IMPROVING UNDERGRADUATE STEM EDUCATION (IUSE)

IUSE Funding
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request
BIO	$2.18	$5.00	$4.00
CISE	3.00	3.00	3.00
EHR	89.99	90.00	90.00
ENG	7.14	5.00	5.15
GEO	6.86	8.00	6.00
OPP	0.37	0.50	0.45
Total	**$109.54**	**$111.50**	**$108.60**

Overview

High-quality undergraduate STEM education is essential for preparing the diverse STEM workforce needed to sustain U.S. leadership in innovation.[1,2] 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.[3] Thus, the 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 systemic efforts. In addition, IUSE supports innovative undergraduate STEM education to prepare the STEM workforce in interdisciplinary areas, such as computational and data-enabled science and engineering. It also supports education in emerging fields such as AI and QIS. All IUSE projects include 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, enabling it to respond rapidly to support Administration priorities. 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 instructional materials. This flexibility enables IUSE to respond rapidly to emerging areas and priorities. For example, in FY 2020, IUSE contributed to the Data Science Corps (DSC) program within the HDR Big Idea. HDR-DSC supports projects that engage a diverse cadre of 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.

IUSE was initiated as a multi-year, NSF-wide priority investment area, originally 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 to ensure the United States' undergraduate STEM education enterprise

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[1] 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
[2] 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
[3] 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

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, NSF anticipates that IUSE will continue as the principal component of its undergraduate education strategies for the long term.

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 Environments:* Investments will build 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 build the knowledge base for how to do so.
3. *Build the STEM Workforce for Emerging Industries:* Investments will advance the preparation of undergraduate students to be productive members of the future STEM and STEM-capable workforce.

FY 2022 Investments

As part of its mission to advance STEM, NSF plans to invest $108.60 million in IUSE in FY 2022. The IUSE initiative's anchor investment is made by IUSE/EHR, a program solicitation within EHR's Division of Undergraduate Education. IUSE/EHR supports research and development activities such as studying 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 more specific funding goals 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 40 awards.
*   BIO - *IUSE: Research Coordination Networks/Undergraduate Biology Education (RCN-UBE)*: Supports collaborative networks to improve undergraduate biology education; approximately 13 awards.
*   ENG - *IUSE/Professional Formation of Engineers: Revolutionizing Engineering Departments (IUSE/PFE:RED)*: Supports organizational change strategies to transform undergraduate engineering education; approximately five awards.
*   CISE - *IUSE: Computing in Undergraduate Education (IUSE:CUE)*: Supports teams of institutions of higher education to re-envision the role of computer science in undergraduate education, leading to a larger, more diverse population of students with the computational skills necessary for careers in a broad range of fields; approximately seven awards.
*   GEO - *IUSE: Pathways into the Earth, Ocean, Polar, and Atmospheric & Geospace Sciences (IUSE:GEOPATHS)*: Supports strategies to increase the number and diversity of undergraduate students pursuing geoscience degrees; approximately 20 awards.

IUSE funding focuses on advancing the Nation's vision of an undergraduate STEM education enterprise in which every undergraduate becomes STEM-knowledgeable and all students who desire to pursue a STEM education that maximizes their full potential for a STEM career can do so.