NFR Employment

The numbers of both postdoctoral appointees and NFRs rose between 2022 and 2023 (table 3 and table 4). Overall, postdoc employment increased by 3,100 (4.9%). However, due to several previous years of decline, the number of postdocs was similar in 2023 (65,850) and in 2020 (65,681). Conversely, NFR employment counts increased by 3,993 (13.2%) since 2019 and by 2,063 (6.4%) between 2022 and 2023.

Table 3

Postdoc employment, by sex, citizenship status, race, and ethnicity: 2019–23

(Number)

Characteristic	Postdoctoral appointees						
						Percent change	
	2019	2020	2021	2022	2023	2019–23	2022–23
All surveyed fields	66,247	65,681	63,328	62,750	65,850	-0.6	4.9
U.S. citizens and permanent residents[a]	29,452	29,890	29,755	27,289	27,701	-5.9	1.5
Male	15,570	15,579	15,480	14,247	14,321	-8.0	0.5
Female	13,882	14,311	14,275	13,042	13,380	-3.6	2.6

Table 3

Postdoc employment, by sex, citizenship status, race, and ethnicity: 2019–23

(Number)

Characteristic	Postdoctoral appointees						
						Percent change	
	2019	2020	2021	2022	2023	2019–23	2022–23
Hispanic or Latino	1,924	2,027	2,142	2,192	2,352	22.2	7.3
Not Hispanic or Latino							
American Indian or Alaska Native	69	72	80	92	111	60.9	20.7
Asian	5,891	5,696	6,014	5,286	5,631	-4.4	6.5
Black or African American	1,088	1,081	1,138	1,141	1,230	13.1	7.8
Native Hawaiian or Other Pacific Islander	52	52	40	34	57	9.6	67.6
White	16,972	17,123	16,369	15,221	14,585	-14.1	-4.2
More than one race	519	555	687	638	694	33.7	8.8
Unknown race and ethnicity	2,937	3,284	3,285	2,685	3,041	3.5	13.3
Temporary visa holders	36,795	35,791	33,573	35,461	38,149	3.7	7.6
Male	23,603	22,660	21,040	21,791	23,137	-2.0	6.2
Female	13,192	13,131	12,533	13,670	15,012	13.8	9.8

[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.

Table 4

Postdoc and nonfaculty researcher employment, by field: 2019–23

(Number and percent change)

Characteristic	Postdoctoral appointees							Nonfaculty researchers						
						Percent change							Percent change	
	2019	2020	2021	2022	2023	2019–23	2022–23	2019	2020	2021	2022	2023	2019–23	2022–23
All surveyed fields	66,247	65,681	63,328	62,750	65,850	-0.6	4.9	30,349	29,661	30,548	32,279	34,342	13.2	6.4
Science and engineering	46,769	47,203	45,529	45,008	47,033	0.6	4.5	22,728	22,133	22,720	23,778	25,175	10.8	5.9
Science	38,503	38,741	37,189	36,673	37,982	-1.4	3.6	18,819	18,212	18,728	19,423	20,600	9.5	6.1
Agricultural and veterinary sciences	1,079	1,678	1,595	1,705	1,993	84.7	16.9	645	964	902	1,068	1,238	91.9	15.9
Biological and biomedical sciences	21,847	21,902	20,245	19,585	19,520	-10.7	-0.3	8,229	8,112	8,187	8,207	8,589	4.4	4.7
Computer and information sciences	878	823	880	859	987	12.4	14.9	510	458	457	507	631	23.7	24.5
Geosciences, atmospheric sciences, and ocean sciences	1,778	1,790	1,797	1,787	1,919	7.9	7.4	2,177	2,150	2,308	2,448	2,455	12.8	0.3
Mathematics and statistics	1,070	1,076	1,112	1,110	1,220	14.0	9.9	305	201	235	251	307	0.7	22.3
Multidisciplinary and interdisciplinary sciences	972	832	878	840	988	1.6	17.6	820	679	816	931	818	-0.2	-12.1

Table 4

Postdoc and nonfaculty researcher employment, by field: 2019–23

(Number and percent change)

Characteristic	Postdoctoral appointees							Nonfaculty researchers						
						Percent change							Percent change	
	2019	2020	2021	2022	2023	2019–23	2022–23	2019	2020	2021	2022	2023	2019–23	2022–23
Natural resources and conservation	806	845	889	936	937	16.3	0.1	582	573	620	605	663	13.9	9.6
Physical sciences	7,159	6,937	6,823	6,877	7,220	0.9	5.0	3,316	2,890	2,895	2,894	3,095	-6.7	6.9
Psychology	1,152	1,312	1,325	1,308	1,344	16.7	2.8	576	749	803	786	950	64.9	20.9
Social sciences	1,762	1,546	1,645	1,666	1,854	5.2	11.3	1,659	1,436	1,505	1,726	1,854	11.8	7.4
Engineering	8,266	8,462	8,340	8,335	9,051	9.5	8.6	3,909	3,921	3,992	4,355	4,575	17.0	5.1
Aerospace, aeronautical, and astronautical engineering	227	233	277	244	254	11.9	4.1	124	149	144	153	166	33.9	8.5
Biological, biomedical, and biosystems engineering	1,602	1,696	1,616	1,540	1,594	-0.5	3.5	545	525	589	685	674	23.7	-1.6
Chemical, petroleum, and chemical-related engineering	1,229	1,157	1,167	1,239	1,501	22.1	21.1	410	330	307	313	349	-14.9	11.5
Civil, environmental, transportation, and related engineering fields	865	1,006	968	1,018	1,070	23.7	5.1	492	488	479	569	654	32.9	14.9
Electrical, electronics, communications, and computer engineering	1,305	1,302	1,275	1,217	1,339	2.6	10.0	637	706	755	734	799	25.4	8.9
Industrial, manufacturing, systems engineering, and operations research	167	194	127	143	170	1.8	18.9	137	155	107	197	221	61.3	12.2
Mechanical engineering	1,142	1,149	1,200	1,189	1,317	15.3	10.8	531	469	529	527	560	5.5	6.3
Metallurgical, mining, materials, and related engineering fields	665	630	562	542	557	-16.2	2.8	303	299	259	280	249	-17.8	-11.1
Other engineering	1,064	1,095	1,148	1,203	1,249	17.4	3.8	730	800	823	897	903	23.7	0.7
Health	19,478	18,478	17,799	17,742	18,817	-3.4	6.1	7,621	7,528	7,828	8,501	9,167	20.3	7.8
Clinical medicine	16,650	16,287	15,561	15,630	16,393	-1.5	4.9	6,273	6,500	6,751	7,351	7,798	24.3	6.1
Other health	2,828	2,191	2,238	2,112	2,424	-14.3	14.8	1,348	1,028	1,077	1,150	1,369	1.6	19.0

Note(s):
For more information on the mapping of fields and codes in the Survey of Graduate Students and Postdoctorates in Science and Engineering, see table A-17 at https://ncses.nsf.gov/surveys/graduate-students-postdoctorates-s-e/2023#technical-tables.

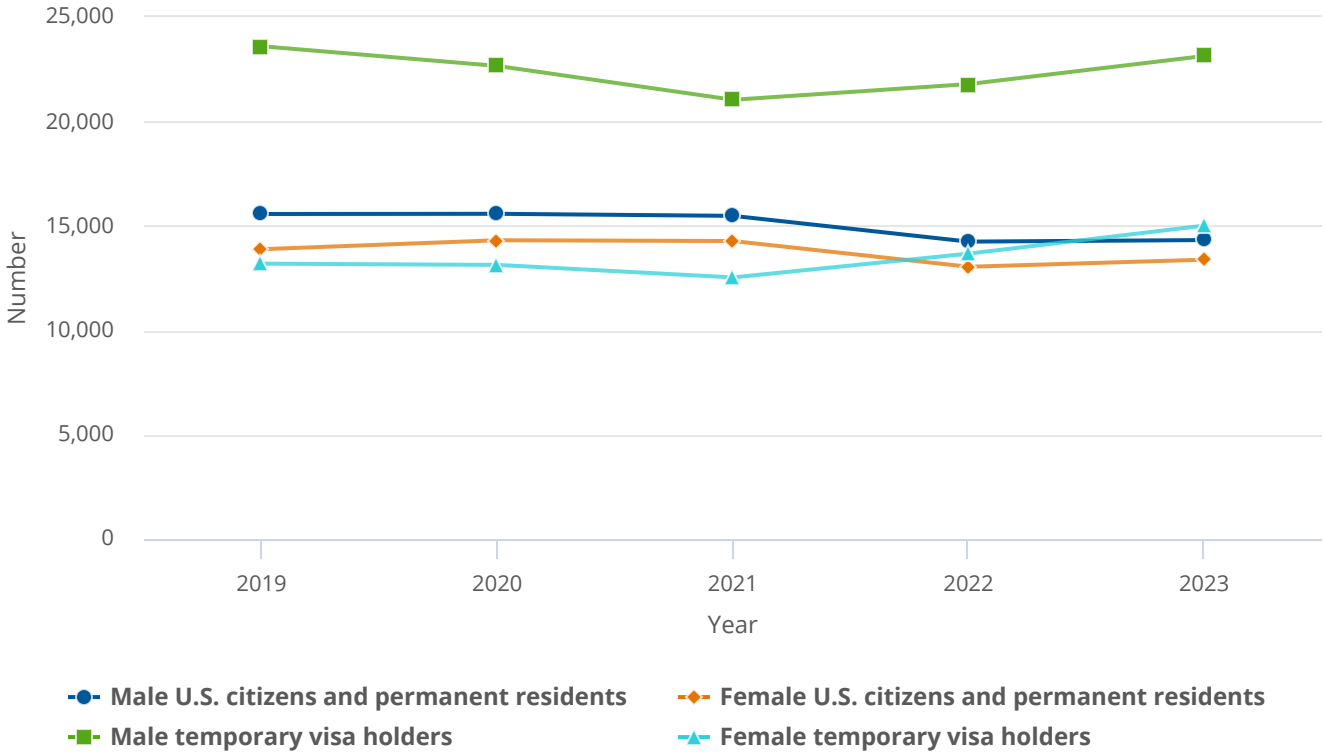
Source(s):
National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

Demographics of Postdocs

The rise in postdoctoral appointments resulted mainly from an increase in postdocs with temporary visas (table 3). Between 2022 and 2023, there was an increase of 2,688 (7.6%) in temporary visa–holding postdocs, and between 2019 and 2023, there was an increase of 1,354 (3.7%). There were also notable sex differences in these trends. Although male postdocs holding temporary visas increased by 1,342 (6.2%) between 2022 and 2023, there were 466 (2%) fewer male temporary visa–holding postdocs in 2023 than there were in 2019. In contrast, the number of female postdocs with temporary visas increased by 1,346 (9.8%) since 2022 and by 1,820 (13.8%) since 2019. In 2023, there were more female postdocs on temporary visas than male U.S. citizens and permanent residents or female U.S. citizens and permanent residents (figure 2).

Figure 2

Postdoc employment, by sex and citizenship status: 2019–23



Source(s):
National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

The number of U.S. citizen and permanent resident postdocs increased slightly by 412 (1.5%) from 2022 to 2023 but declined by 1,751 (5.9%) since 2019 (table 3). Proportionally, there were more postdocs who held temporary visas in 2019 (55.5%) and in 2023 (57.9%) than U.S. citizens and permanent residents in the same years (45.5% and 42.1%, respectively).

Field of Research

From 2022 to 2023, postdoctoral appointments increased by 1,309 (3.6%) in science, 716 (8.6%) in engineering, and 1,075 (6.1%) in health (table 4). Several broad fields had notable 1-year changes. In science fields, multidisciplinary and interdisciplinary sciences postdocs increased by 148 (17.6%), agricultural and veterinary sciences postdocs increased by 288 (16.9%), and computer and information sciences postdocs increased by 128 (14.9%). In engineering fields, chemical, petroleum, and chemical-related engineering saw a 262 (21.1%) increase in postdocs, whereas industrial, manufacturing, systems engineering, and operations research saw a 27 postdoc (18.9%) increase. All other broad fields either rose as well or remained stable, including both health fields.

In 2023, the two largest fields for postdocs were biological and biomedical sciences with 19,520 postdocs and clinical medicine with 16,393. These are the only two fields employing more than 10,000 postdocs; together, they accounted for 54.5% of all postdoctoral employment. Between 2019 and 2023, biological and biomedical sciences declined by 2,327 postdocs (10.7%), and clinical medicine fell by 257 (1.5%). However, in the most recent year, from 2022 and 2023, biological and biomedical sciences postdocs remained stable, whereas clinical medicine postdoc counts increased by 763 postdocs (4.9%).

Over the period from 2019 to 2023, NFR employment increased by 3,993 (13.2%), and between 2022 and 2023, it rose by 2,063 (6.4%) (table 4). Between 2022 and 2023, computer and information sciences experienced the largest 1-year percentage increase at 24.5%, or 124 NFRs. Additionally, clinical medicine had the largest numeric increase rising by 447 NFRs (6.1%). Similar to postdoc appointments, biological and biomedical sciences remain the largest field for NFR employment, with 8,589 NFRs reported. This is followed closely by clinical health NFRs, which totaled 7,798 in 2023. Together, these two fields comprise 47.7% of all SEH NFR employment.

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 2023 GSS collected data from 22,802 organizational units (departments, programs, affiliated research centers, and health care facilities) at 687 eligible institutions and their affiliates in the United States, Puerto Rico, and Guam. The unit response rate was 97.8%. An overview of the survey is available at the survey homepage.

In 2020, the GSS amended its taxonomy to align with a revised NCSES Taxonomy of Disciplines (TOD) and 2020 National Center for Education Statistics (NCES) Classification of Instructional Programs (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; although 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 additional detail in some fields were made to the GSS taxonomy based on the 2020 CIP codes reported to GSS. Finally, similar to science and health, broad fields were added to engineering.

At the field level, some notable changes 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 under social sciences, to align with the 2020 TOD. Finally, 22 new 2020 CIP codes were added to multidisciplinary and interdisciplinary sciences; 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 the technical tables: tables A-17, A-18a, and A-18b (https://ncses.nsf.gov/pubs/nsf22319).

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 2023 survey is available at https://ncses.nsf.gov/surveys/graduate-students-postdoctorates-s-e/. Data are also available in NCSES's interactive data tool (https://ncsesdata.nsf.gov/ids/gss). For more information about the survey, contact the Survey Manager, Michael I. Yamaner.

NCSES has reviewed this product for unauthorized disclosure of confidential information and approved its release (NCSES-DRN24-043).

Notes

1 For more information, see the full set of data tables: table 4-3.

2 Other engineering includes agricultural engineering; engineering mechanics; physics; and science, nuclear engineering, and engineering not elsewhere classified.

3 For more information, see the full set of data tables: table 1-11b.

Suggested Citation

Smith B, Arbeit CA, Thompson H, Yamaner MI; National Center for Science and Engineering Statistics (NCSES). 2024. *Graduate Enrollment and Postdoctoral Appointments in Science, Engineering, and Health Rise, Driven Largely by Increases in the Number of Women and Temporary Visa Holders.* NSF 25-316. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/pubs/nsf25316.

Contact Us

Report Author(s)

Bethany Smith
KEN Consulting, Inc., under subcontract to RTI International

Caren A. Arbeit
RTI International, under contract to NCSES

Herbert Thompson
KEN Consulting, Inc., under subcontract to RTI International

Michael I. Yamaner
Survey Manager
NCSES
Tel: (703) 292-7815
E-mail: myamaner@nsf.gov

NCSES

National Center for Science and Engineering Statistics
Directorate for Social, Behavioral and Economic Sciences
U.S. National Science Foundation
2415 Eisenhower Avenue, Suite W14200
Alexandria, VA 22314
Tel: (703) 292-8780
FIRS: (800) 877-8339
TDD: (800) 281-8749
E-mail: ncsesweb@nsf.gov