DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES (EHR)

$1,287,270,000
+$177,010,000 / 15.9%

EHR Funding
(Dollars in Millions)

	FY 2020 Actual	FY 2020 CARES Act Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Percent
Division of Research on Learning in Formal and Informal Settings (DRL)	$198.62	$2.16	$204.16	$229.66	$25.50	12.5%
Division of Undergraduate Education (DUE)	269.37	1.38	270.10	283.10	13.00	4.8%
Division of Human Resource Development (HRD)	210.77	0.80	215.36	307.88	92.52	43.0%
Division of Graduate Education (DGE)[1]	405.48	0.66	420.64	466.63	45.99	10.9%
Total	**$1,084.24**	**$5.00**	**$1,110.26**	**$1,287.27**	**$177.01**	**15.9%**

[1] In FY 2022, full funding for the Graduate Research Fellowship Program is in the EHR with funds from IA moved to the Division of Graduate Education. The table above shows all years in the new structure for comparability.

About EHR

The work of EHR is closely aligned with the Administration's priorities of advancing equity and addressing systemic racism to remove barriers for diverse communities. Through existing programs EHR supports activities and research that aim to increase participation in science and engineering of individuals from racial and ethnic groups who are traditionally underrepresented in STEM fields, including MSIs. When coupled with equally important priorities to expand clean energy, strengthen the economy, and maintain global competitiveness in emerging technologies, it is apparent that STEM education and research play a central role in fostering the necessary social and economic infrastructure to support these initiatives. Now, more than ever, the Nation needs a robust STEM enterprise comprised of a diverse, highly skilled U.S. STEM workforce with competitive salaries and STEM-literate public to address societal challenges that were exacerbated by the global pandemic and support a vibrant U.S. economy.

The STEM enterprise is a microcosm of society and the challenges that impact society are reflected and often magnified in STEM education at all levels. To bolster STEM education communities most challenged in FY 2021, EHR increased investments in racial equity research across the directorate while also expanding opportunities for community colleges and supplements to fund post-doctoral training in STEM education. Through EHR's investments in foundational and future-oriented STEM educational research, the results of funded research are used to inform STEM programs and practices, to ensure the prosperity of the Nation through a well-educated STEM workforce which will contribute to efforts to raise the Nation's leadership in STEM education. Like all research, results might be applied more immediately or well into the future. As such, in FY 2022, EHR will deepen efforts to build capacity for STEM education research and identify and tackle the challenges in STEM education needed to create a well-paid workforce for the emerging industries that will help drive the U.S. economy. Thus, the EHR research portfolio invests in projects to address foundational (perennial) issues in STEM education by exploring persistent questions about the learning and teaching of STEM content, as well as future-oriented areas that result from changes in technology, the Nation's demography, the economy, and new directions in STEM. These areas include how and what to teach students so that they are prepared to engage with AI, QIS, and computing, and how to do so in a manner, whether virtually, in-person, or in a blended format, that reduces demographic disparities. EHR's partnership with Boeing is one model for leveraging public-private partnerships to develop the STEM workforce for emerging industries. In FY 2020, EHR and Boeing focused on how to develop the workforce in model-based engineering, mechatronics, and data science/sensor analytics through the use of flexible, personalized learning systems. In FY 2022, EHR will continue to study the implementation of personalized learning systems in developing the STEM workforce, while engaging in conversations with potential industry partners that build on successful collaborations with Boeing, Accenture, General Electric

and Intel.

EHR allocations across divisions are designed to accomplish the collective work of the directorate, best described by three underlying themes: contributing to research on STEM learning and learning environments, broadening participation and institutional capacity in STEM, and developing the STEM professional workforce. Progress in STEM depends on innovators and future leaders in the Nation's science and engineering (S&E) enterprise in both the public and private sectors. Innovators from PK-12 and informal learning environments are critical members of the future STEM and STEM-related workforce. Through its scholarship, fellowship, and traineeship programs, EHR supports the development of talent at the undergraduate and graduate levels. EHR programs such as the Advanced Technology Education (ATE) support the STEM-specific workforce, including a data-skilled workforce and the broader workforce that rely on STEM skills, thus addressing the Nation's critical need for a highly skilled technical workforce that reflects the diversity of society and is attractive to employers that offer competitive salaries. The Centers of Research Excellence in Science and Technology (CREST), the Alliances for Graduate Education and the Professoriate (AGEP), and the Graduate Research Fellowship Program (GRFP) serve to provide graduate students and faculty with the research experiences needed to enter the workforce of the future.

The progress of S&E also depends on a public that can take full advantage of well-paid STEM-related employment opportunities that help drive the U.S. economy, and that values and participates in STEM, both formally and informally. The Discovery Research PreK-12 program (DRK-12) and Advancing Informal STEM Learning program (AISL) both support evidence-based approaches to learning in formal and informal settings. Importantly, the opportunities made possible by federal investments in STEM must be provided effectively to—and draw from—the full and diverse talent pool of the Nation. To this end, EHR continues to support the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP), the Improving Undergraduate STEM Education (IUSE): Hispanic-Serving Institutions (HSI) Program, and the Tribal Colleges and Universities Program (TCUP) to facilitate the advancement of early career STEM professionals at Minority Serving Institutions (MSIs) and to enhance the academic experience of students studying STEM at MSIs.

As a natural extension of EHR's experience in broadening participation, EHR serves as the steward for NSF INCLUDES, one of NSF's Big Ideas. EHR continues to make advances in knowledge generation and dissemination through NSF INCLUDES to understand what interventions work and under what conditions to broaden participation in STEM. For more information about NSF INCLUDES, see the narrative in the NSF-Wide Investments chapter.

EHR also supports NSF and Administration priorities through participation in Foundation-wide activities. Through existing programs, EHR invests in NSF's Big Ideas HDR, FW-HTF, and NNA. By incorporating the Big Ideas into the NRT's priority themes, EHR invests in the development of researchers with the necessary skills to conduct convergence research. In FY 2022, EHR continues to support SaTC, and NITRD (education and workforce), all of which provide opportunities for research on the intersection of artificial intelligence and education.

EHR continues its strong emphasis on evidence-based decision making and its commitment to generating robust evidence to inform the development, management, and assessment of its programs and portfolios of investment. A multi-year learning agenda (evidence-building plan) for EHR's STEM human capital development programs will inform and guide future actions. EHR experts in evaluation will continue to collaborate with staff in NSF's Evaluation and Assessment Capability in developing NSF-wide learning agendas and with other federal agencies to share best practices, work toward the use of common metrics and instruments, strengthen evidence-building capacity for decision-making, and support transparency and accountability. A similar multi-year learning agenda was developed for NSF INCLUDES in FY 2020 and a plan for implementation is under development.

Major Investments

EHR Major Investments

(Dollars in Millions)

Area of Investment[1,2]	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Percent
Advanced Manufacturing	$1.45	$2.00	$2.00	-	-
Artificial Intelligence	6.76	30.00	50.00	20.00	66.7%
Biotechnology	16.07	9.00	9.00	-	-
Graduate Research Fellowship Program[3]	284.51	284.52	318.52	34.00	11.9%
IUSE	89.99	90.00	90.00	-	-
Quantum Information Science	3.98	4.00	4.00	-	-
SaTC	55.00	60.00	70.00	10.00	16.7%
NSF's Big Ideas					
NSF INCLUDES	*20.75*	*20.00*	*46.50*	*26.50*	*132.5%*

[1] Major investments may have funding overlap and thus should not be summed.

[2] This table reflects this directorate's support for selected areas of investment. In other directorate narratives, areas of investment displayed in this table may differ and thus should not be summed across narratives.

[3] The Graduate Research Fellowship Program is consolidated within the EHR Division of Graduate Education in FY 2022 and is restated in prior years for comparability.

- AI in Education and Workforce: EHR activities in this area include investments in NRT for AI focused traineeships; the Artificial Intelligence Research Institutes; AI at the intersection of cybersecurity; as well as investments in AI across EHR programs.
- Biotechnology: EHR invests in biotechnology through research and workforce development programs.
- GRFP: In FY 2022, funding for GRFP will be stewarded in EHR. For more information on GRFP, see the Major Investments in STEM Graduate Education narrative within the NSF-Wide Investments chapter.
- IUSE: EHR will lead the NSF-wide IUSE activity. For more information, see the IUSE narrative within the NSF-Wide Investments chapter.
- QIS: EHR invests in QIS through education and workforce development programs to prepare a diverse quantum information science and engineering workforce.
- SaTC: EHR will support SaTC activities through the CyberCorps®: Scholarship for Service (SFS) program.
- NSF INCLUDES: EHR will support NSF INCLUDES Alliances. For more information, see the NSF INCLUDES narrative within the NSF-Wide Investments chapter.

<u>EHR Major Investments in Broadening Participation</u>

Education and Human Resource Directorate Programs to Broaden Participation

(Dollars in Millions)

	Amount of Funding Captured	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate	
					Amount	Percent
Broadening Participation: Focused Programs						
ADVANCE	100%	$18.00	$18.00	$20.50	$2.50	13.9%
Alliances for Grad Ed & the Professoriate (AGEP)	100%	8.00	8.00	12.00	$4.00	50.0%
Ctrs of Research Excellence in Science & Tech (CREST)	100%	24.00	24.00	39.00	$15.00	62.5%
Excellence Awards in Science & Engineering (EASE)[1]	100%	7.33	5.00	7.64	$2.64	52.8%
Historically Black Colleges & Universities Undergraduate Program (HBCU-UP)	100%	35.00	36.50	46.50	$10.00	27.4%
Improving Undergraduate STEM Education: Hispanic Serving Institutions (IUSE:HSI)	100%	45.00	46.50	56.50	$10.00	21.5%
NSF INCLUDES	100%	20.75	20.00	46.50	$26.50	132.5%
Louis Stokes Alliances for Minority Participation (LSAMP)	100%	47.49	49.50	69.50	$20.00	40.4%
NSF Scholarships in STEM (S-STEM)[2]	100%	79.91	132.75	121.85	-10.90	-8.2%
Tribal Colleges & Universities Program (TCUP)	100%	15.00	16.50	21.00	$4.50	27.3%
Subtotal, Focused Programs		**$300.48**	**$356.75**	**$440.99**	**$84.24**	**23.6%**
Broadening Participation: Emphasis Programs[3]						
Advancing Informal STEM Learning (AISL)	58%	36.24	36.25	40.60	4.35	12.0%
Computer Science for All (CSforALL)	62%	9.30	6.20	6.20	-	-
Discovery Research PreK-12 (DRK-12)	56%	53.20	53.20	53.20	-	-
EHR Core Research	62%	41.43	47.52	60.15	12.63	26.6%
Graduate Research Fellowship Program (GRFP)[4]	67%	189.48	189.49	212.13	22.64	11.9%
Improving Undergraduate STEM Education (IUSE)	64%	57.59	57.60	57.60	-	-
Innovative Technology Experiences for Students and Teachers (ITEST)[2]	74%	25.80	32.75	30.06	-2.69	-8.2%
Robert Noyce Teacher Scholarship Program (NOYCE)	59%	41.16	39.53	39.53	-	-
Subtotal, Emphasis Programs		**$454.22**	**$462.54**	**$499.48**	**$36.94**	**8.0%**
Total, EHR Broadening Participation Programs		**$754.70**	**$819.29**	**$940.47**	**$121.18**	**14.8%**

[1] The Excellence Awards in Science and Engineering (EASE) program is comprised of both Presidential Awards for Excellence in Science, Math and Engineering Mentoring (PAESMEM) and Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST).

[2] Innovative Technology Experiences for Students and Teachers (ITEST) and NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) are H1B Visa funded programs.

[3] Emphasis Programs have broadening participation as one of several emphases but broadening participation is not an explicit goal of the program. These programs are included at a percentage of their funding level.

[4] The Graduate Research Fellowship Program is consolidated within the EHR Division of Graduate Education in FY 2022 and is restated in prior years for comparability.

For more information on programs that support EHR Major Investments, see the narratives for individual EHR divisions.

EHR Funding for Centers Programs

EHR Funding for Centers Programs
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Percent
Artificial Intelligence Research Institutes	2.03	7.59	17.59	10.00	131.8%
Total	**$2.03**	**$7.59**	**$17.59**	**$10.00**	**131.8%**

For detailed information on individual centers programs, please see the NSF-Wide Investments chapter.

Appropriations Language

For necessary expenses in carrying out science, mathematics and engineering education and human resources programs and activities pursuant to the National Science Foundation Act of 1950 (42 U.S.C. 1861 et seq.), including services as authorized by section 3109 of title 5, United States Code, authorized travel, and rental of conference rooms in the District of Columbia, $~~968,000,000~~1,287,270,000, to remain available until September 30, ~~2022~~2023.

Education and Human Resources
FY 2022 Summary Statement
(Dollars in Millions)

	Enacted/ Request	Unobligated Balance Available Start of Year	Unobligated Balance Available End of Year	Adjustments to Prior Year Accounts	Transfers	Obligations Actual/ Estimates
FY 2020 Appropriation	$940.00	$5.66	-$4.25	$3.02	$2.55	$946.98
FY 2021 Estimated	968.00	4.25				972.25
FY 2022 Request	1,287.27					1,287.27
$ Change from FY 2021 Estimated						$315.02
% Change from FY 2021 Estimated						32.4%

Totals exclude reimbursable amounts.

Explanation of Carryover

Within the EHR account, $4.25 million was carried over into FY 2021, including $2.18 million in anticipated no-year recoveries.

Advanced Technological Education (ATE)
- Amount: $1.45 million
- Purpose: Funds became available late in FY 2020 after decommitment of an incremental grant commitment. Funds will be used on new ATE projects recommended for award.
- Obligation: FY 2021 Quarter 2 and Anticipated FY 2021 Quarter 3

Robert Noyce Teacher Scholarship Program (Noyce)
- Amount: $564,832
- Purpose: These funds will be used to invest in teacher preparation and/or support Noyce fellows during completion of a teaching obligation.
- Obligation: FY 2021 Quarter 2

The remaining $55,000 consists of funds from EHR for projects not funded in FY 2020.

Funding Profile

EHR Funding Profile			
	FY 2020 Actual Estimate	FY 2021 Estimate	FY 2022 Estimate
Statistics for Competitive Awards:			
Number of Proposals	4,337	4,400	4,700
Number of New Awards	996	950	1,300
Regular Appropriation	963	950	1,300
CARES Act	33		
Funding Rate	23%	22%	28%
Statistics for Research Grants:			
Number of Research Grant Proposals	3,322	3,200	3,500
Number of Research Grants	672	650	900
Regular Appropriation	643	650	900
CARES Act	29		
Funding Rate	20%	20%	26%
Median Annualized Award Size	$190,546	$260,000	$260,000
Average Annualized Award Size	$276,341	$280,000	$280,000
Average Award Duration, in years	2.9	2.9	2.9

In FY 2022, the number of research grant proposals is expected to increase by approximately 200 compared to the FY 2020 Actual, and EHR expects to award about 900 research grants accounting for the increase in overall grant funding. Average annual award size and duration are not expected to materially fluctuate in FY 2020 through FY 2022.

People Involved in EHR Activities

Number of People Involved in EHR Activities				
	FY 2020 Actual Estimate	FY 2020 CARES Act Actual Estimate	FY 2021 Estimate	FY 2022 Estimate
Senior Researchers	7,534	68	8,000	8,600
Other Professionals	2,238	26	2,200	2,600
Postdoctoral Associates	349	10	350	400
Graduate Students	11,300	26	11,300	13,400
Undergraduate Students	16,600	195	16,600	19,000
K-12 Teachers	37,800	2	37,800	43,300
K-12 Students	85,500	15	85,500	98,100
Total Number of People	**161,321**	**342**	**161,750**	**185,400**

DIVISION OF RESEARCH ON LEARNING IN FORMAL   **$229,660,000**
  AND INFORMAL SETTINGS (DRL)   **+$25,500,000 / 12.5%**

DRL Funding

(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Percent
Total	**$198.62**	**$204.16**	**$229.66**	**$25.50**	**12.5%**
Research	**183.62**	**194.16**	**219.66**	**25.50**	**13.1%**
Education	**15.00**	**10.00**	**10.00**	**-**	**-**

About DRL

DRL invests in foundational research to advance understanding about teaching and learning in STEM—including computer science and emerging fields such as data science, quantum information science, and artificial intelligence. With a focus on equity issues, the DRL portfolio addresses the design, implementation, and study of learning environments, models, and online learning platforms intended to enable STEM learning for all students—particularly those who have been underrepresented in STEM—through both formal and informal activities across the STEM ecosystem. Advances in STEM learning ultimately support individuals who pursue STEM careers, as well as the Nation's broader workforce that will increasingly require STEM knowledge. DRL's programs inform and support lifelong access to high-quality STEM learning opportunities that will enable building of the Nation's economy.

FY 2022 Summary

Research
- AISL resources will support design, adaptation, implementation, and research on innovative modes of lifelong learning in informal environments such as science museums, community centers, and public media that have been economically challenged and serve vulnerable populations. Emphases will include equity in STEM, workforce development, adult and family learning of STEM, public participation in scientific research, remote/online learning, and climate education.
- DRK-12 focuses on research and development of resources, models, and tools to help U.S. students pre-K-12 learn STEM, including computer science and emerging fields such as data science, quantum information science, and artificial intelligence. U.S. students benefit from a strong start beginning in early childhood, and continuing education in mathematics and other STEM disciplines. DRK-12 supports research and development of resources for teachers and schools across diverse educational settings including remote/online learning environments.
- EHR Core Research (ECR) funds enable significant progress on important basic and use-inspired basic research questions about STEM learning and teaching. ECR supports research and development addressing persistent issues in the learning and teaching of STEM content, such as equity issues in STEM education and the STEM workforce. ECR also supports future-oriented topics that envision STEM learning environments of the future, engage cutting-edge technologies in research methodologies, and evaluation of innovative models for broadening participation in STEM. In FY 2022, ECR will expand the portfolio of research on future-oriented topics in the education and training of a diverse workforce for emerging industries, push the boundaries of technology use in education including and beyond remote learning, and examine how learning will change because of advances in technology and developments in emerging industries. Researchers will need to develop new methodologies to tackle new questions. In FY 2022, EHR will continue efforts through the ECR Building Capacity in STEM Education Research initiative to develop human capital for future-oriented

STEM education research and encourage submissions from MSIs in discipline-based education and broadening participation research.

- National Artificial Intelligence Research Institutes in FY 2022: EHR will support research on AI in relation to education and the workforce, with an emphasis on supporting minority-serving institutions. The goal of the institutes is to improve learning and education, by incorporating AI into educational technology and anticipating how future workplaces will be changed by AI. There will be a particular focus on the changing roles of human teachers/educators, mentors and collaborators, and the changing nature of educational systems and workforce needs.

Education
- CSforAll addresses the national need to build computer science education opportunities and teacher preparation at the preK-12 level, as part of building the U.S. economy. CSforAll projects are expected to address equity issues in computer science education, including the participation of girls and women, and other under-represented groups. In FY 2022, CSforAll will be supported at $10.0 million in EHR, with an additional $14.50 million in support from CISE.

DIVISION OF UNDERGRADUATE EDUCATION (DUE)   **$283,100,000**
                                                      +$13,000,000 / 4.8%

DUE Funding

(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate	
				Amount	Percent
Total	**$269.37**	**$270.10**	**$283.10**	**$13.00**	**4.8%**
Research	126.05	128.10	141.10	13.00	10.1%
Education	143.32	142.00	142.00	-	-

About DUE

DUE supports excellence in undergraduate STEM education for all students. It achieves this goal by funding projects that will strengthen STEM education at two- and four-year colleges and universities. These projects include efforts to design, develop, and implement high-quality educational experiences, as well as scientific research to understand the effectiveness and impacts of those experiences. DUE investments promote educational innovations across the full range of public and private U.S. institutions of higher education. The resulting improvements in STEM education increase student learning, leading to greater retention and degree attainment by undergraduates. These STEM graduates have more employment opportunities and career options, as well as greater lifetime earning potential. For example, innovative educational programs at community colleges enable students to enter careers in advanced technologies such as additive manufacturing, biotechnology, precision agriculture, nano-optics, and cybersecurity. DUE support also enables STEM majors to enter the K-12 teaching workforce in high-need school districts. In these ways, DUE investments broaden participation in the future STEM workforce and help the Nation meet STEM workforce needs. In FY 2021, DUE supported a new research emphasis on the learning and teaching of STEM content at 2-year institutions. We will continue this focus in FY 2022, as a diverse population of students start their STEM studies or enroll in STEM courses at 2-year colleges at some point in their careers.

FY 2022 Summary

Research
- ECR funds enable significant progress on important basic and use-inspired basic research questions about STEM learning and teaching. ECR is managed and funded across all EHR divisions. For a full description, see the write up in the DRL Division narrative.
- HSI funds will continue to support the improvement of undergraduate education at HSIs and build the capacity for STEM education and STEM education research at HSIs that have previously received little or no funding from NSF. Outreach efforts will continue to seek to engage institutions that are new to NSF.
- IUSE funding will support: mitigation of COVID-19 impacts on undergraduate education; increased understanding of and gains in diversity, equity, and inclusion in STEM education; increased use of evidence-based educational practices; advancements in the knowledge base concerning undergraduate research, including course-based research; development or identification of indicators, metrics, and assessments to measure readiness for and progress toward institutional and national improvements in undergraduate STEM education. For more information see the IUSE narrative in the NSF-Wide Investments chapter.

Education
- ATE funding will support understanding and development of effective preparation that will educate the skilled technical workforce, including technicians in advanced technological industries such as advanced manufacturing.
- Noyce funding will invest in teacher preparation and support Noyce fellows during completion of a teaching obligation in high-need school districts.

DIVISION OF HUMAN RESOURCE DEVELOPMENT (HRD)   **$307,880,000**
                                                          +$92,520,000 / 43.0%

HRD Funding

(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Change over FY 2021 Estimate Percent
Total	**$210.77**	**$215.36**	**$307.88**	**$92.52**	**43.0%**
Research	137.96	142.86	210.24	67.38	47.2%
Education	72.82	72.50	97.64	25.14	34.7%

About HRD

HRD serves as a focal point for NSF's agency-wide commitment to broadening participation in STEM of historically underrepresented groups—minorities, women, and persons with disabilities by enhancing the quality and excellence of STEM education and research opportunities. HRD's mission is to create and grow a vibrant and diverse U.S. STEM workforce by supporting the inclusion and participation of individuals historically underrepresented in STEM and the institutions that serve them. Programs within HRD have a strong focus on partnerships and collaborations in support of institutional transformation and capacity building that lead to increased STEM participation of underrepresented groups. Priority is placed on investments in innovative and transformative strategies that serve as models for achieving the full participation of these populations and for providing opportunities for educators, researchers, and institutions, particularly at MSIs. These investments help to mitigate the deleterious impacts of the COVID-19 pandemic on STEM education and the STEM enterprise by supporting and growing the Nation's diverse STEM talent.

FY 2022 Summary

Research
- AGEP funds will continue to support innovative STEM faculty career pathway models for advancing doctoral students, postdoctoral scholars and faculty who are historically underrepresented minorities (URMs) in STEM. The AGEP program will continue efforts to conduct a portfolio analysis, complete awardee site reviews, share best practices and collaborative partnerships findings, and network through the annual AGEP research conference.
- The CREST program focuses on building research capacity at MSIs that have undergraduate enrollments of 50 percent or more of members from minority groups underrepresented among those holding advanced degrees in science or engineering fields. In FY 22, funding will continue to support CREST centers, HBCUs through the Research Infrastructure for Science and Engineering component, and additional Postdoctoral Research Fellows, fostering increased collaborations across the centers and building research capacity at minority serving institutions.
- ECR funds enable significant progress on important basic and use-inspired basic research questions about STEM learning and teaching. ECR is managed and funded across all EHR divisions. For a full description, see the write up in the DRL Division narrative.
- HSI will continue to support the improvement of undergraduate education at HSIs and build capacity for STEM education and research at HSIs that have previously received little or no funding from NSF. Outreach efforts will continue to seek to engage institutions that are new to NSF.
- NSF INCLUDES will continue to fund broadening participation projects and related research through NSF INCLUDES Alliances and other existing NSF broadening participation portfolio programs. These

include pilot projects, planning grants, supplements, and starter networks (e.g., research coordination networks) that serve as on-ramps to the NSF INCLUDES Alliances and the NSF INCLUDES National Network. For more information about NSF INCLUDES, see the NSF-Wide Investments chapter.

- TCUP funding will support the design, implementation, and assessment of comprehensive institutional improvements in STEM instruction to advance the quality of student preparation in STEM. TCUP will also continue to support projects to build and enhance STEM research capacity at TCUP institutions. TCUP will support eligible institutions through the TCUP Enterprise Advancement Centers to partner with tribal communities to enhance their ability to respond to community needs.

Education

- ADVANCE will continue to support evidence-based systemic change strategies to promote equity in STEM academic workplaces. ADVANCE will continue to evaluate the sustainability of its strategies and support adaptation of successful practices for achieving institutional change.
- Excellence Awards in Science and Engineering (EASE) will continue to coordinate and support the Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST) and Presidential Awards for Excellence in Science, Mathematics, and Engineering (PAESMEM) awards.
- HBCU-UP funds will support research for HBCU STEM faculty, enhance the academic experience of students, increase numbers of students completing STEM degrees, and support institutional transformation efforts. The program will continue to support broadening participation research through its HBCU-UP Broadening Participating Research Centers.
- Louis Stokes Alliances for Minority Participation (LSAMP) funding will continue to support an increased focus on broadening participation in STEM research and evaluation to expand knowledge about effective strategies for student recruitment, retention, and persistence in STEM programs. Additionally, LSAMP will emphasize support for evidence-based interventions that are proven to increase STEM baccalaureate degree production, particularly mentoring and early experiential research experiences nationally and abroad and continue support for STEM post-baccalaureate activities and will continue to support activities at the transfer and transition points through the Bridges to the Baccalaureate and Bridges to the Doctorate tracks.

DIVISION OF GRADUATE EDUCATION (DGE)   **$466,630,000**
                                                            +$45,990,000 / 10.9%

DGE Funding

(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate	
				Amount	Percent
Total	**$405.48**	**$420.64**	**$466.63**	**$45.99**	**10.9%**
Research	16.46	18.12	20.11	1.99	11.0%
Education	389.03	402.52	446.52	44.00	10.9%

[1] The Graduate Research Fellowship Program is consolidated within the EHR Division of Graduate Education in FY 2022 and is restated in prior years for comparability.

About DGE

DGE provides leadership for cross-Foundation investments that support a diverse cadre of U.S. graduate students in STEM and STEM education research, and for improvement and innovation in graduate education to prepare tomorrow's STEM leaders. The division achieves this through direct investment in individuals; funding projects that spearhead the development and implementation of bold, new, and potentially transformative models for graduate education training in high priority interdisciplinary or convergent research areas; and through basic research on STEM graduate education. This research supports innovations in graduate education by exploring new ways for graduate students in research-based master's and doctoral degree programs to develop the skills, knowledge, and competencies needed to pursue a range of STEM careers in the 21st century. Special emphasis is given to training students in areas of national priority, such as cybersecurity, AI, advanced manufacturing, advanced wireless, biotechnology, and QIS. DGE also leads EHR research on the development of the STEM professional workforce. The resulting body of research expands the knowledge base that informs successful models, practices and approaches for the preparation of a STEM professional workforce ready to advance the frontiers of science and engineering and to assume leadership roles in emerging industries.

FY 2022 Summary

Research
- ECR funds enable significant progress on important basic and use-inspired basic research questions about STEM learning and teaching. ECR is managed and funded across all EHR divisions. For a full description, see the write up in the DRL Division narrative.

Education
- NSF GRFP will be fully funded in EHR in FY 2022 at a total funding level of $318.52 million to support 2,500 new fellowships with a cost of education allowance of $12,000 and a stipend of $34,000 per fellow. The GRFP program will continue to align awards with Administration priorities, including climate, clean energy, and emerging technologies such as AI and quantum. In addition, DGE will continue efforts to ensure that GRFP recipients reflect the diversity of the STEM graduate student population and to improve professional development opportunities for program participants.
- The NRT will advance transformative programs that combine interdisciplinary training with innovative professional development activities to educate the next generation of scientists, including those from groups currently under-represented in the field, to solve convergent research problems in areas of national need, as well as assuming leadership roles across emerging industries. In FY 2022, NRT will expand to include a special focus on traineeships in AI and AI engineering. Additionally, the monitoring

and evaluation program for NRT will continue to collect data from existing programs to inform future efforts. Innovations in Graduate Education (IGE, a part of the NRT program, will focus on research into graduate student training, including efforts to recover effectively from the impacts of the COVID-19 pandemic on graduate education. IGE will also support an Innovation Acceleration Hub through which the results of IGE projects can be disseminated to the STEM graduate education community.

- SFS funding will improve the capacity of institutions to provide students with the latest curricular and assessment approaches and experiences available ensuring they are well prepared with cybersecurity skills and knowledge. SFS support will also allow institutions to conduct research to build understanding of the most effective preparation for a variety of cybersecurity professions. In addition, SFS will invest in the cybersecurity education and workforce development component of NSF's Secure and Trustworthy Cyberspace: Education (SaTC:EDU) investment area, including projects that span educational aspects of the frontier between AI and cybersecurity. Emphasis will be given to K-12 cybersecurity education, students from community colleges, veterans, and other underrepresented groups.

For more information about GRFP and NRT, see the Major Investments in STEM Graduate Education narrative within the NSF-Wide Investments chapter.

H-1B NONIMMIGRANT PETITIONER FEES $162,470,000

In FY 2022, H-1B Nonimmigrant Petitioner Fees are projected to be $162.47 million.

H-1B Nonimmigrant Petitioner Fees Funding
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change Over FY 2021 Estimate	
				Amount	Percent
H-1B Nonimmigrant Petitioner Fees Funding	$114.78	$177.00	$162.47	-$14.53	-8.2%

Beginning in FY 1999, Title IV of the American Competitiveness and Workforce Improvement Act (ACWIA) of 1998 (P.L. 105-277) established an H-1B Nonimmigrant Petitioner Account in the general fund of the U.S. Treasury for fees collected for each petition for alien nonimmigrant status. That law required that a prescribed percentage of funds in the account be made available to NSF for scholarships to low-income STEM students; grants for mathematics, engineering, or science enrichment courses; and systemic reform activities. In FY 2005, Public Law 108-447 reauthorized H-1B funding. NSF was provided with 40 percent of the total H-1B receipts collected. Thirty percent of H-1B receipts (75 percent of the receipts that NSF receives) are to be used for a low-income scholarship program, Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM). Ten percent of receipts (25 percent of the receipts that NSF receives) are designated for support of private-public partnerships in K-12 education through Innovative Technology Experiences for Students and Teachers (ITEST).

Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM)

The S-STEM program began in 1999 under P.L. 105-277. Originally, the program was named Computer Science, Engineering, and Mathematics Scholarships (CSEMS) and supported grants for scholarships to academically talented, low-income students with demonstrated financial need pursuing associate, baccalaureate, or graduate degrees in computer science, computer technology, engineering, engineering technology, or mathematics. Grantee institutions awarded scholarships of up to $2,500 per year for two years to eligible students. The CSEMS activity continued under the American Competitiveness in the 21st Century Act (P.L. 106-313) with a prescribed percentage of H-1B receipts (22 percent) which totaled approximately 59.5 percent of the total H-1B funding for NSF. P.L. 106-313 also amended P.L. 105-277 by increasing the maximum scholarship duration to four years and the annual stipend to $3,125.

Under the Consolidated Appropriations Act, 2005 (P.L. 108-447), the prescribed percentage of H-1B receipts available for the low-income scholarship program was increased to 30 percent (approximately 75 percent of the total H-1B funding for NSF). Eligibility for the scholarships was expanded from the original fields of computer science, engineering, and mathematics to include "other technology and science programs designated by the Director." The maximum annual scholarship award amount was raised from $3,125 to $10,000. Language also was added allowing NSF to use up to 50 percent of funds "for undergraduate programs for curriculum development, professional and workforce development, and to advance technological education." As a result, the program was renamed in 2006 from CSEMS to S-STEM.

- Low-income Scholarship Program: S-STEM. The S-STEM program provides institutions with funds for student scholarships to encourage and enable academically talented low-income U.S. students with unmet financial need to complete an associate, baccalaureate, or graduate degree in fields of science, technology, engineering, or mathematics. Earning these degrees enables the graduates to enter the STEM workforce or STEM graduate school. The program emphasizes the importance of recruiting students to STEM disciplines, mentoring and supporting students through degree completion, and partnering with employers to facilitate student career placement in the STEM workforce.

Since its inception, the low-income scholarship program has received more than 7,700 proposals from all types of colleges and universities and has made more than 2,300 awards. In addition to scholarships, S-STEM awards also provide funding for student support activities such as faculty mentoring, academic support, curriculum development, leadership development, and internships. These high-impact activities are known to be effective for recruiting and retaining students in high-demand technology-rich fields through graduation and into employment. In FY 2022, in addition to the long-standing scholarship support, all S-STEM projects will continue to conduct activities to inform the accumulation of knowledge about interventions that affect associate or baccalaureate STEM degree attainment by academically talented, low-income U.S. students with unmet financial need. S-STEM projects report much higher retention and graduation rates among their scholarship students than among other STEM majors. As a result, research on S-STEM projects can help the nation understand effective practices to support STEM degree attainment at scale. Approximately 90 awards are anticipated in FY 2022, with a continued emphasis on increasing involvement of community colleges, especially Hispanic-serving institutions. S-STEM activities in FY 2022 will leverage efforts in IUSE: EHR, LSAMP, and the IUSE: HSI Program to enhance persistence of students. S-STEM will continue to be a partner in the NSF INCLUDES initiative. S-STEM programming and research also will align with NRT, with the goal of understanding and enhancing effective learning environments and pathways for students on the continuum from two-year to four-year to master's and doctoral degrees.

Private-Public Partnerships in K-12

The American Competitiveness in the 21st Century Act (P.L. 106-313) amended P.L. 105-277 and changed the way petitioner fees were to be expended. P.L. 106-313 directed the remaining 40.5 percent of the total H-1B funding for NSF (15 percent of H-1B receipts) toward K-12 activities involving private-public partnerships in a range of areas such as materials development, student externships, and mathematics and science teacher professional development. The ITEST program was developed as a partnership activity in K-12 to increase opportunities for students and teachers to learn about, experience, and use information technologies within the context of STEM, including information technology (IT) courses. In FY 2005, P.L. 108-447 reduced the prescribed percentage of H-1B receipts available for private-public partnerships in K-12 to 10 percent (approximately 25 percent of the total H-1B funding for NSF).

- <u>Private-Public Partnerships in K-12: ITEST</u>. The ITEST program invests in K-12 activities that address the ongoing and growing need for STEM professionals and information technology workers in the U.S. and seeks solutions to help ensure the breadth and depth of the U.S. STEM workforce. ITEST funds activities for students and teachers that emphasize mathematics, science, and engineering and computer science careers, and emphasizes the importance of evaluation and research to understand the impact of such activities. The program supports the development, implementation, testing, and scale-up of models, STEM robotics projects, and research studies to improve the STEM workforce and build a student's capacity to participate in the STEM workforce. The solicitation places emphasis on capturing and establishing a reliable knowledge base about the dispositions toward and knowledge about STEM workforce skills in U.S. students.

  Since its inception, the ITEST program has received more than 4,300 grant proposals and made more than 520 awards (including co-funded projects) that allow K-12 students and teachers to work closely with scientists, engineers, and other STEM professionals on extended research projects that promote awareness of STEM careers and interest in pursuing education pathways to those careers. The ITEST program encourages proposals relating to emerging industries such as artificial intelligence, data science, and quantum information science. Funded projects draw on a wide mix of community partnerships, including universities, industry, museums, science and technology centers, and school districts to identify the characteristics that attract a wide and diverse range of young people to STEM careers, especially those students historically underrepresented in those careers. ITEST will make approximately 25-30 awards in FY 2022.

H-1B Financial Activities from FY 2011 - FY 2020

(Dollars in Millions)

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Receipts	$106.11	$128.99	$120.94	$132.49	$143.00	$138.80	$141.07	$155.99	$156.72	$153.03
Unobligated Balance start of year	$50.15	$60.93	$99.31	$108.31	$111.39	$116.02	$74.63	$96.86	$64.68	$77.47
Appropriation Previously unavailable (Sequestered)				$5.10	$9.54	$7.30	$6.80	$9.73	$10.30	$9.72
Appropriation Currently unavailable (Sequestered)				-$9.54	-$7.30	-$6.80	-$9.73	-$10.30	-$9.72	-$9.03
Obligations incurred:										
Scholarships in Science, Technology, Engineering, and Mathematics	77.67	72.57	83.98	92.18	109.34	140.54	84.38	156.40	114.76	79.91
Private-Public Partnership in K-12[1]	18.62	21.59	31.51	37.23	29.83	44.35	35.11	35.86	34.24	34.87
Total Obligations	$96.29	$94.16	$115.49	$129.41	$139.17	$184.89	$119.49	$192.26	$149.00	$114.78
Unallocated Recoveries	3.12	0.96	3.55	-	4.95	1.60	3.58	4.66	4.49	8.26
Unobligated Balance end of year	$63.09	$96.72	$108.31	$111.39	$122.41	$72.03	$96.86	$64.68	$77.47	$124.67

[1] P.L. 108-447 directs that 10 percent of the H-1B Petitioner funds go toward K-12 activities involving private-public partnerships in a range of areas such as materials development, student externships, math and science teacher professional development, etc.

Explanation of Carryover

Within the H-1B account, $124.67 million was carried over into FY 2021.

Innovation Technology Experiences for Students
- Amount: $33.42 million
- Purpose: Since NSF receives the largest payments of H-1B visa fees in August and September, there was insufficient time to obligate the receipts on awards before the end of the fiscal year.
- Obligation: FY 2021 Quarter 1-2 and Anticipated FY 2021 Quarter 3-4

Scholarships in Science, Technology, Engineering, and Mathematics
- Amount: $89.88 million
- Purpose: Since NSF receives the largest payments of H-1B visa fees in August and September, there was insufficient time to obligate the receipts on awards before the end of the fiscal year.
- Obligation: FY 2021 Quarter 1-2 and Anticipated FY 2021 Quarter 3-4

The remaining $1.37 million remains available for H-1B account adjustments.