EDUCATION FOR HUMAN RESOURCES (EHR) **$930,930,000**
-$3,600,000 / -0.4%

EHR Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual Amount	Change over FY 2019 Actual Percent
Division of Research on Learning in Formal and Informal Settings (DRL)	$228.27	-	$223.53	-$4.74	-2.1%
Division of Undergraduate Education (DUE)	264.82	-	236.59	-28.23	-10.7%
Division of Human Resource Development (HRD)	188.11	-	188.78	0.67	0.4%
Division of Graduate Education (DGE)	253.33	-	282.03	28.70	11.3%
Total	**$934.53**	**-**	**$930.93**	**-$3.60**	**-0.4%**

About EHR

EHR supports the Administration's priorities of building and leveraging a diverse, highly skilled U.S. STEM workforce and STEM-literate public by funding high quality research and development in STEM education, unique in the federal context, and also grounding its programs in basic research findings about STEM learning and teaching.

EHR recognizes the need to invest in foundational and future-oriented STEM educational research, using the results of research to inform STEM programs and practices, to ensure the prosperity of the nation through a well-educated STEM workforce. Like all research, results might be applied more immediately or well into the future. As such, in FY 2021, EHR will deepen efforts to build capacity for STEM education research and identify and tackle the challenges in STEM education needed to create the workforce for the Industries of the Future (IotF). Thus, EHR's research portfolio will 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 Artificial Intelligence, Quantum Information Science, and Computing, and how to do so in a manner that reduces demographic disparities. EHR's partnership with Boeing is one model for leveraging public-private partnerships to develop the STEM workforce for IotF. 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 2021, EHR will continue to study the implementation of personalized learning systems in developing the STEM workforce for IotF.

EHR allocations across divisions are designed to accomplish the collective work of the directorate, best described by three underlying themes: STEM learning and learning environments, broadening participation and institutional capacity, and STEM professional workforce development. These themes dovetail with the three aspirational goals of the Federal government's 5-year strategic plan*, Charting a Course for Success: America's Strategy for STEM Education*,[1] which are: (1) Build Strong Foundations for STEM Literacy; (2) Increase Diversity, Equity, and Inclusion in STEM, and (3) Prepare the STEM Workforce for the Future. EHR's programs all contribute to these strategic goals. In addition, EHR supports the implementation of the 5-year strategic plan by co-chairing the NSTC Subcommittee on Federal Coordination in STEM

[1] NSTC (2018). Charting a Course for Success: America's Strategy for STEM Education. www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf

Education (FC-STEM) and co-leading several FC-STEM Interagency Working Groups.

Progress in STEM depends on *discoverers*—innovators and future leaders in the nation's science and engineering (S&E) enterprise in both the public and private sectors. These discoverers, including those from K-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 discoverers at the undergraduate and graduate levels. EHR programs 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 diverse, highly skilled technical workforce.

The progress of S&E also depends on a public that can take full advantage of STEM-related employment opportunities, and that values and participates in STEM, both formally and informally. 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 Service 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 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 NRT's priority themes, EHR invests in the development of researchers with the necessary skills to conduct convergence research. In FY 2021, 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 accomplish the transparency and accountability objectives set out in the federal five-year strategy for STEM education.

Major Investments

EHR Major Investments
(Dollars in Millions)

Area of Investment[1,2]	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual Amount	Change over FY 2019 Actual Percent
Advanced Manufacturing[3]	-	-	$2.00	$2.00	N/A
Artificial Intelligence[3]	-	-	37.59	37.59	N/A
Bioeconomy	10.62	-	9.00	-1.62	-15.3%
GRFP	142.26	-	137.64	-4.62	-3.2%
IUSE	89.99	-	74.09	-15.90	-17.7%
NRT	33.04	-	61.87	28.83	87.3%
SaTC	55.33	-	52.13	-3.20	-5.8%
NSF's Big Ideas					
NSF INCLUDES Stewardship	*20.01*	*-*	*18.92*	*-1.09*	*-5.4%*

[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] EHR did not formally track these activities in FY 2019.

- Artificial Intelligence in Education and Workforce: EHR activities in this area include investments in NRT for AI focused traineeships, investments in the Artificial Intelligence Institutes as well as investments in AI across EHR programs.
- Bioeconomy: EHR invests in bioeconomy through research and workforce development programs. Graduate Research Fellowship Program (GRFP): An equal investment is provided through the Integrative Activities budget for a total GRFP investment of $275.28 million. For more information on the GRFP, see the Major Investments in STEM Graduate Education narrative within the NSF-Wide Investments chapter.
- Improving Undergraduate STEM Learning (IUSE): EHR will lead the NSF-wide IUSE activity. For more information, see the IUSE narrative within the NSF-Wide Investments chapter. The primary goals of the IUSE: HSI activity are to promote research on engaged student learning at HSIs, to incentivize institutional and community transformation, and to promote fundamental research about what it takes to diversify and increase participation in STEM effectively, including research that improves our understanding of how to build institutional capacity at HSIs. These activities will address the Nation's need to make the STEM workforce more inclusive.
- NSF Research Traineeship (NRT): The investment for FY 2021 NRT activities will advance transformative programs that combine interdisciplinary training with innovative professional development activities to educate the next generation of scientist to solve convergent research problems in areas of national need. In FY 2021, NRT will expand to include a special focus on traineeships in artificial intelligence and artificial intelligence engineering. For more information, see the Major Investments in STEM Graduate Education narrative within the NSF-Wide Investments chapter.
- SaTC ($52.13 million): 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.

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

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, ~~$940,000,000~~ $930,930,000 to remain available until September 30, ~~2021.~~ 2022.

Education and Human Resources
FY 2021 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/ Estimates
FY 2019 Appropriation	$910.00	$14.27	-$5.66	$3.92	12.00	$934.53
FY 2020 Enacted	940.00	5.66				945.66
FY 2021 Request	930.93					930.93
$ Change from FY 2020 Enacted						-$14.73
% Change from FY 2020 Enacted						-1.6%

Totals exclude reimbursable amounts.

Explanation of Carryover

Within the Education and Human Resources (EHR) account, $5.66 million was carried over into FY 2020.

Excellence Awards in Science and Engineering
- Amount: $2.32 million
- Purpose: These funds will be used to recognize recipients of the Presidential Awards for Excellence in Mathematics and Science Teaching and recipients of the Presidential Awards for Excellence in Science, Mathematics and Engineering Mentoring.
- Obligation: Funds were obligated during FY 2020 Quarter 1

Robert Noyce Teacher Scholarship Program
- Amount: $3.34 million
- Purpose: Recovered no-year funds will be applied to Noyce future commitments.
- Obligation: Anticipated FY 2020 Quarter 2

Funding Profile

EHR Funding Profile

	FY 2019 Actual Estimate	FY 2020 (TBD)	FY 2021 Estimate
Statistics for Competitive Awards:			
Number of Proposals	3,782	-	4,400
Number of New Awards	843	-	850
Funding Rate	22%	N/A	19%
Statistics for Research Grants:			
Number of Research Grant Proposals	3,106	-	3,200
Number of Research Grants	511	-	550
Funding Rate	16%	N/A	17%
Median Annualized Award Size	$250,707	-	$260,000
Average Annualized Award Size	$340,370	-	$280,000
Average Award Duration, in years	3.1	-	2.9

EHR supports investment in core research in education and STEM learning as well as STEM education development and training.

Program Monitoring and Evaluation

External Program Evaluations and Studies

- In FY 2020, EHR will initiate the following evaluations.
  - In FY 2020, the Division of Undergraduate Education (DUE) will initiate several activities designed to provide evaluative evidence on and inform future evaluations of the Improving Undergraduate STEM Education: Education and Human Resources (IUSE: EHR) program. A Dear Colleague Letter will invite proposals for research (e.g., meta-syntheses) on results of IUSE: EHR investments in institutional and community transformation. Results from funded proposals, expected in FY 2022 and beyond, are expected to be used to inform plans for future solicitations and for accountability purposes. Additionally, DUE will convene a meeting of all IUSE funding programs in FY 2020 to inform plans for future external program evaluations and studies in FY 2021 and beyond.
- EHR has two evaluations underway, each of which is summarized below:
  - The ADVANCE: Organizational Change for Gender Equity in STEM Academic Professions (ADVANCE) program is currently being assessed. The evaluation is being conducted by Windrose Vision. Final results from this study are expected in FY 2022.
  - The Advanced Technological Education (ATE) program is currently being assessed. The evaluation is being conducted by Insight Policy Research. Final results from this study are expected in FY 2020.

Committees of Visitors (COV)

- The DGE COV convened October 2018 and reviewed division operations and the core programmatic portfolio for the four-year period spanning FY 2014 through FY 2017. The COV stated that DGE's merit review process was working very well, and that the panel summaries were substantive. DGE's unique cross-agency mission to serve all of the disciplines was centrally important to the overall mission of meeting the needs of graduate education. The COV was impressed at the excellent

scholarship demonstrated in the review process by the program officers. Major recommendations of the COV were to improve coaching and tools for reviewers to ensure equally consistent reviews, collecting more robust demographic and scientific information on reviewers, and more focus on evaluation activities. DGE is addressing the COV recommendations through its future planning activities, internal process changes, and programmatic updates.

- In November 2018, the DUE COV reviewed division operations and core programs for FY 2014 or FY 2015 through FY 2018 (depending on the funding program). The DUE COV concluded that DUE had implemented NSF's merit review criteria with high quality and effectiveness. They were impressed by DUE's ability to manage a high volume of work while maintaining high merit review standards. They noted that panel summaries could be improved to better describe the rationale for the panel decision and suggested potential improvements to reviewer training, outreach, and efficiency. DUE is prioritizing the recommendations based on potential impact and will address these recommendations through changes in merit review processes, technical enhancements, and revision of funding program solicitations.
- In October 2019, the COV reviewed DRL. The COV is expected to present their report to the EHR Advisory Committee at its Spring 2020 meeting.
- In 2020, a COV is anticipated to review HRD.

The Performance and Management chapter provides details regarding the periodic reviews of programs and portfolios of programs by external Committees of Visitors and directorate Advisory Committees. Please see this chapter for additional information.

People Involved in EHR Activities

Number of People Involved in EHR Activities

	FY 2019 Actual Estimate	FY 2020 (TBD)	FY 2021 Estimate
Senior Researchers	3,233	-	5,700
Other Professionals	1,302	-	2,000
Postdoctoral Associates	175	-	300
Graduate Students	11,300	-	11,300
Undergraduate Students	16,600	-	16,200
K-12 Teachers	37,700	-	37,700
K-12 Students	85,200	-	85,000
Total Number of People	**155,510**	**-**	**158,200**

DIVISION OF RESEARCH ON LEARNING IN FORMAL AND INFORMAL SETTINGS (DRL) **$223,530,000**
-$4,740,000 / -2.1%

DRL Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual Amount	Change over FY 2019 Actual Percent
Total	**$228.27**	**-**	**$223.53**	**-$4.74**	**-2.1%**
Learning and Learning Environments	**25.70**	**-**	**70.28**	**44.58**	**173.5%**
Computer Science for All (CSforAll)[1]	-	-	9.46	9.46	N/A
EHR Core Research (ECR): STEM Learning	25.70	-	60.82	35.12	136.7%
Broadening Participation & Institutional Capacity	**150.69**	**-**	**145.66**	**-5.03**	**-3.3%**
Advancing Informal STEM Learning (AISL)	62.48	-	55.77	-6.71	-10.7%
Discovery Research PreK-12 (DRK-12)	88.21	-	89.89	1.68	1.9%
STEM Professional Workforce	**51.88**	**-**	**7.59**	**-44.29**	**-85.4%**
Artificial Intelligence Research Institutes	**-**	**-**	7.59	7.59	N/A
Science, Technology, Engineering, Mathematics + Computing (STEM+C) Partnerships[1]	51.88	-	-	-51.88	-100.0%

[1] In FY 2019, CSforAll was supported as a component of STEM+C. The FY 2019 Actual is shown for comparison purposes only. FY 2021 funding for STEM+C moves to implement CSforAll as a freestanding program and to expand EHR's computer science education portfolio through existing programs.

About DRL

DRL invests in foundational research to advance understanding about teaching and learning in STEM—including computer science as part of STEM. 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. The DRL portfolio includes the design, implementation, and study of learning environments, models, and digital 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. DRL's programs inform and support lifelong access to high-quality STEM learning opportunities that will prepare learners for jobs of the future.

FY 2021 Summary

Learning and Learning Environments

- CSforAll, which focuses on improving computer science instruction at the preK-12 level, became a free-standing program in FY 2020. In FY 2021, CSforAll will be supported at $9.46 million in EHR, with an additional $9.51 million in support from CISE. Previously, CSforAll was supported as a component of the STEM+C Partnerships program.
- ECR funds enable significant progress on important questions about STEM learning and teaching. ECR supports research addressing persistent issues in the learning and teaching of STEM content as well as frontier topics that envision STEM learning environments of the future. In FY 2021, ECR will expand the portfolio of research on frontier topics in the education and training of a workforce for the IotF, push the boundaries of technology use in learning, and examine how learning will change because of advances in technology and developments in IotF. Researchers will need to develop new methodologies to tackle new questions. In FY 2021 EHR will continue efforts through the ECR Building Capacity in STEM Education Research initiative to develop capacity for future-oriented STEM education research.

Broadening Participation and Institutional Capacity

- AISL resources will support design, adaptation, implementation, and research on innovative modes of lifelong learning in informal environments. Emphases will include broadening participation in STEM, workforce development, adult and family learning of STEM, and public participation in scientific research, do it yourself technology, and cyberlearning.
- DRK-12 focuses on research and development of resources, models, and tools to help U.S. students pre-K through 12 learn STEM, including computer science. U.S. students require a strong early start and continuing education in mathematics and other STEM disciplines in order to compete for jobs in the global economy. Resources will support improving STEM achievement for preK-12 students in key innovative and emerging science areas. DRK-12 supports research and development of innovative learning environments across diverse educational settings including technology-supported learning environments.

STEM Professional Workforce

- In FY 2021, EHR will support research institutes on AI in relation to education and the workforce. The goal of these 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.

DIVISION OF UNDERGRADUATE EDUCATION (DUE) **$236,590,000**
-$28,230,000 / -10.7%

DUE Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual Amount	Change over FY 2019 Actual Percent
Total	**$264.82**	**-**	**$236.59**	**-$28.23**	**-10.7%**
Learning and Learning Environments	**123.12**	**-**	**121.15**	**-1.97**	**-1.6%**
EHR Core Research (ECR): STEM Learning Environments	13.13	-	37.60	24.47	186.4%
IUSE: Hispanic Serving Institutions (HSI) Program	20.00	-	9.46	-10.54	-52.7%
Improving Undergraduate STEM Education (IUSE)	89.99	-	74.09	-15.90	-17.7%
STEM Professional Workforce	**141.70**	**-**	**115.44**	**-26.26**	**-18.5%**
Advanced Technological Education (ATE)	66.51	-	70.97	4.46	6.7%
Robert Noyce Teacher Scholarship Program (Noyce) - Annual Funding	64.50	-	44.47	-20.03	-31.1%
Robert Noyce Teacher Scholarship Program (Noyce) - No Year Funding	10.69	-	-	-10.69	-100.0%

About DUE

DUE supports excellence in undergraduate STEM education for all students. It achieves this goal by supporting 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 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. STEM graduates have more employment opportunities and career options, and greater lifetime earning potential.[2] 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.

FY 2021 Summary

<u>Learning and Learning Environments</u>

- ECR funds enable significant progress on important questions about STEM learning and teaching. ECR supports research addressing persistent issues in the learning and teaching of STEM content as well as frontier topics that envision STEM learning environments of the future. In FY 2021, ECR will expand the portfolio of research on frontier topics in the education and training of a workforce for the IotF, push the boundaries of technology use in learning, and examine how learning will change because of advances in technology and developments in IotF. Researchers will need to develop new methodologies to tackle new questions In FY 2021 EHR will continue efforts through the ECR Building Capacity in STEM Education Research initiative to develop capacity for future-oriented STEM education research.

[2] https://ncses.nsf.gov/pubs/nsb20198/s-e-labor-market-conditions#earnings

- IUSE funding will support: increased use of evidence-based educational practices; advancements in the knowledge base concerning undergraduate research, including course-based research; and 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.
- DUE's HSI budget of $9.46 million and HRD's HSI budget of $4.73 million will enable a total FY 2021 investment of $14.19 million. These 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.

STEM Professional Workforce

- ATE funding will support research on and development of effective preparation of 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.
- ATE and Noyce will continue to emphasize the preparation of a diverse STEM workforce and will incorporate a focus on inclusion, in partnership with the NSF INCLUDES initiative.

DIVISION OF HUMAN RESOURCE DEVELOPMENT (HRD)

$188,780,000
+$660,000 / 0.4%

HRD Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual Amount	Change over FY 2019 Actual Percent
Total	**$188.12**	**-**	**$188.78**	**$0.66**	**0.4%**
Learning and Learning Environments	**59.54**	**-**	**67.87**	**8.33**	**14.0%**
ADVANCE[1]	[18.00]	-	17.03	N/A	N/A
Alliances for Graduate Education and the Professoriate (AGEP)	7.99	-	7.13	-0.86	-10.8%
Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)	35.01	-	31.22	-3.79	-10.8%
Tribal Colleges and Universities Program (TCUP)	15.01	-	12.49	-2.52	-16.8%
Broadening Participation & Institutional Capacity	**98.95**	**-**	**95.72**	**-3.23**	**-3.3%**
EHR Core Research (ECR): Broadening Participation and Institutional Capacity in STEM	12.92	-	28.54	15.62	120.9%
IUSE: Hispanic Serving Institutions (HSI) Program	20.01	-	4.73	-15.28	-76.4%
Big Idea: NSF INCLUDES[2]	20.01	-	18.92	-1.09	-5.4%
Louis Stokes Alliances for Minority Participation (LSAMP)	46.01	-	43.53	-2.48	-5.4%
STEM Professional Workforce	**29.63**	**-**	**25.19**	**-4.44**	**-15.0%**
Centers for Research Excellence in Science and Technology (CREST)	24.00	-	21.41	-2.59	-10.8%
Excellence Awards in Science and Engineering (EASE)	5.63	-	3.78	-1.85	-32.9%

[1] Total FY 2019 Actual funding for ADVANCE is $18.0 million with $16.47 million contributed from the R&RA account. In FY 2021, all funding for ADVANCE resides in the EHR account.

[2] Total FY 2019 Actual funding for NSF INCLUDES is $20.20 million with $200,000 contributed from the R&RA account. In FY 2021, all funding for NSF INCLUDES resides in the EHR account.

About HRD

HRD serves as a focal point for NSF's agency-wide commitment to enhancing the quality and excellence of STEM education and research through broadening participation in STEM of historically underrepresented groups—minorities, women, and persons with disabilities. HRD's mission is to create and grow a vibrant and diverse U.S. STEM workforce by supporting the inclusion and participation of underrepresented individuals in STEM and the institutions that serve them. 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 who 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.

FY 2021 Summary

<u>Learning and Learning Environments</u>

- ADVANCE will be funded entirely in EHR. ADVANCE will continue to evaluate the sustainability of its strategies and support adaptation of successful practices for achieving institutional change.
- 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). The AGEP program will continue efforts to conduct a portfolio analysis, complete awardee site reviews and share best practices, collaborative partnerships findings and networking through the annual AGEP research conference.

- 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.
- TCUP funding will support the design, implementation, and assessment of comprehensive institutional improvements in STEM instruction and 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.

Broadening Participation and Institutional Capacity

- ECR funds enable significant progress on important questions about STEM learning and teaching. ECR supports research addressing persistent issues in the learning and teaching of STEM content as well as frontier topics that envision STEM learning environments of the future. In FY 2021, ECR will expand the portfolio of research on frontier topics in the education and training of a workforce for the IotF, push the boundaries of technology use in learning, and examine how learning will change because of advances in technology and developments in IotF. Researchers will need to develop new methodologies to tackle new questions In FY 2021 EHR will continue efforts through the ECR Building Capacity in STEM Education Research initiative to develop capacity for future-oriented STEM education research.
- HRD's HSI budget of $4.73 million combines with DUE's $9.46 million contribution for a total FY 2021 level of $14.19 million, which 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.
- NSF INCLUDES program will continue to fund broadening participation projects and related research through NSF INCLUDES Alliances and the existing NSF broadening participation portfolio such as 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.
- 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.

STEM Professional Workforce

- Centers of Research Excellence in Science and Technology (CREST) funding will enable new CREST centers and support additional Postdoctoral Research Fellows, fostering increased collaborations across the centers and building research capacity at minority serving institutions.
- Excellence Awards in Science and Engineering (EASE) will collaborate with the Noyce program to continue supporting the professional development of pre K-12 STEM teachers through the STEM Teacher Leadership Network. EASE will also initiate research into the impact of PAEMST on awardees.

DIVISION OF GRADUATE EDUCATION (DGE) **$282,030,000**
+$28,700,000 / 11.3%

DGE Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual Amount	Change over FY 2019 Actual Percent
Total	**$253.32**	**-**	**$282.03**	**$28.71**	**11.3%**
Learning and Learning Environments	**6.68**	**-**	**-**	**-6.68**	**-100.0%**
Project and Program Evaluation (PPE)	6.68	-	-	-6.68	-100.0%
STEM Professional Workforce	**246.64**	**-**	**282.03**	**35.39**	**14.3%**
CyberCorps®: Scholarship for Service (SFS)	55.33	-	52.13	-3.20	-5.8%
EHR Core Research (ECR): STEM Professional Workforce Preparation	16.01	-	30.39	14.38	89.8%
Graduate Research Fellowship Program (GRFP)	142.26	-	137.64	-4.62	-3.2%
NSF Research Traineeship (NRT)[1]	33.04	-	61.87	28.83	87.3%

[1] Total FY 2019 Actual funding for NRT is $54.09 million with $21.05 million contributed from the R&RA account. In FY 2021, all funding for NRT resides in the EHR account.

About DGE

DGE provides leadership for cross-Foundation investments that support U.S. graduate students in STEM, 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. 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.

FY 2021 Summary

<u>STEM Professional Workforce</u>

- ECR funds enable significant progress on important questions about STEM learning and teaching. ECR supports research addressing persistent issues in the learning and teaching of STEM content as well as frontier topics that envision STEM learning environments of the future. In FY 2021, ECR will expand the portfolio of research on frontier topics in the education and training of a workforce for the IotF, push the boundaries of technology use in learning, and examine how learning will change because of advances in technology and developments in IotF. Researchers will need to develop new methodologies to tackle new questions In FY 2021 EHR will continue efforts through the ECR Building Capacity in STEM Education Research initiative to develop capacity for future-oriented STEM education research.
- 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. Emphasis will be given to K-12 cybersecurity education, students from community colleges, veterans, and other underrepresented groups.

- NSF Graduate Research Fellowships Program (GRFP) funding in EHR, together with matching funds in the IA budget, provide a total FY 2021 funding level of $275.28 million to support 1,600 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 artificial intelligence, quantum information science. In addition, DGE will continue efforts to improve professional development opportunities for program participants.
- NRT's Innovations in Graduate Education (IGE) program, will focus on model design, innovation, and research in graduate student training and professional development. The NRT traineeships will advance transformative programs that combine interdisciplinary training with innovative professional development activities to educate the next generation of scientist to solve convergent research problems in areas of national need. In FY 2021, NRT will expand to include a special focus on traineeships in artificial intelligence and artificial intelligence engineering. Additionally, the monitoring and evaluation program for NRT will be initiated.
- 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 **$157,000,000**

In FY 2021, H-1B Nonimmigrant Petitioner Fees are projected to be $157.0 million.

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

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Request	FY 2021 Request Change Over FY 2020 Estimate Amount	Percent
H-1B Nonimmigrant Petitioner Fees Funding	$149.00	$157.00	$157.00	-	-

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).

The FY 2021 Request includes a legislative proposal to double the ACWIA fee for the H-1B visa program (to $3,000 per worker for large employers and $1,500 for small employers) to prepare American workers for jobs that are currently being filled by foreign workers, especially in STEM fields. Under the proposal, NSF's allocation for the ITEST program (10 percent) would remain the same, while its allocation for S-STEM would decrease from 30 percent to 15 percent, a level that would maintain absolute funding levels under current estimates.

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 7,000 proposals from all types of colleges and universities and has made more than 2,000 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-technology fields through graduation and into employment. In FY 2020, in addition to the long-standing scholarship support, all S-STEM projects will continue to conduct research on 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 2020, with a continued emphasis on increasing involvement of community colleges, especially Hispanic-serving institutions. S-STEM activities in FY 2020 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).

- Private-Public Partnerships in K-12: ITEST. 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 3,800 grant proposals and made more than 450 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. Funded projects draw on a wide mix of local resources, 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 2021.

H-1B Financial Activities from FY 2010 - FY 2019

(Dollars in Millions)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Receipts	**$91.22**	**$106.11**	**$128.99**	**$120.94**	**$132.49**	**$143.00**	**$138.80**	**$141.07**	**$155.99**	**$156.72**
Unobligated Balance start of year	**$52.62**	**$50.15**	**$60.93**	**$99.31**	**$108.31**	**$111.39**	**$116.02**	**$74.63**	**$96.86**	**$64.68**
Appropriation Previously unavailable (Sequestered)					**$5.10**	**$9.54**	**$7.30**	**$6.80**	**$9.73**	**$10.30**
Appropriation Currently unavailable (Sequestered)					**-$9.54**	**-$7.30**	**-$6.80**	**-$9.73**	**-$10.30**	**-$9.72**
Obligations incurred:										
Scholarships in Science, Technology, Engineering, and Mathematics	75.96	77.67	72.57	83.98	92.18	109.34	140.54	84.38	156.40	114.76
Private-Public Partnership in K-12[1]	20.85	18.62	21.59	31.51	37.23	29.83	44.35	35.11	35.86	34.24
Total Obligations	**$96.81**	**$96.29**	**$94.16**	**$115.49**	**$129.41**	**$139.17**	**$184.89**	**$119.49**	**$192.26**	**$149.00**
Unallocated Recoveries	2.20	3.12	0.96	3.55	-	4.95	1.60	3.58	4.66	4.49
Unobligated Balance end of year	**$49.24**	**$63.09**	**$96.72**	**$108.31**	**$111.39**	**$122.41**	**$72.03**	**$96.86**	**$64.68**	**$77.47**

[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, $77.47 million was carried over into FY 2020.

Innovation Technology Experiences for Students

- Amount: $32.19 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: Anticipated FY 2020 Quarter 2

Scholarships in Science, Technology, Engineering, and Mathematics

- Amount: $45.28 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: Anticipated FY 2020 Quarter 2