

**IMPROVING UNDERGRADUATE STEM EDUCATION (IUSE)****\$93,130,000**  
**-\$5,990,000 / -6.0%**

**IUSE Funding**  
(Dollars in Millions)

	FY 2018 Actual	FY 2019 (TBD)	FY 2020 Request
BIO	\$2.23	-	\$1.90
CISE	-	-	2.00
EHR	90.97	-	78.30
ENG	0.05	-	4.75
GEO	5.82	-	5.70
OPP	0.05	-	0.48
<b>Total</b>	<b>\$99.12</b>	<b>-</b>	<b>\$93.13</b>

**Overview**

High-quality undergraduate STEM education is essential for preparing a diverse professional STEM workforce that can sustain U.S. leadership in STEM innovation.<sup>1,2</sup> IUSE is an NSF-wide activity that works toward the goal of ensuring that every college student in the U.S. has exceptional STEM learning opportunities. To this end, IUSE supports research and development to improve undergraduate STEM education from individual STEM classrooms to nation-wide efforts. IUSE also supports innovations in undergraduate STEM education in emerging areas, such as those needed to produce a STEM workforce that can use innovative interdisciplinary approaches, massive data sets, and/or computation to identify and solve problems. All IUSE projects include research and assessment components, thus also contributing new knowledge about what works in undergraduate STEM education and why.

STEM undergraduate education is essential to meet the demand for STEM professionals in the U.S. workforce. Currently, STEM-related occupations represent about six percent of total U.S. employment<sup>3</sup> and the demand for workers in STEM-related occupations is expected to continue to grow at higher than average rates. The average wage of STEM occupations is nearly double that of non-STEM occupations.<sup>4</sup> In addition to educating STEM workers, high-quality undergraduate STEM education is essential for producing STEM-knowledgeable workers who can use STEM skills in business and industry, as well as a STEM-literate public that understands and benefits from the progress of STEM.<sup>5</sup>

Reflecting the breadth of STEM, IUSE is one of NSF’s most flexible funding programs, capable of supporting projects relevant to any NSF directorate. IUSE also supports projects that cross all STEM

<sup>1</sup> Hulten, C. (2017). The Importance of Education and Skill Development for Economic Growth in the Information Era. In Education, Skills, and Technical Change: Implications for Future US GDP Growth. University of Chicago Press. Retrieved from: [www.nber.org/chapters/c13937.pdf](http://www.nber.org/chapters/c13937.pdf)

<sup>2</sup> Olson, S., & Riordan, D. G. (2012). Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics. Report to the President. Executive Office of the President.; [https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final\\_2-25-12.pdf](https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final_2-25-12.pdf).

<sup>3</sup> [www.bls.gov/opub/ted/2017/8-point-8-million-science-technology-engineering-and-mathematics-stem-jobs-in-may-2016.htm?view\\_full](http://www.bls.gov/opub/ted/2017/8-point-8-million-science-technology-engineering-and-mathematics-stem-jobs-in-may-2016.htm?view_full)

<sup>4</sup> [www.bls.gov/spotlight/2017/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future/pdf/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future.pdf](http://www.bls.gov/spotlight/2017/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future/pdf/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future.pdf)

<sup>5</sup> National Academies of Sciences, Engineering, and Medicine. (2016). Science literacy: Concepts, contexts, and consequences. National Academies Press. Retrieved from: [www.nap.edu/catalog/23595/science-literacy-concepts-contexts-and-consequences](http://www.nap.edu/catalog/23595/science-literacy-concepts-contexts-and-consequences)

disciplines, such as incorporating active learning approaches.<sup>6</sup> The flexibility of IUSE enables it to respond rapidly to emerging areas and priorities. For example, in FY2018, it launched the Accelerating Discovery Program, which funded undergraduate education projects aligned with NSF's 10 Big Ideas, including efforts to establish the nation's first undergraduate program on quantum computing.

IUSE is a multi-year, NSF-wide priority investment area, spanning FY 2014 to FY 2020. However, NSF's emphasis on improving undergraduate STEM education is expected to extend beyond FY 2020, enabling NSF to support the ongoing improvements needed for undergraduate STEM education to remain current with innovations in STEM and STEM learning.

## **Goals**

IUSE aims to contribute to nation-wide improvements in undergraduate STEM Education by:

1. Improving STEM learning and learning environments at the undergraduate level. These investments improve the knowledge base for innovative undergraduate STEM instruction.
2. Broadening participation and institutional capacity for STEM learning. These investments increase the number and diversity of undergraduate students in STEM majors and career pathways.
3. Building the STEM workforce for tomorrow. These investments improve the preparation of undergraduate students to be productive members of the future STEM and STEM-capable workforce.

## **FY 2020 Investments**

As part of its mission to advance STEM, NSF plans to invest \$93.13 million in FY 2020. This funding represents investments within and across directorates and is aligned with the IUSE goals. The IUSE initiative's anchor investment is IUSE: EHR, a solicitation-based program in the EHR Division of Undergraduate Education (DUE). IUSE: EHR funds: (1) innovative learning resources; (2) design of research questions to understand the impact of such resources; (3) strategies to implement effective instruction in a department or multiple departments, within or across institutions; (4) faculty development projects; (5) design and testing of instruments for measuring student outcomes; and (6) innovative activities that could have a high impact on learning and contribute to transforming undergraduate STEM education. IUSE: EHR is complemented by five additional IUSE core programs, which share the three common IUSE goals, but with a narrower funding focus than IUSE: EHR. These programs and their number of awards anticipated for FY 2020 are as follows:

- *EHR/IUSE: Hispanic Serving Institutions (HSI)*: Supports improvements in retention and graduation rates at HSIs that have not received high levels of NSF support; approximately 15 awards.
- *BIO: Research Coordination Networks: Undergraduate Biology Education (RCN: UBE)*: Supports collaborative networks to improve undergraduate biology education; approximately 10 awards.
- *ENG: IUSE/Professional Formation of Engineers: Revolutionizing Engineering Departments (IUSE/PFE:RED)*: Supports organizational change strategies to transform undergraduate engineering education; approximately 3 awards.
- *CISE: IUSE/Computing in Undergraduate Education (CUE)*: Supports multi-institution teams to re-envision the role of computing in interdisciplinary fields and to integrate the study of ethics into computer science curricula; approximately 14 awards.
- *GEO/IUSE: Pathways into Geoscience (IUSE: GEOPATHS)*: Support strategies to increase the number and diversity of undergraduate students pursuing geoscience degrees; approximately 20 awards.

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<sup>6</sup> Freeman, S., et al. (2014). Active learning increases student performance in science. *Proceedings of the National Academy of Sciences*. 111: 8410-8415. Retrieved from: [www.pnas.org/content/111/23/8410.abstract](http://www.pnas.org/content/111/23/8410.abstract)