

## EDUCATION AND HUMAN RESOURCES (EHR)

**\$952,860,000**  
**+\$72,860,000 / 8.3%**

### EHR Funding (Dollars in Millions)

	FY 2015 Actual	FY 2016 Estimate	FY 2017 Request	Change Over	
				FY 2016 Estimate Amount	Percent
Division of Research on Learning in Formal and Informal Settings (DRL)	\$227.20	\$222.75	\$249.28	\$26.53	11.9%
Division of Graduate Education (DGE)	286.14	278.48	305.26	26.78	9.6%
Division of Human Resource Development (HRD)	143.90	150.23	155.89	5.66	3.8%
Division of Undergraduate Education (DUE)	229.08	228.54	242.43	13.89	6.1%
<b>Total, EHR</b>	<b>\$886.33</b>	<b>\$880.00</b>	<b>\$952.86</b>	<b>\$72.86</b>	<b>8.3%</b>

Totals may not add due to rounding.

The FY 2017 Budget Request for EHR is \$952.86 million, of which \$898.87 million is discretionary funding and \$53.99 million is new mandatory funding. The major focus of the mandatory funding is support for STEM education core activities, with special emphasis on advancing computational- and data-intensive areas, principally through the support of early career investigators likely to be receptive to interdisciplinary and technology-intensive approaches to education. Examples of EHR activities in these areas include research initiation support for early career investigators, and cross-over investigators from STEM research to STEM education research that:

- Exploits the growing technological and data cyberinfrastructure particularly for initiatives tied to computational and inferential thinking in data science;
- Improves human capacity in cybersecurity;
- Develops and evaluates computer science coursework and instructional practices tied to the scientific and engineering disciplines; and
- Leads to transformative research on STEM learning and learning environments, broadening participation, and workforce development.

### About EHR

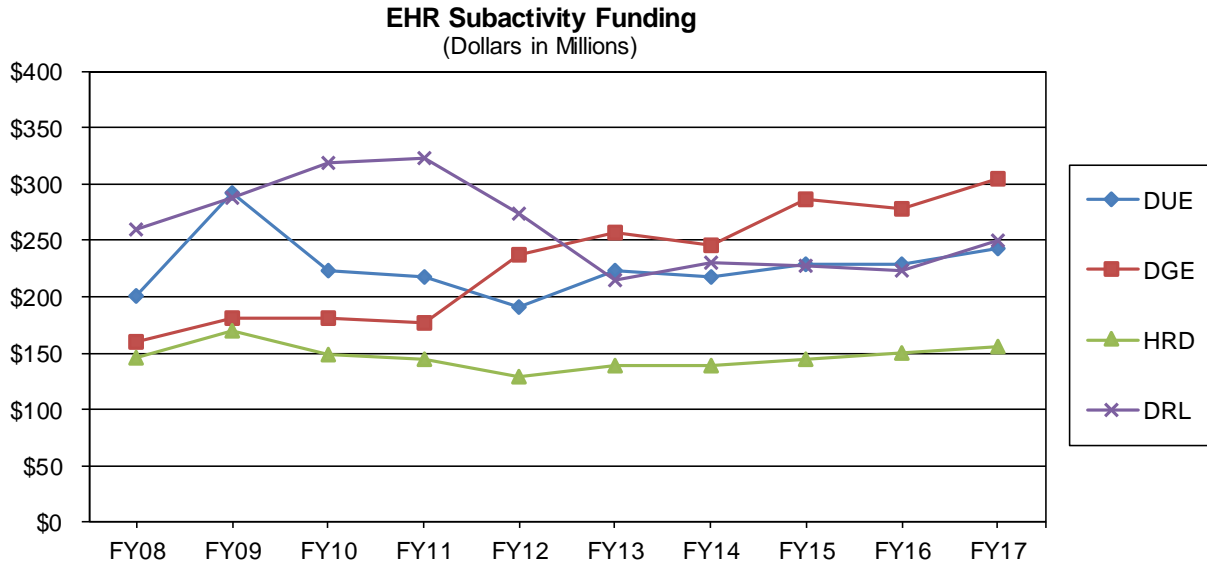
The mission of the Directorate for Education and Human Resources (EHR), to provide the research foundation to develop a diverse, science, technology, engineering, and mathematics (STEM) literate public and workforce ready to advance the frontiers of science and engineering for society, has guided and shaped EHR's portfolio and priorities for more than 60 years. While the EHR mission remains constant, the context in which this mission is enacted changes. Each decade brings new challenges and opportunities.

The federal investment in STEM education, and within it the focused investment in STEM education research based at NSF, must anticipate and respond to changes in: population demographics and diversity; economic conditions; the nature and practices of science and engineering; and the data- and cyber-infrastructure that is transforming society, security, and the nature of research.

The progress of science and engineering depends on the education of discoverers —those who will be the leaders and innovators in science and engineering. These discoverers will become part of the STEM and STEM-related workforce, including public and private sector, academic, policy, research, and teaching occupations. The progress of science and engineering also depends on a public that values and participates

in the STEM enterprise through formal and informal education, STEM-related aspects of their work, public participation in scientific research, and civic engagement.

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.



FY 2009 funding reflects both the FY 2009 omnibus appropriation and funding provided through the American Recovery and Reinvestment Act of 2009 (P.L. 111-5).

**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, ~~\$880,000,000~~, \$898,870,000, to remain available until September 30, 2017-2018.

(*Science Appropriations Act, 2016.*)

**Education and Human Resources**  
**FY 2017 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 2015 Appropriation	\$866.00	\$16.37	-\$2.63	\$6.59	-	\$886.33
FY 2016 Estimate	880.00	2.63				882.63
<i>FY 2017 Discretionary</i>	<i>898.87</i>					
<i>FY 2017 (new) Mandatory</i>	<i>53.99</i>					
FY 2017 Total Request	952.86					952.86
\$ Change from FY 2016 Estimate						\$70.23
% Change from FY 2016 Estimate						8.0%

Totals may not add due to rounding.

**Explanation of Carryover**

Within the **Education and Human Resources (EHR)** account, \$2.69 million (including \$62,144 in reimbursable funds) was carried over into FY 2016.

Excellence Awards in Science and Engineering (EASE)

- Amount: \$2.61 million
- Reason: Approximately \$2.33 million for the Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST) program was carried over into FY 2016. The FY 2014 awardees were not recognized in FY 2015 and have been scheduled to be recognized in FY 2016 along with the FY 2015 awardees.
- Reason: \$275,682 for the Presidential Awards for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM) was carried over into FY 2016. The FY 2014 and 2015 awardees were not recognized in FY 2015 and are scheduled to be recognized in FY 2016.
- Anticipated Obligation: FY 2016 Quarter 2

The remaining \$23,041 are residual funds from various EHR accounts.

**EHR 2017 EHR Summary**

EHR's proposed investment in FY 2017 employs three themes to respond to changing population demographics and diversity, changing economic conditions, changes in the nature and practices of science and engineering, and changes in the data- and cyberinfrastructure that is transforming society and the nature of research. These guide the design of solicitations and program activities; EHR's investments are coordinated within these core research areas.<sup>1</sup>

- As part of **broadening participation and institutional capacity**, EHR will serve as a central resource for:
  - Co-leading, with the Directorate for Engineering (ENG) and the Office of Integrative Activities (OIA), the implementation of NSF's investment in Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES). EHR

<sup>1</sup> See Strategic re-re-envisioning for the Education and Human Resources Directorate, September 2014  
[www.nsf.gov/ehr/Pubs/AC\\_ReEnvisioning\\_Report\\_Sept\\_2014\\_01.pdf](http://www.nsf.gov/ehr/Pubs/AC_ReEnvisioning_Report_Sept_2014_01.pdf)

will help identify promising strategic goals and objectives that are pivotal for improving the participation of traditionally underrepresented groups, promote implementation research to support scaling of effective models, and involve all EHR broadening participation programs as NSF INCLUDES affiliates.

- An increased focus on STEM education for Native youths primarily within the Tribal Colleges and Universities program.
- Co-leading, with the Directorate for Computer and Information Science and Engineering (CISE), the agency priority goal “Public Participation in STEM Research” bringing to bear a growing research base about how engagement of non-experts in scientific research is valuable both for developing interest and learning in science and engineering and increasing scientific output.
  
- As part of **learning and learning environments**, EHR will promote:
  - Research on the science of learning as translated into educational environments for STEM.
  - Studies about specific learning issues in the STEM disciplines.
  - The development and study of models for improving STEM learning environments and their implementation.
  - Research to further the learning of crosscutting and interdisciplinary topics, such as data science and the science of science communication.
  - Improvement of undergraduate learning opportunities to attract and retain STEM majors, via such emphases as research courses and technological innovations.
  
- As part of **STEM professional workforce development**, EHR will place particular emphasis on specialized professional development and preparation for:
  - The STEM teachers of tomorrow, through the Robert Noyce Teacher Scholarship Program (Noyce).
  - Future cybersecurity experts through the CyberCorps<sup>®</sup>: Scholarship for Service (SFS) program.
  - NSF involvement in the training component of the National Strategic Computing Initiative.
  - Innovation in STEM graduate education in a variety of disciplines through the NSF Research Traineeship (NRT) program’s Innovation in Graduate Education track.

EHR is a co-lead directorate, with the Directorate for Biological Sciences (BIO), in the development and implementation of the NSF strategic framework for graduate education.

EHR’s core education research investment guides strategic and impactful STEM education improvement. In addition, EHR will continue to support the development and study of evidence-based and evidence-generating innovations and models for improving STEM learning. Investment in EHR core research (ECR) is key to improving and solving enduring challenges in STEM education in the three thematic areas that guide EHR’s work: the improvement of learning and learning environments; successful models of broadening participation; and educating the STEM workforce for tomorrow. Findings are accumulating to inform investment, policy, and practice in several areas of STEM education. For instance, there is a solid evidence base to support shifts in undergraduate STEM teaching to approaches that emphasize active learning.<sup>2</sup> Education research about mentoring and providing research experiences to undergraduate and graduate students shows the value of focusing explicitly on students’ professional development.<sup>3</sup> Research indicates that a critical factor in improving teachers’ effectiveness is subject-specific professional

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<sup>2</sup> Freeman, S. et al. (2014). Active learning increases student performance in science. *Proceedings of the National Academy of Sciences*. 111: 8410-8415.

<sup>3</sup> Tsui, L. (2007). Effective strategies to increase diversity in STEM fields: A review of the research literature. *The Journal of Negro Education*, 76: 4, 555-581.

development.<sup>4</sup> There is evidence that engagement in authentic STEM research experiences both inside and outside of school can promote interest and persistence in STEM and course-based research can decrease inequities by expanding research opportunities to more learners from underrepresented groups.<sup>5,6</sup> Student pathways to STEM degree completion are complex; improved metrics, indicators, and data collection systems can help institutions better understand their populations of learners and pathways, including curricular and co-curricular components, that support success in obtaining a STEM degree.<sup>7</sup>

The role of NSF within the federal government, through EHR, in supporting such research on STEM education is unique. EHR programs fund crucial foundational, design and development, and implementation research that is available to inform large investments at scale made by other agencies, organizations, and the private sector for promising or effective practices. The EHR research portfolio also supports the increasingly coherent suite of investments NSF-wide in undergraduate and graduate STEM education. That support occurs through strategic linkages with the discipline-specific needs of all NSF directorates and engagement in cross-directorate science and engineering initiatives. In addition, the EHR investments in preK-12 STEM education and informal STEM learning are focused, catalytic contributions that push the frontiers of effective learning and practice in those environments. Such work is foundational as a part of the national STEM education infrastructure.

Overall, there are no significant shifts in EHR's priorities between FY 2016 and FY 2017. Rather, EHR will intensify its engagement in foundational research, broadening participation, and advancing science and engineering through strategic collaborations across the NSF disciplines.

EHR will participate in the cross-Foundation priorities NSF INCLUDES, Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS), and Understanding the Brain (UtB). For INFEWS and UtB, EHR's emphasis is on innovation in the development of a diverse, next-generation workforce with the skills and competencies needed in these emerging areas through the NRT and Centers for Research Excellence in Science and Technology (CREST) programs. STEM and education communities funded in EHR programs will be encouraged to engage in the NSF INCLUDES National Network, and EHR-based capacity for measurement and indicators in broadening participation will be engaged in the development of the NSF INCLUDES Backbone Organization.

EHR's FY 2017 Budget Request reflects a continuing strong commitment to deepening and strengthening the synergies within EHR and between EHR and the other directorates. Recognizing the unique commitment of NSF in the integration of education and the sciences, EHR's funding prioritizes strategic collaborations that address discipline-specific needs in the sciences and engineering and that utilize the significant experience and expertise of the STEM education community to inform and improve the impact of strategic investments. This is reflected in EHR's interest in expanding the NRT program to align with NSF-wide scientific priorities so that the field can be challenged to devise truly cutting-edge innovations in preparing graduate students to be researchers in these evolving areas. It is also evident in our continued leadership in the Improving Undergraduate STEM Education (IUSE) activity, SFS, and discipline-specific

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<sup>4</sup> Penuel, W.R., Fishman, B.J., Yamaguchi, R., & Gallagher, L.P. (2007). What makes professional development effective? Strategies that foster curriculum implementation. *American Educational Research Journal*, 44(4), 921-958; and

Garet, M.S., Porter, A., Desimone, L., Birman, B., & Yoon, K.S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal*, 38(4), 915-945.

<sup>5</sup> Locks, A.M., & Gregerman, S.R. (2008). Undergraduate research as an institutional retention strategy: The University of Michigan model. In R. Taraban & R.L. Blanton (Eds.) *Creating effective undergraduate research programs in science: The transformation from student to scientist* (pp. 11-32). New York: Teachers College Press; and Laursen, S. et al. (2010). *Undergraduate research in the sciences: Engaging students in real science*. San Francisco, CA: Jossey-Bass.

<sup>6</sup> National Research Council (2015). *Integrating discovery-based research into the undergraduate curriculum*. Washington, DC: National Academies Press.

<sup>7</sup> National Research Council (2016). *Barriers and opportunities for 2-year and 4-year STEM degrees: Systemic change to support students' diverse pathways*. Washington, DC: National Academies Press; and Locks & Gregerman (2008).

partnerships, as well as in our expansion of NSF Innovation Corps for Learning as a means of stimulating wide use of EHR-funded results and tools.

EHR staff continue to provide cross-agency leadership to the Federal Coordination in STEM Education Task Force (FC-STEM) and the associated Interagency Working Groups (IWG) on the implementation of the *Federal Science, Technology, Engineering, and Mathematics (STEM) Education 5-Year Strategic Plan* developed by the Committee on STEM Education (CoSTEM). EHR staff will continue to serve in key roles as co-chairs and members of the groups and will provide support in development of the evidence base, with the long-term outcome to be a more impactful and efficient federal investment in STEM education.

### **FY 2017 Summary by Division**

- The Division of Research on Learning in Formal and Informal Settings (DRL) invests in foundational research on STEM learning. This includes the development and testing of innovative resources, models, and tools for STEM learning both inside and outside of school, for the public, for preK-12 students, for teachers, and for youth; research on national STEM education priorities; and evaluation studies and activities. The FY 2017 DRL investment for ECR: STEM Learning supports a wide range of high quality foundational studies across the STEM domains and across levels and institutional type. The Discovery Research PreK-12 (DRK-12) program supports awards that focus on research and development models and tools for preK-12 education. The Advancing Informal STEM Learning (AISL) program allows expanded emphasis on broadening participation through informal learning environments, including out-of-classroom experiences. DRL, in collaboration with CISE, will lead NSF's involvement in the Administration's Computer Science (CS) for All initiative which accelerates NSF's ongoing efforts to enable rigorous and engaging computer science education in schools across the Nation.
- The Division of Graduate Education (DGE) provides support to U.S. graduate students and innovative graduate programs to prepare tomorrow's leaders in STEM. DGE's role includes support for research that focuses on the general issues related to the development of the STEM professional workforce at the graduate level. In FY 2017, through ECR: STEM Professional Workforce Preparation, DGE will increase its interactions with STEM workforce preparation programs based in other EHR divisions in areas such as teacher preparation and professional development and STEM career development at the undergraduate level. DGE provides intellectual leadership for the use and conduct of research that provides the knowledge base that informs implementation of successful approaches, practices, and models for STEM professional workforce preparation. Another focus for DGE in FY 2017 is reflected in the plan to align NRT with the NSF-wide scientific priorities INFEWS and UtB. At the same time, DGE will continue to promote innovation in graduate education through activities that provide new professional development opportunities for the Graduate Research Fellowship program (GRFP) fellows (i.e., Graduate Research Opportunities Worldwide (GROW) and Graduate Research Internships Program (GRIP)) and through research on the implementation of innovative new program and learning opportunities. In addition, DGE will be involved in the pilot activities in graduate education that are underway as part of NSF's Agency Priority Goal on expanding professional development for graduate students. Another key emphasis for DGE is the expansion of the SFS program to increase the quality of the preparation of tomorrow's cybersecurity experts to predict, engage and recover from cyber-attacks through support of more and well-prepared students' entry into this field through scholarships and government access to their expertise over time.
- The Division of Human Resource Development (HRD) invests in building a diverse and well-qualified STEM workforce through broadening the participation of groups underrepresented in STEM. In FY 2017, HRD programs serve as a foundation for NSF INCLUDES, and all will be affiliated with it. In FY 2017, HRD continues leading efforts to improve STEM education for Hispanic students and at

Hispanic-serving Institutions (HSIs) by focusing on Hispanic-serving two-year institutions in partnership with a variety of programs throughout EHR, within a programmatic framework that recognizes the diverse needs of the varied types of HSIs. HRD investments in Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs), and other minority-serving institutions (MSIs) remain critically important. These programs together with ADVANCE, CREST, and the Louis Stokes Alliances for Minority Participation (LSAMP) program will be instrumental in encouraging its principal investigator (PI) community to lead the development of a set of specific goals and objectives for inclusion within NSF INCLUDES. HRD also leads the ECR: Broadening Participation and Institutional Capacity in STEM activity which builds the research base for the science of broadening participation.

- The Division of Undergraduate Education (DUE) provides NSF-wide leadership and expertise for transforming undergraduate STEM education to meet the needs of the 21<sup>st</sup> century STEM workforce. DUE will continue to emphasize evidence-based and evidence-generating approaches to improve undergraduate education; discipline-focused needs in learning research and development of physical and virtual tools, technologies, and other learning experiences; and emerging areas of science in undergraduate programs in STEM. DUE is the lead division for the NSF-wide IUSE activity which serves as an umbrella for agency-wide investments in undergraduate STEM education. EHR's contribution to IUSE allows for expanded focus on research experiences as part of the undergraduate STEM experience. In FY 2017, DUE's IUSE: EHR program will partner with other directorates on discipline-specific needs in undergraduate education. Funding for ECR: STEM Learning Environments will increase to support fundamental research in STEM education. Further, DUE will continue to focus on supporting the Administration's goal of generating 100,000 new effective STEM teachers and one million more STEM graduates through the Noyce program-in conjunction with HRD's Excellence Awards in Science and Engineering (EASE) program.

## Major Investments

### EHR Major Investments

(Dollars in Millions)

Area of Investment	FY 2015 Actual	FY 2016 Estimate	FY 2017 Request	Change Over FY 2016 Estimate	
				Amount	Percent
CIF21	\$2.50	\$2.50	\$2.50	-	-
GRFP	166.52	165.96	166.08	0.12	0.1%
NSF I-Corps™	0.55	1.55	1.55	-	-
NSF INCLUDES	-	3.00	4.00	1.00	33.3%
INFEWS	-	4.00	6.00	2.00	50.0%
Improving Undergraduate STEM Education (IUSE)	83.84	87.00	92.50	5.50	6.3%
NSF Research Traineeship (NRT) <sup>1</sup>	40.74	31.05	37.71	6.66	21.4%
SaTC	45.04	50.00	70.00	20.00	40.0%
Understanding the Brain	5.00	11.00	11.00	-	-
<i>BRAIN</i>	2.00	2.00	2.00	-	-

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

<sup>1</sup> FY 2015 funding for Integrative Graduate Education and Research Traineeship (IGERT) (\$4.60 million) is included in the NRT line.

- Cyberinfrastructure Framework for 21<sup>st</sup> Century Science, Engineering, and Education (CIF21): In FY 2017, through the Project and Program Evaluation (PPE) program, \$2.50 million will support

CIF21's Building Community and Capacity for Data-intensive Research activity. For more information, see the CIF21 narrative within the NSF-Wide Investments chapter.

- Graduate Research Fellowship Program (GRFP): GRFP increases \$120,000, to a total of \$166.08 million. An equal investment is provided through the Integrative Activities budget for a total GRFP investment of \$332.16 million. For more information, see the Major Investments in STEM Graduate Education narrative within the NSF-Wide Investments chapter.
- NSF Innovation Corps (I-Corps™): In FY 2017, DUE will support EHR's participation in this activity at a level of \$1.55 million. For more information, see the I-Corps™ narrative within the NSF-Wide Investments chapter.
- NSF INCLUDES: In FY 2017, \$4.0 million will support NSF INCLUDES Alliances. For more information, see the NSF INCLUDES narrative within the NSF-Wide Investments chapter.
- Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS): \$6.0 million will support emphasis on the food-energy-water nexus research area through NRT. For more information, see the INFEWS narrative within the NSF-Wide Investments chapter.
- Improving Undergraduate STEM Learning (IUSE): In FY 2017, EHR will lead the NSF-wide IUSE activity with an investment of \$92.50 million and coordinate the participation of the Directorates for Geosciences (GEO), BIO, and ENG. Research and Related Activities (R&RA) account funding will be retained within individual directorates and offices and totals \$16.50 million for a Foundation IUSE investment of \$109.0 million. For more information, see the IUSE narrative within the NSF-Wide Investments chapter.
- NSF Research Traineeship (NRT): The investment for FY 2017 NRT activities is \$37.71 million, of which \$7.0 million is dedicated to supporting Innovation in Graduate Education (IGE) for model design, innovation, and research in graduate student training and professional development. For more information, see the Major Investments in STEM Graduate Education narrative within the NSF-Wide Investments chapter.
- Secure and Trustworthy Cyberspace (SaTC): Through the CyberCorps®: Scholarship for Service (SFS) program, EHR will support SaTC activities at \$70.0 million. Additional SFS funding in FY 2017 will lay the groundwork for SFS alumni to be available over the course of their careers to serve the federal government to help respond rapidly to cybersecurity challenges.
- Understanding the Brain (UtB): Through the NRT, EHR core research (ECR), IUSE, and DRK-12 programs, EHR will invest in cognitive and learning sciences research efforts at the level of \$11.0 million to better understand brain function during learning and problem solving in specific domains of STEM education, and to translate and apply findings from neuroscience and cognition for the improvement of education. EHR investments also will support the preparation of the next generation of neuroscientists and cognitive scientists. This investment includes \$2.0 million for the Administration's Brain Research through Advancing Innovation and Neurotechnologies (BRAIN) Initiative.

### **Summary and Funding Profile**

EHR supports investment in core research in education and STEM learning as well as STEM education development and training. In FY 2017, the number of research grant proposals is estimated at 3,200. EHR



expects to award approximately 570 research grants with an average annualized award size and duration of \$290,000 and 2.8 years, respectively.

<b>EHR Funding Profile</b>			
	FY 2015 Actual Estimate	FY 2016 Estimate	FY 2017 Estimate
<b>Statistics for Competitive Awards:</b>			
Number of Proposals	4,243	4,250	4,650
Number of New Awards	831	845	930
Funding Rate	20%	20%	20%
<b>Statistics for Research Grants:</b>			
Number of Research Grant Proposals	2,873	2,900	3,200
Number of Research Grants	515	525	568
Funding Rate	18%	18%	18%
Median Annualized Award Size	\$167,391	\$170,000	\$170,000
Average Annualized Award Size	\$289,493	\$290,000	\$290,000
Average Award Duration, in years	2.7	2.8	2.8

### Program Monitoring and Evaluation

EHR continues its strong emphasis on evidence-based decision making, through projects, programs, and investment portfolios that are evidence-based, evidence building, and evidence improving. In fiscal years 2016 and 2017, EHR will further consolidate program-based monitoring systems, initiate use of administrative data and on-going data collections for monitoring and evaluation, and fully integrate monitoring and evaluation investments. This work aligns closely with the CoSTEM 5-Year Strategic Plan Objective 2: Build and use evidence-based approaches.<sup>8</sup> Using the joint NSF and Institute of Education Sciences (IES) report, *Common Guidelines for Education Research and Development*, released in FY 2013, EHR will ensure that promising practices, key findings, and accumulated knowledge in evaluation are used and adapted for use internally and disseminated to the larger evaluation community. Plans are underway for updating that report in FY 2017.

The National Research Council (NRC) report *Monitoring Progress Toward Successful K-12 STEM Education* (2013) laid the groundwork for a significant effort launched in FY 2014 to develop indicators for tracking progress in preK-12 STEM education, an essential component in developing evidence-based programs. EHR and the National Center for Science and Engineering Statistics, in collaboration with the National Center for Education Statistics (NCES) within IES, are coordinating efforts to adapt and implement data collection on these indicators within other national efforts.

EHR-based infrastructure and processes will be developed in collaboration with the NSF Evaluation and Assessment Capability, as appropriate. EHR experts in evaluation will provide expertise as needed within NSF and to 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, and building collaborative expertise for STEM education evaluation across agencies.

<sup>8</sup> [www.whitehouse.gov/sites/default/files/microsites/ostp/stem\\_stratplan\\_2013.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf)

External Evaluations and Committee of Visitors (COV) completed in FY 2015 and FY 2016:

- COVs for the GK-12/IGERT/SFS, Noyce/Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM), and Advanced Technological Education (ATE) programs, as well as a COV for DRL, were held in 2015.
- The Informal Science Education (ISE) program evaluation conducted by SRI International was completed in FY 2015. The ISE program is now known as the Advancing Informal Science Learning (AISL) program.
- The Innovative Technology Experiences for Students and Teachers (ITEST) program evaluation conducted by SRI International was completed in FY 2015.
- The National STEM Digital Library/Distributed Learning (NSDL) program evaluation conducted by Guardians of Honor was completed in FY 2015.
- The Research and Evaluation on Education in Science and Engineering (REESE) program evaluation conducted by Westat was completed in FY 2015.
- The Discovery Research PreK-12 (DRK-12) program evaluation conducted by Westat was completed in FY 2016.

COVs tentatively scheduled for FY 2016 and FY 2017:

- EHR plans to hold a COV in spring 2016 to review the first three years of the ECR program, which spans all four divisions in the directorate.
- DUE plans to hold a COV in fall 2016 to review the final two years of the Transforming Undergraduate Education in STEM (TUES) program, STEM Talent Expansion Program (STEP), and the Widening Implementation and Demonstration of Evidence-Based Reforms (WIDER) program, along with the first year of the IUSE: EHR program, which consolidated TUES, STEP, and WIDER.
- HRD plans to hold a division-wide COV in fall 2016 to review all HRD programs—i.e., ADVANCE, Alliances for Graduate Education and the Professoriate (AGEP), CREST, Historically Black Colleges and Universities–Undergraduate Program (HBCU-UP), LSAMP, and the Tribal Colleges and Universities Program (TCUP).
- DGE plans to hold a division-wide COV in FY 2017 to review DGE professional workforce programs—i.e., NRT, SFS, and GRFP.

For details regarding the periodic reviews of programs and portfolios of programs by external COVs and directorate advisory committees, please see the Performance chapter for additional information.

**Number of People Involved in EHR Activities**

	FY 2015		FY 2016 Estimate	FY 2017 Estimate
	Actual	Estimate		
Senior Researchers	5,784		5,700	6,300
Other Professionals	2,478		2,400	2,600
Postdoctoral Associates	288		200	300
Graduate Students	10,873		10,800	11,800
Undergraduate Students	15,262		15,200	16,500
K-12 Teachers	36,010		35,800	39,000
K-12 Students	76,000		75,000	82,300
<b>Total Number of People</b>	<b>146,695</b>		<b>145,100</b>	<b>158,800</b>

**DIVISION OF RESEARCH ON LEARNING IN FORMAL  
AND INFORMAL SETTINGS (DRL)**

**\$249,280,000**  
**+\$26,530,000 / 11.9%**

**DRL Funding**  
(Dollars in Millions)

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<b>Learning and Learning Environments</b>	<b>25.94</b>	<b>25.63</b>	<b>52.16</b>	<b>26.53</b>	<b>103.5%</b>
EHR Core Research (ECR): STEM Learning	25.94	25.63	52.16	26.53	103.5%
<b>Broadening Participation &amp; Institutional Capacity</b>	<b>139.07</b>	<b>145.24</b>	<b>145.24</b>	-	-
Advancing Informal STEM Learning (AISL)	55.01	62.50	62.50	-	-
Discovery Research PreK-12 (DRK-12)	84.06	82.74	82.74	-	-
<b>STEM Professional Workforce</b>	<b>62.19</b>	<b>51.88</b>	<b>51.88</b>	-	-
INSPIRE	0.22	-	-	-	N/A
Science, Technology, Engineering, Mathematics + Computing (STEM + C) Partnerships	61.97	51.88	51.88	-	-

Totals may not add due to rounding.

The FY 2017 Budget Request for the Division of Research on Learning in Formal and Informal Settings (DRL) is \$249.28 million, of which \$201.84 million is discretionary funding and \$47.44 million is new mandatory funding. The mandatory funding is within the following funding lines in the above table: EHR core research (\$9.30 million, to a total of \$52.16 million); AISL (\$7.50 million, to a total of \$62.50 million), and STEM + Computing (STEM + C) Partnerships (\$30.64 million, to a total of \$51.88 million).

DRL invests in foundational research to advance understanding about STEM learning and teaching. The DRL portfolio also includes the design, implementation, and study of learning environments, models, and technologies intended to engage and enable STEM learning for all students, particularly those who have been underrepresented in STEM, through both formal and informal STEM activities both within formal education systems and beyond. DRL also provides direction for the EHR portfolio in techniques for measurement and assessment of learning outcomes. The results of DRL-funded projects are a resource for establishing renewed and new partnerships with other directorates, NSF-funded facilities, other agencies, and the private sector for complementary investments in discipline- and practice-based approaches to STEM education.

DRL provides leadership for: 1) EHR's core research portfolio; 2) cyberlearning and big data investments, 3) the NSF-wide Einstein Fellows program; 4) agency-wide participation in public participation in scientific research investments, in partnership with CISE, through the Agency Priority Goal; and 5) research collaborations with other directorates related to big data and data science; neuroscience; the science of learning; smart and connected communities; and promoting research to advance the participation of women and girls in STEM, in part by addressing biases against girls, women, and underrepresented minority groups in STEM learning environments (in partnership with the EHR/Human Resource Development division); and catalyzing research for increasing the participation of people with disabilities and learning challenges in STEM.

In FY 2017, DRL will invest across its programs in research and development at the early childhood level intended to foster STEM learning. DRL will support research employing data science methodologies to 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. DRL will fund research and development related to understanding, measuring, and enhancing socioemotional skills such as persistence, teamwork, and learning to learn, in light of evidence indicating these skills are important for positive STEM educational outcomes. DRL programs will seek proposals for research and development that are driven by questions and needs of practitioners, the diverse nature of K-12 schools including shifting demographic contexts and students with learning disabilities, and the importance of conducting research in settings that include significant numbers of students of low socio-economic status. Finally, in FY 2017, DRL will increase efforts to engage the STEM education research and development communities with technology improvements, shared data, networked research activity, and implementation and improvement research.

In FY 2017, through the Innovative Technology Experiences for Students and Teachers (ITEST) program, DRL will lead EHR's involvement in the Administration's CS for All initiative, by making \$10.0 million available to advance the effective teaching and learning of computer science in K-12 education. In addition, DRL will contribute \$5.0 million to NSF's UtB initiative; this includes \$2.0 million for the Administration's Brain Research through Advancing Innovation and Neurotechnologies (BRAIN) Initiative to support research on the neural and cognitive basis of STEM learning.

### **FY 2017 Summary**

All funding decreases/increases represent change over the FY 2016 Estimate.

#### **Learning and Learning Environments**

- ECR: STEM Learning increases \$26.53 million, to a total of \$52.16 million. This program will continue to expand and deepen the portfolio of foundational STEM education research on learning, learning environments, broadening participation, and the STEM professional workforce. An area of emphasis within the learning and learning environments theme for FYs 2016 and 2017 will be early childhood STEM learning, which will be highlighted in ECR along with the Research in Disabilities Education and Research on Gender in Science and Engineering emphases. Increased funding will enable more strategic and coordinated research investment in areas of high importance for improving STEM learning across all of the Nation's demographics, including new knowledge about how to successfully develop talent in groups that have traditionally been underrepresented in STEM. DRL will also provide new direction for partnerships with science-rich entities funded across the NSF, such as large facilities, and centers, in order to explore the potential of these learning environments for engaging and exciting STEM learners of all ages, and for enhancing data infrastructure to advance STEM education research.

#### **Broadening Participation and Institutional Capacity in STEM**

- Broadening participation investments in FY 2017 will continue to focus on understanding changing demographics and building talent so that diversity is an asset for science. AISL remains at the FY 2016 Estimate level of \$62.50 million. These resources will support design, adaptation, implementation, and research on innovative modes of learning in the informal environment, including emphases on public participation in scientific research, making, and cyberlearning. AISL will continue to encourage projects that utilize informal learning environments in novel ways to engage students from groups traditionally underrepresented in STEM and will continue with Phase 2 of the Wellcome Trust Science Learning+ collaboration, a partnership grant program supporting joint U.S. and United Kingdom initiatives.
- DRK-12 investments will remain at the FY 2016 Estimate level of \$82.74 million. These funds are aimed at improving STEM achievement for all preK-12 students. Investments will focus on enabling success for preK-12 students in all groups and across diverse educational settings, and STEM

discipline-specific, and interdisciplinary, teaching and learning challenges. STEM teachers, developers, and researchers must keep pace with and contribute to deeper understandings about the technologies that inform their work; build, study, adapt, and implement evidence-based instructional materials and assessment models; translate and use lessons emerging from the science of learning; and become expert in how best to prepare the Nation's diverse learners for the future. The teacher education emphasis in DRK-12 continues its focus on implementation research on policy and practice issues associated with national and state activities, and on the role of authentic STEM research experiences in teacher development and in learning environment design as a means of reaching a wide range of students.

**STEM Professional Workforce**

- The STEM + C Partnerships program advances research on and development of innovative courses, curriculum, course materials, pedagogies, instructional strategies, and models that integrate computing into one or more other STEM disciplines. In addition, the program builds capacity in K-12 computing education with foundational research and focused teacher preparation. The program advances a 21<sup>st</sup> century vision for STEM education in which computing is integral to all STEM disciplines and essential to STEM learning and teaching. The STEM + C Partnerships program will be an important resource for the evolving CS for All initiative. EHR's FY 2017 STEM + C Partnerships investment is \$51.88 million.

**DIVISION OF GRADUATE EDUCATION (DGE)**

**\$305,260,000**  
**+\$26,780,000 / 9.6%**

**DGE Funding**  
(Dollars in Millions)

	FY 2015 Actual	FY 2016 Estimate	FY 2017 Request	Change Over FY 2016 Estimate	
				Amount	Percent
<b>Total, DGE</b>	<b>\$286.14</b>	<b>\$278.48</b>	<b>\$305.26</b>	<b>\$26.78</b>	<b>9.6%</b>
<b>Learning and Learning Environments</b>	<b>15.79</b>	<b>15.50</b>	<b>15.50</b>	-	-
Project and Program Evaluation (PPE)	15.79	15.50	15.50	-	-
<b>STEM Professional Workforce</b>	<b>270.35</b>	<b>262.98</b>	<b>289.76</b>	<b>26.78</b>	<b>10.2%</b>
EHR Core Research (ECR): STEM Professional Workforce Preparation	16.10	15.97	15.97	-	-
CyberCorps®: Scholarship for Service (SFS)	45.04	50.00	70.00	20.00	40.0%
Graduate Research Fellowship (GRF)	166.52	165.96	166.08	0.12	0.1%
INSPIRE	1.75	-	-	-	N/A
NSF Innovation Corps (I-Corps™)	0.20	-	-	-	N/A
NSF Research Traineeship (NRT) <sup>1</sup>	40.74	31.05	37.71	6.66	21.4%

Totals may not add due to rounding.

<sup>1</sup> FY 2015 funding for Integrative Graduate Education and Research Traineeship (IGERT) (\$4.60 million) is included in the NRT line.

The FY 2017 Budget Request for the Division of Graduate Education (DGE) is \$305.26 million in discretionary funding.

DGE provides leadership across NSF for investments that support U.S. graduate students in science and engineering and for improvement and innovation in graduate education to prepare tomorrow’s leaders for numerous new and existing roles in STEM. DGE focuses on the development of the broad STEM professional workforce through excellent graduate education.

In FY 2017, DGE will further emphasize research on the development of the STEM workforce through ECR. In FY 2017, the SFS program will use \$25.0 million to expand its collaborations with other federal agencies to explore mechanisms through which this well-prepared workforce can continue to contribute to government throughout their careers. In addition, through the SFS program, DGE will initiate activities to strengthen and expand university capacity to prepare and provide continuing education for diverse cadres of cybersecurity experts for the Nation who are ready to identify evolving cyber threats. The program also will support research and development in programs, curriculum, and assessment related to cybersecurity educational needs at every level of higher education. Finally, efforts to engage community colleges in the preparation of cybersecurity professionals will continue. See the Major Investments in STEM Graduate Education section in the NSF-wide Investments chapter for more information.

Another focus for DGE is the continued inclusion of INFEWS and UtB as priority research areas in the NRT program in FY 2017. At the same time, DGE will continue to promote innovation in graduate education from activities that range from new research and professional development opportunities for all graduate students supported by fellowships, scholarships, and traineeships (modeled on Graduate Research Opportunities Worldwide (GROW) and Graduate Research Internship Program (GRIP)) to research on the implementation of innovative new program and learning opportunities such as those in NRT and NRT’s Innovation Graduate Education track. DGE will increase its emphasis on broadening participation in the STEM workforce through additional outreach to HSIs, HBCUs and TCUs as well as providing additional

opportunities for veterans. DGE will support UtB at a level of \$4.0 million through the NRT and ECR: STEM Professional Workforce Preparation programs. Partnerships and new pilot activities with disciplinary divisions across NSF are being developed in FY 2016 through the Agency Priority Goal on designing graduate education to better prepare tomorrow's STEM workforce. DGE is collaborating in these efforts to meet the needs of graduate education within specific fields, and expand promising approaches.

With BIO, DGE has administrative and intellectual responsibility for the development and implementation of the NSF strategic plan in graduate education. DGE also leads the EHR evaluation portfolio (particularly in the area of human capital), and is co-lead with NIH in the FC-STEM IWG on Graduate Education.

## **FY 2017 Summary**

All funding decreases/increases represent change over the FY 2016 Estimate.

### **Learning and Learning Environments**

- The request for PPE is \$15.50 million, equal to the FY 2016 Estimate. Administrative oversight for EHR's activity in evaluation, monitoring, and related research activities will reside in DGE, and staff will collaborate closely with the Evaluation and Assessment Capability in OIA. Efforts will include launching long-term studies to examine and compare the impact of various NSF investment approaches in graduate students and funding the development of instruments to assess metrics identified in the NRC report, *Monitoring Progress Toward Successful K-12 STEM Education* (2013). The Promoting Research and Innovative Methodologies for Evaluation (PRIME) activity within the PPE program is on hold in FY 2016 for review. In FY 2017, it is anticipated that resources will be realigned to take up examination of other issues, including methodology for studying graduate education, data privacy in research and evaluation, and use of administrative data in evaluation.

### **STEM Professional Workforce**

- ECR: STEM Professional Workforce Preparation (\$15.97 million) investments will expand the knowledge base to improve STEM professional workforce development at all educational levels through development of models, research, and evaluation, and will allow translation of the results of the research for adoption/adaptation in workforce and education programs.
- SFS increases \$20.0 million, to a total of \$70.0 million. In FY 2017, NSF will invest \$25.0 million in the expansion of the SFS program to lay the groundwork for SFS program alumni to be available over the course of their careers to serve the federal government's response to cybersecurity challenges. SFS funding will improve the capacity of institutions to provide the latest curricular and assessment approaches and experiences available to ensure that the students are well prepared with cybersecurity skills and knowledge, and to conduct research to build understanding of the most effective preparation for a variety of cybersecurity professions. It also will enable awards to a broader spectrum of institutions to make additional scholarships. Due to greater capacity, increased attention will be directed to community colleges, continuing an effort launched in FY 2015.
- EHR's portion of GRFP increases \$120,000, to a total of \$166.08 million. The program will support 2,000 new fellowships with a cost of education allowance of \$12,000 and a stipend of \$34,000. For more information, see the Major Investments in STEM Graduate Education narrative within the NSF-Wide Investments chapter.
- In FY 2017, EHR's NRT investment increases \$6.66 million, to a total of \$37.71 million. NRT will continue to support projects in the FY 2017 NSF-wide priorities INFEWS and UtB. As part of the Innovation in Graduate Education track, NRT will challenge the field to devise, implement, and assess cutting-edge innovations in preparing graduate students to be researchers in these evolving areas. NRT will seek bold new STEM graduate education pilots and models in order to transform current practices in graduate education.

**DIVISION OF HUMAN RESOURCE DEVELOPMENT (HRD)**

**\$155,890,000**  
**+\$5,660,000 / 3.8%**

**HRD Funding**  
(Dollars in Millions)

	FY 2015 Actual	FY 2016 Estimate	FY 2017 Request	Change Over	
				FY 2016 Estimate Amount	Percent
<b>Total, HRD</b>	<b>\$143.90</b>	<b>\$150.23</b>	<b>\$155.89</b>	<b>\$5.66</b>	<b>3.8%</b>
<b>Learning and Learning Environments</b>	<b>55.14</b>	<b>58.53</b>	<b>58.53</b>	-	-
ADVANCE	1.52	1.53	1.53	-	-
Alliances for Graduate Education and the Professoriate (AGEP)	8.00	8.00	8.00	-	-
Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)	32.04	35.00	35.00	-	-
Tribal Colleges and Universities Program (TCUP)	13.58	14.00	14.00	-	-
<b>Broadening Participation &amp; Institutional Capacity</b>	<b>58.83</b>	<b>61.88</b>	<b>67.54</b>	<b>5.66</b>	<b>9.1%</b>
EHR Core Research (ECR): Broadening Participation and Institutional Capacity in STEM	12.92	12.88	17.54	4.66	36.2%
<b>NSF INCLUDES</b>	-	3.00	4.00	1.00	33.3%
Louis Stokes Alliances for Minority Participation (LSAMP)	45.91	46.00	46.00	-	-
<b>STEM Professional Workforce</b>	<b>29.93</b>	<b>29.82</b>	<b>29.82</b>	-	-
Centers for Research Excellence in Science and Technology (CREST)	24.01	24.00	24.00	-	-
Excellence Awards in Science and Engineering (EASE)	5.92	5.82	5.82	-	-

Totals may not add due to rounding

The FY 2017 Budget Request for the Division of Human Resource Development (HRD) is \$155.89 million, of which \$153.09 million is discretionary funding and \$2.80 million is new mandatory funding. The mandatory funding is within the EHR core research line in the above table.

HRD provides support to grow the innovative and competitive U.S. STEM workforce by supporting the inclusion and success of individuals currently underrepresented in STEM and the institutions that serve them, and conducting research on effective mechanisms and models for achieving both of these goals.

In FY 2017, EHR will continue its substantial role in NSF-wide activities to strengthen inclusion and broadening participation for all groups in STEM. EHR is a co-lead organization in the implementation of NSF INCLUDES, with primary expertise coming from HRD. HRD anticipates that members of the principal investigator community from all HRD-based programs will be leaders and innovators in the NSF INCLUDES initiative, and all HRD programs will affiliate with NSF INCLUDES. The NSF INCLUDES Network Alliances will be promoted strongly through HRD programs, and the LSAMP program will introduce an NSF INCLUDES Alliance track. The ADVANCE program will pilot a special track, tentatively named Increasing the Participation and Success of Faculty of Color in Academic Science and Engineering Careers (SUCCESS), in connection with NSF INCLUDES. HRD also will continue efforts from FY 2016 to provide publicity and outreach to the rapidly growing set of HSIs to encourage increased proposal submission to the many programmatic opportunities available at EHR to address the specific needs of particular types of HSIs, within a program framework for investment.



HRD will increase its partnerships with other organizations (e.g., the U.S. Department of Education's Office of Postsecondary Education's Hispanic-Serving Institutions Division and U.S. Department of Agriculture's National Institute of Food and Agriculture) to advance Administration STEM education priorities. The AGEP program will focus on the transition from postdoctoral training to faculty position, particularly for those who are underrepresented in STEM. New coordinated efforts will be built among the LSAMP, IUSE, and ATE programs to enhance the persistence of undergraduate students, and with GRFP to reach talent broadly for the Nation and to diversify the GRFP applicant pool. HRD will work with the SFS program, particularly in preparing and supporting students from two-year colleges to transition into four-year degree courses that are supported by SFS. HRD has administrative and intellectual responsibility for EASE, in partnership with the Office of Science and Technology Policy. EASE will continue to support professional development for K-12 teachers and STEM educators and mentors, as well as the identification and recognition of educators who have particular impact on broadening participation. Collaborative efforts among the EASE, Noyce, and DRK-12 programs will support the professional development of preK-12 teachers, and connections will be made from HRD to CS for All to increase the access to computer science for students in groups traditionally underrepresented in STEM. HRD is co-lead with NIH in the FC-STEM Broadening Participation IWG.

### **FY 2017 Summary**

All funding decreases/increases represent change over the FY 2016 Estimate.

#### **Learning and Learning Environments**

- HRD supports the development of effective STEM learning and learning environments through several existing programs (ADVANCE, AGEP, HBCU-UP, and TCUP). These programs will continue to build on the knowledge about successful approaches to broadening STEM participation with a focus on retention of underrepresented undergraduate students and building institutional capacity in MSIs.
- In FY 2017, ADVANCE will continue to support work in institutional transformation and faculty development, focus on the advancement of women of color, as well as focus on disciplinary areas that foster collaborations through developing networks and partnerships.
- AGEP will support innovative and sustainable ways to promote inclusion in the STEM academic workforce, and will implement new strategies to work with the NRT program and GRFP focusing on transitions from graduate to postdoctoral training to increase STEM career opportunities. AGEP will look into models that support the transition of postdoctoral scientists to faculty positions.
- TCUP will work with the Howard Hughes Medical Institute, to provide Native American students more hands-on learning experiences in the classroom. HRD programs will support studies on learning issues and challenges in specific STEM disciplines in order to understand better the factors that may increase retention and completion rate of underrepresented students.

#### **Broadening Participation and Institutional Capacity in STEM**

- In FY 2017, HRD will continue to provide strategic direction and guidance for the broadening participation and institutional capacity component of ECR. ECR funding increases by \$4.66 million in FY 2017 to a total of \$17.54 million. HRD will integrate into ECR the broadening participation research tracks of all HRD programs to support more investigators from MSIs that will carry out foundational research to explore topics, such as: approaches to using diversity as an asset for science; successful approaches that engage a diverse group of learners and audiences; the use of culturally relevant materials in engaging learners from groups traditionally underrepresented in STEM; and development and implementation of models that support persistence, retention, and success in STEM for groups underrepresented in STEM disciplines. In addition, MSIs will be encouraged to explore research topics and workshops that support capacity building at these institutions, with a focus on developing faculty to carry out STEM education research.

*Directorate for Education and Human Resources*

- HRD's funding for NSF INCLUDES increases by \$1.0 million to a total of \$4.0 million to support the development of the NSF INCLUDES Alliances and the Backbone Organization. HRD will lead EHR efforts to incorporate the principles of NSF INCLUDES across all programs, as appropriate, and will play a key role in the development of metrics and approaches to the assessment of NSF INCLUDES and other investments in broadening participation.
- LSAMP funding is \$46.0 million in FY 2017, equal to the FY 2016 Estimate.

**STEM Professional Workforce**

- The graduate education component of the CREST program is part of a National Academies of Science (NAS) review on effective practices in STEM graduate education to be initiated in FY 2016. It is expected that based on the NRC review findings, the CREST program will be changed to better address the needs of the field in FY 2017 and FY2018. CREST introduced a Postdoctoral Research Fellowship track in FY2016 which fosters increased collaborations across the centers and builds research capacity at MSIs. CREST funding is \$24.0 million in FY 2017, equal to the FY 2016 Estimate.
- EASE will remain at the FY 2016 Estimate level of \$5.82 million and will continue to support professional development for K-12 teachers and STEM educators and mentors, as well as the identification and recognition of educators who have particular impact on broadening participation.

**DIVISION OF UNDERGRADUATE EDUCATION (DUE)**

**\$242,430,000**  
**+\$13,890,000 / 6.1%**

**DUE Funding**  
(Dollars in Millions)

	FY 2015 Actual	FY 2016 Estimate	FY 2017 Request	Change Over FY 2016 Estimate	
				Amount	Percent
<b>Total, DUE</b>	<b>\$229.08</b>	<b>\$228.54</b>	<b>\$242.43</b>	<b>\$13.89</b>	<b>6.1%</b>
<b>Learning and Learning Environments</b>	<b>100.00</b>	<b>100.10</b>	<b>113.99</b>	<b>13.89</b>	<b>13.9%</b>
EHR Core Research (ECR): STEM Learning Environments	16.16	13.10	21.49	8.39	64.0%
Improving Undergraduate STEM Education (IUSE)	83.84	87.00	92.50	5.50	6.3%
<b>STEM Professional Workforce</b>	<b>129.08</b>	<b>128.44</b>	<b>128.44</b>	-	-
Advanced Technological Education	67.67	66.00	66.00	-	-
NSF Innovation Corps (I-Corps™)	0.35	1.55	1.55	-	-
Robert Noyce Teacher Scholarship Program (Noyce)	61.06	60.89	60.89	-	-

Totals may not add due to rounding.

The FY 2017 Budget Request for the Division of Undergraduate Education (DUE) is \$242.43 million, of which \$238.68 million is discretionary funding and \$3.75 million is new mandatory funding. The mandatory funding is within the EHR core research line in the above table.

DUE supports the design, development, and study of innovative STEM learning environments that integrate cutting-edge science and education findings to optimize learning for all undergraduates. DUE invests in discipline-based education research where disciplinary expertise and evidence from the learning sciences are infused into physical and virtual tools, technologies, and other learning experiences, and then iteratively improved through research and development to impact STEM learning at scale.

In FY 2017, DUE programs will continue to provide direction for the nationwide movement to transform undergraduate STEM education by investing in the design, implementation, and study of innovative environments for undergraduate STEM interdisciplinary and disciplinary learning. DUE also continues to be the main source of support across Federal agencies for discipline-based educational research.<sup>9</sup> DUE will focus on investments for improving mathematics learning and teaching, particularly in the first two years; improving data science learning; developing socio-emotional and twenty first century skills in conjunction with STEM learning; and developing the next generation of researchers who will study undergraduate STEM education. In collaboration with the National Center for Education Statistics, plans are being developed for a revision of the National Study of Postsecondary Faculty to provide data on teaching practices, the evolving role of technology in education, and the rapidly changing nature of faculty work, and we anticipate that implementation will begin in FY 2017.

To build a diverse, innovative STEM and STEM-savvy workforce, in FY 2017 a “New-to-IUSE” opportunity will be established in IUSE: EHR for investigators from minority-serving community colleges, as well as investigators from two- and four- year institutions with prior funding from HBCU-UP and TCUP programs and awardees from recent Dear Colleague Letters for HSIs. Across DUE programs, research and

<sup>9</sup> National Research Council (2012) *Discipline-based Education Research: Understanding and Improving Learning in Undergraduate Science and Education*, Washington, DC: National Academies Press

development 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 will be emphasized.

DUE provides administrative leadership for EHR in the NSF-wide IUSE activity, the community college investment portfolio (in partnership with HRD), and in the FC-STEM IWG on Undergraduate Education.

### **FY 2017 Summary**

All funding decreases/increases represent change over the FY 2016 Estimate.

#### **Learning and Learning Environments**

- ECR: STEM Learning Environments increases by \$8.39 million to a total of \$21.49 million. DUE has leadership for this ECR focus area. The increase will support foundational research and related development for the improvement of STEM learning environments, including cyberlearning, as well as the use of data science to understand and improve learning environments. With an investment of \$2.0 million, DUE will support UtB.
- DUE's funding for IUSE increases by \$5.50 million to a total of \$92.50 million. This funding will support scaling evidence-based practices; advancing the knowledge base for undergraduate research, including course-based research; 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. DUE will increase the STEM research and experiential learning opportunities available in NSF-funded large facilities, national laboratories, and centers through the S-STEM program in collaboration with the NSF Graduate Research Internship Program (GRIP).
- DUE will work with HRD to align the IUSE: EHR and S-STEM (an H-1B Visa funded program) programs with the LSAMP program to leverage the strengths of all programs for enhancing persistence of students from low-income and underrepresented groups. The two divisions will focus on improving undergraduate learning at HSIs. This alignment will be informed by an HRD- and DUE-funded study by the National Academies on *Barriers and Opportunities in Completing Two or Four Year STEM Degrees*.<sup>10</sup>

For more information regarding IUSE and NSF's undergraduate framework, see the IUSE narrative in the NSF-Wide Investments chapter.

#### **STEM Professional Workforce**

The request for ATE is \$66.0 million, equal to the FY 2016 Estimate. Noyce remains at the FY 2016 level of \$60.89 million. In FY 2017, ATE activities will continue to fund research on effective preparation of advanced technology technicians; while Noyce will continue investing in teacher preparation. In addition, both programs will continue to have emphasis on the preparation of a diverse STEM workforce and will incorporate a focus on inclusion, in partnership with the NSF INCLUDES initiative.

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<sup>10</sup> Board on Science Education. *Barriers and Opportunities in Completing Two or Four Year STEM Degrees*. [http://sites.nationalacademies.org/DBASSE/BOSE/CurrentProjects/DBASSE\\_080405](http://sites.nationalacademies.org/DBASSE/BOSE/CurrentProjects/DBASSE_080405)

**H-1B NONIMMIGRANT PETITIONER FEES**

**\$100,000,000**  
**\$0 / 0.0%**

In FY 2017, H-1B Nonimmigrant Petitioner Fees are projected to be \$100.0 million, equal to the FY 2016 estimate.

**H-1B Nonimmigrant Petitioner Fees Funding**

(Dollars in Millions)

	Change Over				
	FY 2015	FY 2016	FY 2017	FY 2016 Estimate	
	Actual	Estimate	Request	Amount	Percent
H-1B Nonimmigrant Petitioner Fees Funding	\$139.17	\$100.00	\$100.00	-	-

Beginning in FY 1999, Title IV of the American Competitiveness and Workforce Improvement Act 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).

- **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 over 6,900 proposals from all types of colleges and universities and has made awards for 1,453 projects. In addition to scholarships, projects include a coherent ecosystem of student support activities featuring close involvement of faculty, student mentoring, academic support, curriculum development, and recognition of the students. Such activities are important in recruiting and retaining students in high-technology fields through graduation and into employment. In FY 2017, in addition to the long-standing scholarship support, all S-STEM projects will contribute to the knowledge base of scholarly research in education by carrying out research on interventions which affect associate or baccalaureate degree attainment for 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, it is important to systematically study the reasons for this success so that effective practices can be used at scale. Approximately 85-90 awards are anticipated in FY 2017, with an emphasis on increasing involvement of community colleges, especially Hispanic-serving institutions. S-STEM activities in FY 2017 will leverage efforts in the IUSE: EHR, LSAMP programs to enhance persistence of students. S-STEM will be a partner in the NSF INCLUDES initiative. S-STEM programming and research emphasis also will align with NRT to understand and enhance development of effective

learning environments and pathways for scholarship and traineeship students on the continuum from two-year to four-year to master's to doctoral degrees.

- 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 US 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. Building on FY 2016 investments, ITEST will seek to build its portfolio in the area of computer science, with the intention of infusing more high quality opportunities for the learning of computer science into the Nation's K-12 schools as a part of the Administration's CS for All initiative. In FY 2017, we anticipate aligning \$10.0 million within ITEST funding for this initiative.

Since its inception, the ITEST program has received 4,580 proposals and funded 360 projects that allow students and teachers to work closely with scientists, engineers, and other STEM professionals on extended research projects ranging from biotechnology to environmental resource management to programming and problem-solving. Projects draw on a wide mix of local resources, including universities, industry, museums, science and technology centers, and school districts in order to identify the characteristics that attract a wide and diverse range of young people to STEM careers, especially those students not successful in traditional school settings. ITEST will be a partner in the NSF INCLUDES initiative. Approximately 20 awards are anticipated in FY 2017.

**H-1B Financial Activities from FY 2006 - FY 2015**

(Dollars in Millions)

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
<b>Receipts</b>	<b>\$105.32</b>	<b>\$107.36</b>	<b>\$104.43</b>	<b>\$88.66</b>	<b>\$91.22</b>	<b>\$106.11</b>	<b>\$128.99</b>	<b>\$120.94</b>	<b>\$132.49</b>	<b>\$143.00</b>
<b>Unobligated Balance start of year</b>	<b>\$89.58</b>	<b>\$98.19</b>	<b>\$63.37</b>	<b>\$50.83</b>	<b>\$52.62</b>	<b>\$50.15</b>	<b>\$60.93</b>	<b>\$99.31</b>	<b>\$104.76</b>	<b>\$108.35</b>
<b>Appropriation Previously unavailable (Sequestered)</b>									<b>\$5.10</b>	<b>\$9.54</b>
<b>Appropriation Currently unavailable (Sequestered)</b>									<b>-\$9.54</b>	<b>-\$7.30</b>
Obligations incurred:										
Scholarships in Science, Technology, Engineering, and Mathematics <sup>1</sup>	80.95	100.04	92.40	61.22	75.96	77.67	72.57	83.98	92.18	109.34
Private-Public Partnership in K-12 <sup>2</sup>	18.45	45.90	28.72	27.86	20.85	18.62	21.59	31.51	37.23	29.83
<b>Total Obligations</b>	<b>\$99.40</b>	<b>\$145.94</b>	<b>\$121.12</b>	<b>\$89.08</b>	<b>\$96.81</b>	<b>\$96.29</b>	<b>\$94.16</b>	<b>\$115.49</b>	<b>\$129.41</b>	<b>\$139.17</b>
Unallocated Recoveries				2.20	3.12	0.96	3.55	-	4.95	1.60
<b>Unobligated Balance end of year</b>	<b>\$95.50</b>	<b>\$59.61</b>	<b>\$46.68</b>	<b>\$52.62</b>	<b>\$50.15</b>	<b>\$60.93</b>	<b>\$99.31</b>	<b>\$104.76</b>	<b>\$108.35</b>	<b>\$116.02</b>

Totals may not add due to rounding.

<sup>1</sup> In FY 2006, the Computer Science, Engineering, and Mathematics Scholarships (CSEMS) was renamed to Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM).

<sup>2</sup> 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.

**Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM).** The S-STEM program began in 1999 under P.L. 105-277. At this time, 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 21<sup>st</sup> 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.

**Private-Public Partnerships in K-12.** The American Competitiveness in the 21<sup>st</sup> 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).

### **Explanation of Carryover**

Within the **H-1B Nonimmigrant Petitioner** account, \$116.02 million was carried over and consists of \$29.96 million for ITEST and \$86.06 million for S-STEM. 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. These resources will allow both ITEST and S-STEM to support awards through the second quarter of FY 2016.

