

## IMPROVING UNDERGRADUATE STEM EDUCATION (IUSE)

IUSE Funding (Dollars in Millions)			
	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request
BIO	\$2.68	-	\$1.81
CISE	2.74	-	2.00
EHR	89.99	-	74.09
ENG	0.53	-	4.43
GEO	6.00	-	5.42
OPP	-	-	0.46
<b>Total</b>	<b>\$101.94</b>	<b>-</b>	<b>\$88.21</b>

### Overview

High-quality undergraduate STEM education is essential for preparing the diverse STEM workforce needed to sustain U.S. leadership in innovation.<sup>1,2</sup> It is also 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 STEM.<sup>3</sup> Thus, the Improving Undergraduate STEM Education (IUSE) program aims to ensure that every college student in the United States has exceptional STEM learning opportunities.

To achieve this goal, the NSF-wide IUSE initiative supports research and development projects to improve undergraduate STEM education at multiple scales, ranging from individual STEM classrooms to nationwide efforts. IUSE also supports innovative undergraduate STEM education to prepare the STEM workforce in emerging and interdisciplinary areas, such as computational and data-enabled science and engineering. All IUSE projects include research and assessment components, and thus also contribute new knowledge about effective teaching and learning practices in undergraduate STEM education that can guide future innovations.

IUSE is one of NSF's most flexible funding programs, which continues to support Administration priorities to build and leverage a diverse, highly skilled workforce. In addition to supporting projects that have specific relevance to any NSF-supported discipline, it also supports projects that span all STEM disciplines. Examples of such cross-cutting efforts include incorporating active learning, increasing access to undergraduate research experiences, and developing cyberlearning courses and curricula. This flexibility enables IUSE to respond rapidly to emerging areas and priorities. For example, IUSE contributes to the Data Science Corps (DSC) program within the HDR Big Idea. HDR-DSC supports projects that engage students in solving data science challenges faced by communities, organizations, and governmental agencies. Thus, DSC leverages undergraduate data science education in service to science and society, contributing to a strong national data science infrastructure and workforce.

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<sup>1</sup> National Science Board (2018). Our Nation's Future Competitiveness Relies on Building a STEM-Capable U. S. Workforce. [www.nsf.gov/nsb/sei/companion-brief/NSB-2018-7.pdf](http://www.nsf.gov/nsb/sei/companion-brief/NSB-2018-7.pdf)

<sup>2</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](http://www.nber.org/chapters/c13937)

<sup>3</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)

IUSE was initiated as a multi-year, NSF-wide priority investment area, spanning FY 2014 to FY 2020. The NSF 2018-2022 Strategic Plan extended the initiative through FY 2022, thus enabling NSF to support ongoing innovations that will ensure that the undergraduate STEM education enterprise in the United States remains current with advances in STEM and STEM education. Assessment of the IUSE portfolio will inform decisions about continuing the program beyond FY 2022. However, we anticipate that IUSE will continue as the principal component of NSF's undergraduate education strategies for the foreseeable future.

## Goals

IUSE aims to support improvements in undergraduate STEM education across the Nation by funding research, development, and implementation efforts that will:

1. *Improve undergraduate STEM learning and learning environment*—Investments will improve the knowledge base for innovative undergraduate STEM instruction;
2. *Broaden participation and institutional capacity for undergraduate STEM learning*—Investments will increase the number and diversity of undergraduate students in STEM majors and career pathways; and
3. *Build the STEM workforce for tomorrow*—Investments will advance the preparation of undergraduate students to be productive members of the future STEM and STEM-capable workforce.

## FY 2021 Investments

As part of its mission to advance STEM, NSF plans to invest \$88.21 million in FY 2021. The IUSE initiative's anchor investment is made by IUSE/EHR, a solicitation-based program in EHR's Division of Undergraduate Education. IUSE/EHR supports research-based activities such as the use of inquiry-based and active learning approaches in undergraduate instruction, increasing undergraduate research experiences and courses, and research on the persistence and graduation of students in STEM programs. IUSE/EHR is complemented by five additional IUSE core programs, which share the three common IUSE goals listed in the previous section but have a narrower funding focus than IUSE/EHR:

- *EHR/IUSE: Hispanic Serving Institutions (HSI) Program*: Supports improvements in retention and graduation rates at HSIs that have not received high levels of NSF support; approximately 15 awards.
- *BIO/IUSE: 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 (IUSE/PFE:RED)*: Supports organizational change strategies to transform undergraduate engineering education; approximately six awards.
- *CISE/IUSE: Computing in Undergraduate Education (IUSE:CUE)*: Supports multi-institution teams to re-envision the role of computer science in undergraduate education to better prepare a wider, more diverse range of students and to integrate the study of ethics into computer science curricula; approximately 14 awards.
- *GEO/IUSE: Pathways into the Earth, Ocean, Polar, and Atmospheric & Geospace Sciences (IUSE:GEOPATHS)*: GEO supports strategies to increase the number and diversity of undergraduate students pursuing geoscience degrees; approximately 20 awards.

IUSE funding is intended to help move the Nation forward in achieving the vision of an undergraduate STEM education enterprise in which every undergraduate becomes STEM knowledgeable and every student who desires to do so can pursue a STEM education that maximizes their full potential for a STEM career.