**EDUCATION AND HUMAN RESOURCES (EHR)**                          **$823,470,000**
                                                                **-$80,400,000 / -8.9%**

**EHR Funding**

(Dollars in Millions)

| | FY 2018 Actual | FY 2019 Annualized CR[1] | FY 2019 Enacted | FY 2020 Request | Change over FY 2018 Actual Amount | Percent |
|---|---|---|---|---|---|---|
| Division of Research on Learning in Formal and Informal Settings (DRL) | $228.22 | - | - | $181.72 | -$46.50 | -20.4% |
| Division of Undergraduate Education (DUE) | 254.65 | - | - | 219.39 | -35.26 | -13.8% |
| Division of Human Resource Development (HRD) | 162.66 | - | - | 178.30 | 15.64 | 9.6% |
| Division of Graduate Education (DGE) | 258.34 | - | - | 244.06 | -$14.28 | -5.5% |
| **Total** | **$903.87** | **$902.00** | **$910.00** | **$823.47** | **-$80.40** | **-8.9%** |

[1] Annualized CR amount shown to be consistent with figures presented with the President's budget, which was finalized prior to the enactment of the FY 2019 Omnibus appropriation.

**About EHR**

EHR's role in accomplishing NSF's mission is to advance excellence in U.S. STEM education at all levels and in all settings to support the development of a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians and educators and a well-informed citizenry that have access to the ideas and tools of science and engineering. To accomplish this, EHR invests in the development of people and knowledge.

Progress in STEM depends on the education of *discoverers*—innovators and future leaders in the Nation's science and engineering (S&E) enterprise. These discoverers are critical members of the STEM and STEM-related workforce, including public and private sector, academic, policy, research, and teaching occupations. The progress of S&E also depends on a public that can take full advantage of STEM-shaped employment opportunities of the future, and values and participates in STEM (e.g., through formal and informal education, public participation in scientific research, and civic engagement). 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.

EHR plays a vital role in attaining these objectives. EHR is a leader in federal efforts to: prepare the STEM workforce for the future; remove barriers to participation in STEM careers; increase diversity, equity, and inclusion in STEM; and promote excellence in STEM education for all learners across the life-course. EHR is responsible for careful stewardship of public funds that support the development of the Nation's human capital in STEM. EHR awards provide funds that support traineeships, fellowships, research experiences, reskilling and upskilling professional development, and a wide range of institutional capacity building programs. Collectively, these programs educate, train, and support discoverers; engage citizen scientists; and foster a well-informed, STEM-literate citizenry prepared to handle rapid technological change and pursue STEM careers.

Uniquely in the federal context, EHR programs also fund the *discoveries*—the crucial foundational research and the design and implementation studies—that underpin these STEM human capital development initiatives. Just as NSF's R&RA directorates are dedicated to funding basic research that accelerates progress in S&E, EHR supports early-stage, exploratory research that enables improvements in STEM

education, learning, and assessment. Each decade brings new challenges, new learnings, and new opportunities to enhance STEM learning—and as scientists and engineers make new discoveries, education must adapt to the new skills and knowledge necessary for our nation to stay on the cutting-edge of scientific advances.

Knowledge arising from EHR's research portfolio informs EHR's human capital initiatives and a suite of NSF-wide investments in undergraduate and graduate STEM education and broadening participation. Importantly, results, data, and innovations arising from EHR-supported research are also available to catalyze discoveries and inform investments at scale made by other agencies, organizations, and the private sector. In the preK-12 realm, for example, EHR invests in research that yields focused, catalytic contributions to push the frontiers of effective learning and practice in formal education and informal learning environments. In the area of professional workforce development, EHR invests in research that can advance and accelerate efforts to reskill and upskill the workforce in areas where STEM disciplines and skills converge. Across learner populations, EHR invests in research to develop the theories and provide vital evidence to inform STEM education innovation and improvement. Collectively, EHR's research investments provide the knowledge capital that underpins a broad spectrum of STEM education initiatives—at NSF, federally, in schools and institutions of higher education, online, and in libraries, museums, and other learning contexts across the country.

EHR's research and human capital investments are coordinated across three thematic areas:
- STEM learning and learning environments,
- broadening participation and institutional capacity, and
- STEM professional workforce development.

These themes are consistent with the three aspirational goals highlighted in the federal government's five-year strategic plan for STEM education, *Charting a Course for Success: America's Strategy for STEM Education*: (1) build strong foundations for STEM literacy; (2) increase diversity, equity, and inclusion in STEM; and (3) prepare the STEM workforce for the future.[1] EHR's thematic areas also provide a framework for coordinating EHR's contributions to NSF's 10 Big Ideas and identifying opportunities to deepen and strengthen synergies with the R&RA directorates.

EHR's FY 2020 Budget Request is shaped by support for several of NSF's 10 Big Ideas. To increase diversity, equity and inclusion in STEM, EHR will steward the NSF INCLUDES Big Idea, contributing basic, design and development, and implementation research. EHR will also coordinate the participation of other federal agencies and private sector partners in NSF INCLUDES. EHR's stewardship of NSF INCLUDES will incubate and widely disseminate successful models of engaging and retaining populations traditionally underserved in the STEM disciplines—in particular, minorities, women, and persons with disabilities.

In addition to NSF INCLUDES, EHR will contribute to the HDR, FW-HTF, and NNA Big Ideas in FY 2020. As part of the HDR Big Idea, EHR will collaborate with other directorates and offices to make essential contributions to research on how to create and nurture a 21st century data-capable workforce. Through investments from the Division of Undergraduate Education, EHR will continue advances in curriculum and pedagogy of data science. EHR investments will spur discoveries to foster lifelong learning and pervasive learning through technology as part of the FW-HTF Big Idea. Learners must be empowered to take advantage of the transformations to society and work that have resulted from new technologies. EHR will foster discoveries to expand digital platforms and develop new cyberlearning systems to engage all learners in the STEM skills necessary for the workforce of the future. Lastly, EHR will participate in the NNA Big Idea which introduces questions about how to train the next generation of scientists to work at

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[1] www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf

the intersection of social science, natural science, engineering, and economics, creating a laboratory for learning research in convergent spaces. EHR's investments will contribute to the development of a new generation of convergent thinkers and continue to advance innovative ways to engage the public in the research developed through the NNA Big Idea. For more information on NSF's 10 Big Ideas and other priorities, see the NSF-Wide Investments chapter.

EHR staff continue to provide cross-agency leadership to the Federal Coordination in STEM Education Task Force and the associated interagency working groups. EHR will provide staff support for the STEM Education Advisory Panel created by The American Innovation and Competitiveness Act (P.L. 114-329).

**Major Investments**

**EHR Major Investments**
(Dollars in Millions)

| Area of Investment | FY 2018 Actual | FY 2019 (TBD) | FY 2020 Request | Change over FY 2018 Actual Amount | Percent |
|---|---|---|---|---|---|
| GRFP | $142.58 | - | $128.45 | -$14.13 | -9.9% |
| NRT[1] | 33.11 | - | 49.53 | 16.42 | 49.6% |
| SaTC | 55.09 | - | 55.09 | - | - |
| UtB | 11.99 | - | 7.00 | -4.99 | -41.6% |
| *BRAIN Initiative* | *2.00* | - | *2.00* | - | - |
| NSFs Big Ideas | | | | | |
| *NSF INCLUDES[2]* | *5.47* | - | *20.00* | *14.53* | *265.6%* |

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

[1] Total FY 2018 Actual funding for NRT is $53.85 million with $20.74 million contributed from the R&RA account. In FY 2020, all funding for NRT resides in the EHR account. For more information on NRT, see the Major STEM Graduate Education narrative in the NSF-wide Investments chapter.

[2] Total FY 2018 Actual funding for NSF INCLUDES is $17.95 million with $12.48 million contributed from the R&RA account. In FY 2020, all funding for NSF INCLUDES resides in the EHR account. For more information, see the NSF INCLUDES narrative in the NSF-wide Investments chapter.

For more information on programs that support EHR Major Investments, see EHR's division sections.

**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, $873,370,000, $823,470,000, to remain available until September 30, 2020.2021.

**Education and Human Resources**
**FY 2020 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 2018 Appropriation | $902.00 | $7.66 | -$14.26 | $8.47 | - | $903.87 |
| FY 2019 Annualized CR | 902.00 | 14.26 |  |  |  | 916.26 |
| FY 2019 Enacted | 910.00 |  |  |  |  | 910.00 |
| FY 2020 Total Request | 823.47 |  |  |  |  | 823.47 |
| $ Change from FY 2019 Enacted |  |  |  |  |  | -$86.53 |
| % Change from FY 2019 Enacted |  |  |  |  |  | -9.5% |

Totals exclude reimbursable amounts.

## Explanation of Carryover

Within the Education and Human Resources (EHR) account, $14.27 million (including $9,347 in reimbursable funds) was carried over into FY 2019.

Excellence Awards in Science and Engineering
- Amount:   $3.63 million
- Reason:   These carryover 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: Anticipated FY 2019 Quarter 2

The remaining $10.63 million of unallotted no-year funds will be used for awards supporting STEM teacher education associated with the Robert Noyce Teacher Scholarship Program and the EHR Core Research program.

## Funding Profile

**EHR Funding Profile**

|  | FY 2018 Actual Estimate | FY 2019 (TBD) | FY 2020 Estimate |
|---|---|---|---|
| **Statistics for Competitive Awards:** |  |  |  |
| Number of Proposals | 4,161 | - | 4,300 |
| Number of New Awards | 893 | - | 770 |
| Funding Rate | 21% | N/A | 18% |
| **Statistics for Research Grants:** |  |  |  |
| Number of Research Grant Proposals | 3,106 | - | 3,140 |
| Number of Research Grants | 472 | - | 460 |
| Funding Rate | 15% | N/A | 15% |
| Median Annualized Award Size | $295,992 | - | $287,100 |
| Average Annualized Award Size | $345,312 | - | $332,900 |
| Average Award Duration, in years | 3.3 | - | 3.3 |

**Program Monitoring and Evaluation**

EHR continues its strong emphasis on evidence-based decision making, as well as its commitment to generating robust evidence to inform the development, management, and assessment of directorate programs and portfolios of investment. EHR's evaluation priorities include ensuring the efficient use of available administrative data assets and coordinating evidence-building and use across NSF's STEM education, workforce, and broadening participation programs.

External Program Evaluations and Studies:
- In FY 2018, EHR initiated a third-party evaluation of the ADVANCE program.
- In February 2019, EHR supported a workshop entitled *Essential questions and measures: Assessing institutional transformation of undergraduate STEM education* the results of which will inform future plans to evaluate the IUSE program.
- EHR tentatively plans to complete an assessment of the Graduate Research Internship Program (GRIP) in FY 2019. EHR expects insights from this assessment will inform future evaluations of related initiatives (e.g., the INTERN supplemental funding opportunity that since FY 2018 has supported non-academic research internships to improve graduate student preparedness for the STEM workforce).
- In November 2018, EHR completed a collaborative project with the Institute of Education Sciences (IES) to update the *Common Guidelines for Education Research and Development*[2] (jointly released in 2013). A supplement, the *Companion Guidelines on Replication & Reproducibility in Education Research,* was issued in November 2018 to "highlight the importance" of reproducibility and replication studies in education research and "provide cross-agency guidance on the steps investigators are encouraged to take to promote corroboration, ensure the integrity of education research, and extend the evidence base."[3]
- In FY 2020, EHR will complete a systematic plan for addressing priority questions relevant to the directorate's STEM human capital development programs and continue to review existing data assets and assess how they can be leveraged for monitoring and evaluative purposes.
- In FY 2020 and beyond, EHR-based infrastructure and processes will continue to be developed in collaboration with the NSF Evaluation and Assessment Capability, as appropriate. Additionally, EHR experts in evaluation will continue to collaborate with other federal agencies engaged in STEM education program evaluation as a means of sharing best practices, developing tools for portfolio and data analysis, working toward the use of common metrics and instruments, building collaborative expertise for STEM education evaluation across agencies, and accomplishing the objectives for operating with transparency and accountability set-out in the federal government's five-year strategic plan for STEM education, *Charting a Course for Success: America's Strategy for STEM Education.*

EHR will employ evidence from these and other ongoing evaluations and monitoring initiatives to inform future EHR-program decision-making.

Committees of Visitors (COV):
In 2015, EHR began a transition from COVs focusing on individual programs to division-wide COVs that comprehensively examine all programs in the relevant division. All four EHR divisions have now transitioned to this new model.

- In late 2018, COVs reviewed the Division of Graduate Education (DGE) and the Division of Undergraduate Education (DUE). Those COVs are expected to present their reports to the EHR Advisory Committee at its spring 2019 meeting.
- In fall 2019, a COV will review the Division of Research on Learning (DRL).

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[2] www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf
[3] www.nsf.gov/pubs/2019/nsf19022/nsf19022.pdf?WT.mc_id=USNSF_179

- In 2020, a COV will review the Division of Human Resource Development (HRD).

The Performance 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 2018 Actual Estimate | FY 2019 (TBD) | FY 2020 Estimate |
| Senior Researchers | 6,654 | - | 6,000 |
| Other Professionals | 2,421 | - | 2,100 |
| Postdoctoral Associates | 316 | - | 300 |
| Graduate Students | 11,200 | - | 10,200 |
| Undergraduate Students | 16,500 | - | 15,100 |
| K-12 Teachers | 37,400 | - | 34,100 |
| K-12 Students | 84,600 | - | 77,200 |
| **Total Number of People** | **159,091** | **-** | **145,000** |

**DIVISION OF RESEARCH ON LEARNING IN FORMAL**　　　　　　　　　　**$181,720,000**
**AND INFORMAL SETTINGS (DRL)**　　　　　　　　　　　　　　　　　**-$46,500,000 / -20.4%**

**DRL Funding**
(Dollars in Millions)

| | FY 2018 Actual | FY 2019 (TBD) | FY 2020 Request | Change over FY 2018 Actual | |
|---|---|---|---|---|---|
| | | | | Amount | Percent |
| **Total** | **$228.22** | **-** | **$181.72** | **-$46.50** | **-20.4%** |
| **Learning and Learning Environments** | **25.63** | **-** | **27.78** | **2.15** | **8.4%** |
| Computer Science for All (CSforAll)[1] | *[10.00]* | - | 10.00 | - | - |
| EHR Core Research (ECR): STEM Learning | 25.63 | - | 17.78 | -7.85 | -30.6% |
| **Broadening Participation & Institutional Capacity** | **150.72** | **-** | **153.94** | **3.22** | **2.1%** |
| Advancing Informal STEM Learning (AISL) | 62.13 | - | 58.94 | -3.19 | -5.1% |
| Discovery Research PreK-12 (DRK-12) | 88.59 | - | 95.00 | 6.41 | 7.2% |
| **STEM Professional Workforce** | **51.87** | **-** | **-** | **-51.87** | **-100.0%** |
| Science, Technology, Engineering, Mathematics + Computing (STEM+C) Partnerships[1] | 51.87 | - | - | -51.87 | -100.0% |

[1] In FY 2018, CSforAll was supported as a component of STEM+C. The FY 2018 Actual is shown for comparison purposes only. FY 2020 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 science, technology, engineering, and mathematics. Advances in STEM learning ultimately support individuals who pursue STEM careers, as well as the Nation's future STEM workforce more broadly. 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 2020 priorities for DRL include investing in research and development in the following areas:
- Computer science education, including research on computational thinking and the integration of computing with other STEM disciplines.
- STEM learning and learning environments, broadening participation, workforce, and methodologies for STEM education research.
- Learning in math and science disciplines, as well as where disciplines converge, cutting across the STEM ecosystem including formal (preK-12) and informal settings.
- Research that employ data science (associated with the HDR Big Idea), neuroscience, cyberlearning (associated with the FW-HTF Big Idea), and artificial intelligence methodologies. This work will significantly advance the field's knowledge base on: STEM learning and learning environments; broadening participation and institutional capacity in STEM; and increasing retention for students traditionally underserved in STEM at the preK-12, undergraduate, and/or graduate level.

- Understanding, measuring, and enhancing socioemotional skills, such as persistence, teamwork, and learning to learn, in the context of STEM education.
- Early childhood STEM learning and building foundations for STEM literacy at the preK-12 level.

**FY 2020 Summary**

Learning and Learning Environments
- CSforAll will be a free-standing program in FY 2020, and will be supported at $10.0 million in EHR, with an additional $10.0 million in support from CISE. Previously, CSforAll was supported as a component of the STEM+C Partnerships program.
- ECR: STEM Learning is funded at a total of $17.78 million. The resources will support fundamental research (basic research or use-inspired basic research) that advances knowledge on STEM teaching and learning for enduring and cross-cutting issues, addresses urgent national priorities in STEM education, and builds the Nation's capacity to improve STEM teaching and learning.

Broadening Participation in STEM
- Within AISL, $58.94 million will support design, adaptation, implementation, and research on innovative modes of lifelong learning in informal environments, including emphases on broadening participation in STEM, public participation in scientific research, cyberlearning, digital and computational literacy, as well as learning in rural and urban environments.
- DRK-12 is provided $95.0 million for improving STEM achievement of all preK-12 students in math and science disciplines. DRK-12 will support innovative areas such as computer science and engineering education, bolstering a well-prepared teacher workforce and enabling success for preK-12 students in all groups and across diverse educational settings including digital platforms.
- In collaboration with DUE through IUSE and ECR, DRK-12 will invest a total of $7.0 million in research to better understand brain function during learning and to apply findings for the improvement of education. This investment in UtB includes $2.0 million for brain research through the BRAIN Initiative.

STEM Professional Workforce
- The STEM+C Partnerships requested funding level is zero, due to a re-distribution of the major program elements into CSfor All and DRK-12. The STEM+C program conducted a portfolio evaluation in FY 2018, which concluded that a consolidation of NSF's K-12 computing education programs could strengthen agency-wide efforts. In response to the evaluation, EHR will shift some support for STEM+C Partnerships into implementing CSforAll as a freestanding program and will also increase DRK-12 funding to $95.0 million, which will expand its computer science education portfolio. AISL and DRK-12 will continue to invest in R&D supporting computer science education, including research on computational thinking and the integration of computing with other STEM disciplines.

**DIVISION OF UNDERGRADUATE EDUCATION (DUE)**          **$219,390,000**
                                                       **-$35,260,000 / -13.8%**

**DUE Funding**
(Dollars in Millions)

| | FY 2018 Actual | FY 2019 (TBD) | FY 2020 Request | Change over FY 2018 Actual Amount | Percent |
|---|---|---|---|---|---|
| **Total** | **$254.65** | **-** | **$219.39** | **-$35.26** | **-13.8%** |
| **Learning and Learning Environments** | **123.89** | **-** | **97.39** | **-26.50** | **-21.4%** |
| EHR Core Research (ECR): STEM Learning Environments | 13.10 | - | 9.09 | -4.01 | -30.6% |
| IUSE: Hispanic Serving Institutions (HSI) | 19.82 | - | 10.00 | -9.82 | -49.6% |
| Improving Undergraduate STEM Education | 90.98 | - | 78.30 | -12.68 | -13.9% |
| **STEM Professional Workforce** | **130.75** | **-** | **122.00** | **-8.75** | **-6.7%** |
| Advanced Technological Education (ATE) | 66.05 | - | 75.00 | 8.95 | 13.6% |
| NSF Innovation Corps (I-Corps™) | 0.20 | - | - | -0.20 | -100.0% |
| Robert Noyce Teacher Scholarship Program (Noyce) | 64.50 | - | 47.00 | -17.50 | -27.1% |

[1] The FY 2018 HSI funding total of $45.0 million included $15.0 million in FY 2017 carryover funds in IA and $30.0 million in FY 2018 funds in EHR. Within EHR, HSI is co-managed by DUE and HRD. The HSI FY 2020 Request level of $15.0 million will target attracting HSIs not having a funding-track record with NSF while education research and development projects at HSIs will be funded through other EHR programs including IUSE, S-STEM, and ATE.

**About DUE**

DUE supports excellence in undergraduate STEM education for all students by funding projects that design, develop, and implement high-quality educational experiences, as well as execute the scientific research needed to understand the effectiveness of those experiences. DUE investments promote improved teaching practices across the full range of U.S. higher education: community colleges, four-year colleges, comprehensive public institutions, and research universities. In turn, improved STEM learning opens multiple career pathways and improves employment outcomes for undergraduates. For example, innovative educational programs at community colleges enable students to learn advanced technologies such as additive manufacturing, biotechnology, precision agriculture, nano-optics, or cybersecurity. DUE support also enables STEM majors to enter the K-12 teaching workforce in high-need school districts. Such improvements in STEM education enhance student learning, which supports greater retention and degree attainment rates, thus broadening participation in the future STEM workforce and helping to meet future STEM workforce needs.

FY 2020 priorities for DUE include:
- Increasing understanding of what works in undergraduate education, for whom, and why.
  - DUE will continue to be the main source of support across federal agencies for discipline-based educational research (DBER).[4] DBER applies disciplinary expertise and evidence from the learning sciences to create physical and virtual tools, technologies, and high-impact student experiences that could improve undergraduate STEM learning. DBER then uses R&D strategies to iteratively improve these results. Through such design-research cycles, DBER has the potential to improve STEM learning across the Nation, and across all STEM disciplines.

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[4] www.nap.edu/catalog/13362/discipline-based-education-research-understanding-and-improving-learning-in-undergraduate

- Support and influence systemic efforts to improve undergraduate STEM education.
  - DUE will expand existing efforts or develop new funding strategies to support transformation at departmental, institutional, and national scales. This effort will include increased support for research on institutional transformation best practices.
  - Given the increasing role of data science in today's STEM and other enterprises, DUE will examine current investments in data science education. Based upon that analysis, new funding opportunities may emerge or existing programs expanded, such as investments in HDR and the FW-HTF Big Ideas.
  - DUE will examine how to better integrate STEM learning activities with activities that develop students' skills, work habits, and character. This effort will contribute to developing the next generation of researchers who will study STEM and undergraduate STEM education.
  - To ensure the continual responsiveness of the DUE "flagship program" to changing needs, DUE will implement an IUSE: EHR program evaluation.
- Increase the number and diversity of STEM workers and STEM-knowledgeable workers.
  - DUE will continue to support the preparation of future K-12 teachers and highly skilled technicians in advanced technology industries. To broaden participation, additional attention will be placed on attracting proposals to IUSE: EHR from investigators at minority-serving community colleges, and/or from two- and four- year institutions with prior funding from HBCU-UP and TCUP.
  - DUE programs will emphasize R&D on increasing the success of low income and other underrepresented undergraduate groups in making the transition from two-year to four-year STEM degree programs.
- Spur research on STEM learning and learning environments, broadening participation, workforce, and methodologies for STEM education research.

**FY 2020 Summary**

Learning and Learning Environments
- ECR: STEM Learning Environments is funded at a total of $9.09 million. With these funds DUE will continue to support foundational research on STEM undergraduate education, including on-line learning and other innovative approaches supporting active learning.
- DUE's IUSE: HSI program budget remains at the agency-wide level of $10.0 million. Together with HRD's $5.0 million, DUE will continue to support R&D to improve STEM learning in institutions with a high proportion of Hispanic students.
- IUSE: EHR is provided $78.30 million to support scaling evidence-based practices to departmental, institutional, or national levels; advancing the knowledge base for institutional transformation and evidence-based teaching practices; and developing and identifying indicators, metrics, and assessments to measure readiness for and progress toward widespread use of evidence-based resources in undergraduate STEM instruction. For more information see the IUSE narrative in the NSF-Wide Investments chapter.

STEM Professional Workforce
- ATE, funded at $75.0 million, will support R&D on effective preparation of the skilled technical workforce, including technicians in advanced technological industries.
- The I-Corps™ requested funding level is zero. In FY 2020, EHR will not be investing in I-Corps™ due to low business ventures from the initial pilot cohorts on STEM education R&D.
- Noyce is provided $47.0 million and will invest in teacher preparation in STEM.

**DIVISION OF HUMAN RESOURCE DEVELOPMENT (HRD)**        **$178,300,000**
                                                       **+$15,640,000 / 9.6%**

**HRD Funding**
(Dollars in Millions)

| | FY 2018 Actual | FY 2019 (TBD) | FY 2020 Request | Change over FY 2018 Actual | |
|---|---|---|---|---|---|
| | | | | Amount | Percent |
| **Total** | **$162.66** | **-** | **$178.30** | **$15.64** | **9.6%** |
| **Learning and Learning Environments** | **58.54** | **-** | **71.74** | **13.20** | **22.5%** |
| ADVANCE[1] | 1.53 | - | 18.00 | 16.47 | 1076.5% |
| Alliances for Graduate Education and the Professoriate (AGEP) | 8.00 | - | 7.54 | -0.46 | -5.8% |
| Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) | 34.92 | - | 33.00 | -1.92 | -5.5% |
| INSPIRE | 0.09 | - | - | -0.09 | -100.0% |
| Tribal Colleges and Universities Program (TCUP) | 14.00 | - | 13.20 | -0.80 | -5.7% |
| **Broadening Participation & Institutional Capacity** | **74.37** | **-** | **79.93** | **5.56** | **7.5%** |
| EHR Core Research (ECR): Broadening Participation and Institutional Capacity in STEM | 12.88 | - | 8.93 | -3.95 | -30.7% |
| IUSE: Hispanic Serving Institutions (HSI) Program[2] | 10.00 | - | 5.00 | -5.00 | -50.0% |
| Big Idea: NSF INCLUDES[3] | 5.47 | - | 20.00 | 14.53 | 265.6% |
| Louis Stokes Alliances for Minority Participation (LSAMP) | 46.02 | - | 46.00 | -0.02 | -0.0% |
| **STEM Professional Workforce** | **29.75** | **-** | **26.63** | **-3.12** | **-10.5%** |
| Centers for Research Excellence in Science and Technology (CREST) | 24.01 | - | 22.63 | -1.38 | -5.7% |
| Excellence Awards in Science and Engineering (EASE) | 5.74 | - | 4.00 | -1.74 | -30.3% |

[1] Total FY 2018 Actual funding for ADVANCE is $18.0 million with $16.47 million contributed from the R&RA account. In FY 2020, all funding for ADVANCE resides in the EHR account.

[2] The FY 2018 HSI funding total of $45.0 million included $15.0 million in FY 2017 carryover funds in IA and $30.0 million in FY 2018 funds in EHR. Within EHR, HSI is co-managed by DUE and HRD. The HSI FY 2020 Request level of $15.0 million will target attracting HSIs not having a funding-track record with NSF while education research and development projects at HSIs will be funded through other EHR programs including IUSE, S-STEM, and ATE.

[3] Total FY 2018 Actual funding for NSF INCLUDES is $17.95 million with $12.48 million contributed from the R&RA account. In FY 2020, all funding for NSF INCLUDES resides in the EHR account.

**About HRD**

HRD's mission is to create and grow a vibrant and diverse U.S. STEM workforce by supporting the inclusion and broadening participation of underrepresented individuals in STEM and the institutions that serve them. HRD supports the development of and research on effective mechanisms and models for broadening participation, institutional transformation through institutional policies and practices, capacity building for STEM and STEM education research at minority-serving institutions, and faculty and student development.

FY 2020 priorities for HRD include:
- Continue to strengthen NSF-wide activities focusing on inclusion and broadening participation for all groups in STEM.
- Collaborate with all NSF directorates to enhance the research capability at HBCUs through the HBCU Excellence in Research (EiR) initiative.

- Encourage institutional collaboration with other federal agencies, state governments, national laboratories, private sector research labs, and K-12 schools, districts and state agencies to advance knowledge and education on research of significance to the Nation.
- Support programs with objectives to broaden participation and increase institutional capacity in STEM through better retention of students traditionally underserved in STEM.
- Continue to identify and recognize outstanding K-12 STEM educators and mentors and support their professional development in partnership with the Office of Science and Technology Policy.

**FY 2020 Summary**

Learning and Learning Environments
- ADVANCE remains at the agency-wide level of $18.0 million with all funding resources residing in EHR. In FY 2020, EHR will continue to support institutional transformation and faculty development, while also assessing the sustainability of ADVANCE activities, practices and strategies.
- AGEP is provided a total of $7.54 million to support innovative models of doctoral education and faculty advancement for historically underrepresented minorities (URMs) in STEM and/or STEM education research fields. AGEP will continue to work with GRFP and NRT to advance knowledge and practices that improve the participation, transitions, and advancement of URMs in the STEM academy.
- HBCU-UP FY 2020 resources total $33.0 million. This funding will continue to support institutional transformation efforts through research by HBCU STEM faculty that will also enhance the academic and research experiences of students, and thereby increase the number of students completing STEM degrees. HBCU-UP will continue to work with other NSF directorates to enhance the STEM research capacity of the HBCUs.
- TCUP FY 2020 funding totals $13.20 million and will support the design and implementation of comprehensive institutional improvements in STEM instruction and research capacity at Tribal Colleges and Universities, as well as Alaska Native- and Native Hawaiian-serving institutions of higher education.

Broadening Participation in STEM
- ECR: Broadening Participation and Institutional Capacity is funded at a total of $8.93 million. The resources will support fundamental research that advances knowledge in broadening participation in STEM fields.
- IUSE: HSI program will be jointly managed by HRD and DUE. FY 2020 funds from HRD are $5.0 million and will support projects that enhance undergraduate STEM education through research, partnerships, and knowledge development.
- NSF INCLUDES remains at the agency-wide level of $20.0 million with all funding resources residing in EHR. Funds will support incubation and dissemination of models of engaging and retaining populations traditionally underserved in the STEM disciplines. For more information, see the NSF INCLUDES narrative in the NSF-wide Investments chapter.
- LSAMP funding remains at $46.0 million FY 2020. This funding will continue its focus on broadening participation in STEM research and evaluation to expand knowledge about effective strategies for student recruitment, retention, and persistence in STEM programs.

STEM Professional Workforce
- CREST is provided $22.63 million to support new CREST centers and continuation of the Postdoctoral Research Fellowship track introduced in FY 2016. This track increases collaborations across the centers and builds research capacity at minority serving institutions.
- EASE funding totals $4.0 million. In FY 2020, collaborative efforts among the EASE, Noyce, and DRK-12 programs will support the professional development of preK-12 teachers by piloting models for teacher leadership.

**DIVISION OF GRADUATE EDUCATION (DGE)**                    **$244,060,000**
                                                            **-$14,280,000 / -5.5%**

**DGE Funding**
(Dollars in Millions)

| | FY 2018 Actual | FY 2019 (TBD) | FY 2020 Request | Change over FY 2018 Actual | |
| --- | --- | --- | --- | --- | --- |
| | | | | Amount | Percent |
| **Total** | **$258.34** | **-** | **$244.06** | **-$14.28** | **-5.5%** |
| **Learning and Learning Environments** | **7.57** | **-** | **-** | **-7.57** | **-100%** |
| Project and Program Evaluation (PPE) | 7.57 | - | - | -7.57 | -100.0% |
| **STEM Professional Workforce** | **250.77** | **-** | **244.06** | **-6.71** | **-2.7%** |
| CyberCorps®: Scholarship for Service (SFS) | 55.09 | - | 55.09 | - | - |
| EHR Core Research (ECR): STEM Professional Workforce Preparation | 20.00 | - | 10.99 | -9.01 | -45.0% |
| Graduate Research Fellowship Program (GRFP) | 142.58 | - | 128.45 | -14.13 | -9.9% |
| NSF Research Traineeship (NRT)[1] | 33.11 | - | 49.53 | 16.42 | 49.6% |

[1] Total FY 2018 Actual funding for NRT is $53.85 million with $20.74 million contributed from the R&RA account. In FY 2020, all funding for NRT resides in the EHR account.

**About DGE**

DGE provides leadership across NSF for investments that support U.S. graduate students in STEM, and for improvement and innovation in graduate education to prepare tomorrow's STEM leaders. DGE focuses on the development of the broad STEM professional workforce through graduate education.

FY 2020 priorities for DGE include:
- Maintain its SFS collaborations with other federal agencies to explore mechanisms through which members of this cybersecurity workforce can continue to contribute to the government throughout their careers. In addition, DGE will continue activities in the SFS program that strengthen and expand the capacity of universities to develop a diverse cadre of cybersecurity experts for the Nation.
- Continue the goal of GRFP to help build the U.S. STEM human capital necessary to ensure the Nation's leadership in advancing innovations in science and engineering.
- Invest in the NRT program, including the Innovations in Graduate Education (IGE) track.

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

**FY 2020 Summary**

Learning and Learning Environments
- The PPE requested funding level is zero. In FY 2020, EHR will continue to support monitoring and data collection efforts through its existing programs' budgets. The Promoting Research and Innovation in Methodologies for Evaluation (PRIME) solicitation will remain on hiatus in FY 2020.

STEM Professional Workforce
- SFS is funded at $55.09 million. This funding will improve the capacity of institutions to provide the latest curricular and assessment approaches and experiences available to ensure that students are well prepared with cybersecurity skills and knowledge. This funding will also allow institutions to conduct

research to build understanding of the most effective preparation for a variety of cybersecurity professions. Through SFS, EHR will invest in the cybersecurity education and workforce development component of NSF's SaTC investment area.

- ECR: STEM Professional Workforce Preparation is funded at a total of $10.99 million. This investment will expand the knowledge base to improve STEM professional workforce development at all educational levels through development of models, research, and evaluation.
- GRFP is provided $128.45 million. EHR's resources together with matching funds in the IA budget provide a total FY 2020 funding level of $256.90 million to support 1,600 new fellowships with a cost of education allowance of $12,000 and a stipend of $34,000 per fellow.
- NRT is provided $49.53 million with all FY 2020 funding resources residing in EHR. This funding will support graduate training and research projects that align with NSF-wide priority areas. Of the NRT budget, $8.0 million is dedicated to supporting the IGE track. Through IGE, NRT will challenge the field to devise, implement, and assess cutting-edge innovations in preparing graduate students to be researchers in the evolving areas of science, and will seek bold new STEM graduate education pilots and models to transform current practices in graduate education. Through the program's traineeship track, NRT also will support FY 2020 projects related to three NSF Big Ideas (HDR, FW-HTF and NNA).

**H-B NONIMMIGRANT PETITIONER FEES** **$120,000,000**

In FY 2019, H-1B Nonimmigrant Petitioner Fees are projected to be $120.0 million.

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

|  | FY 2018 Actual | FY 2019 Estimate | FY 2020 Request | FY 2020 Request Change Over FY 2019 Estimate | |
|---|---|---|---|---|---|
|  |  |  |  | Amount | Percent |
| H-1B Nonimmigrant Petitioner Fees Funding | $192.26 | $120.00 | $120.00 | - | - |

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 low-income scholarships; 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 2020 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 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 U.S. students demonstrating financial need to enter the STEM workforce or STEM graduate school following completion of an associate, baccalaureate, or graduate degree in fields of science, technology, engineering, or mathematics. 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 2,017 awards. In addition to scholarships, S-STEM awards also provide funding for student support activities featuring close involvement of faculty, student mentoring, academic support, curriculum development, and recognition of student accomplishments. Such activities are important in 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 U.S. students demonstrating financial need. Because S-STEM projects report much higher retention and graduation rates among their scholarship students than among other STEM majors, this research is important to understand this success so that effective practices can be used 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 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 3,751 grant proposals and made 488 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. In FY 2020, ITEST will be a partner in the NSF INCLUDES initiative and will make approximately 25-30 awards.

**H-1B Financial Activities from FY 2009 - FY 2018**

(Dollars in Millions)

| | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 | FY 2017 | FY 2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Receipts** | $88.66 | $91.22 | $106.11 | $128.99 | $120.94 | $132.49 | $143.00 | $138.80 | $141.07 | $155.99 |
| **Unobligated Balance start of year** | $50.83 | $52.62 | $50.15 | $60.93 | $99.31 | $108.31 | $111.39 | $116.02 | $74.63 | $96.86 |
| **Appropriation Previously unavailable (Sequestered)** | | | | | | $5.10 | $9.54 | $7.30 | $6.80 | $9.73 |
| **Appropriation Currently unavailable (Sequestered)** | | | | | | -$9.54 | -$7.30 | -$6.80 | -$9.73 | -$10.30 |
| Obligations incurred: | | | | | | | | | | |
| Scholarships in Science, Technology, Engineering, and Mathematics | 61.22 | 75.96 | 77.67 | 72.57 | 83.98 | 92.18 | 109.34 | 140.54 | 84.38 | 156.40 |
| Private-Public Partnership in K-12 | 27.86 | 20.85 | 18.62 | 21.59 | 31.51 | 37.23 | 29.83 | 44.35 | 35.11 | 35.86 |
| **Total Obligations** | $89.08 | $96.81 | $96.29 | $94.16 | $115.49 | $129.41 | $139.17 | $184.89 | $119.49 | $192.26 |
| Unallocated Recoveries | | 2.20 | 3.12 | 0.96 | 3.55 | - | 4.95 | 1.60 | 3.58 | 4.66 |
| **Unobligated Balance end of year** | $50.41 | $49.24 | $63.09 | $96.72 | $108.31 | $111.39 | $122.41 | $72.03 | $96.86 | $64.68 |

[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 no-year account, $64.68 million was carried over into FY 2019.

Innovation Technology Experiences for Students (ITEST)
- Amount:     $22.08 million
- Reason:     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.
- Anticipated Obligation: FY 2019 Quarter 4

Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM)
- Amount:     $26.98 million
- Reason:     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.
- Anticipated Obligation: FY 2018 Quarter 4.

The remaining $15.62 million consists of unallotted recoveries.