IMPROVING UNDERGRADUATE STEM EDUCATION (IUSE)

IUSE Funding[1]

(Dollars in Millions)

	FY 2023 Base Plan	FY 2024 (TBD)	FY 2025 Request
BIO	$1.50	-	$1.50
CISE	3.00	-	5.00
EDU	92.15	-	97.84
ENG	5.00	-	5.00
Total	**$101.65**	**-**	**$109.34**

[1] Funding displayed may have overlap with other topics and programs.

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, IUSE aims to ensure that every undergraduate 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. Additionally, 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 artificial intelligence (AI) and quantum information science (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. 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, institutional and community transformation, increasing access to undergraduate research experiences, and developing courses and instructional materials utilizing emerging technologies. This flexibility enables IUSE to respond rapidly to support emerging areas and Administration priorities. For example, in FY 2023, IUSE supported applied research on the use of emerging and novel technologies such as AI,

[1] National Science Board (2018). Our Nation's Future Competitiveness Relies on Building a STEM-Capable U. S. Workforce. Retrieved from: 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

augmented reality, virtual reality, cyber-learning, etc. in undergraduate STEM. In addition, the FY 2024 Dear Colleague Letter (DCL), Advancing Education for the Future AI Workforce (EducateAI), encourages the submission of novel and high impact proposals that advance inclusive computing education that prepares undergraduate students for the AI workforce.

In FY 2023, IUSE launched a new solicitation: *IUSE: Innovation in Two-Year College STEM Education (ITYC)*. Through this program, the agency ramps up its investment in two-year colleges. The twin goals of the ITYC program are to (1) advance innovation, promote equitable outcomes, and broaden participation for all students in STEM at two-year colleges and (2) enhance the capacity of two-year colleges to harness the talent and potential of their diverse student and faculty population through innovative disciplinary, multi-department, and college-wide efforts. With more than 1,000 two-year colleges enrolling over 11 million students, these institutions provide STEM education to a large population of students entering the STEM workforce and are critical to the Nation's STEM competitiveness. Among U.S. students who earned Science & Engineering bachelor's degrees between 2010 and 2017, about half (47 percent) had done some coursework at a community college and nearly a fifth (18 percent) earned associate degrees.

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 that the U.S. undergraduate STEM education enterprise remains current with advances in STEM and STEM education. Given the success of the IUSE program, IUSE will continue to serve as the principal NSF initiative that provides a Foundation-wide framework of investments to support the Agency's commitment to the highest caliber undergraduate STEM education. By improving the quality and effectiveness of undergraduate education in all STEM fields, IUSE investments enable NSF to lead national progress toward a diverse and innovative workforce and a STEM-literate public.

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 2025 Investments

NSF plans to invest $109.34 million in IUSE in FY 2025. IUSE's anchor investment is made by IUSE: EDU, a program solicitation within EDU's Division of Undergraduate Education. IUSE: EDU 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: EDU 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: EDU:

- EDU – *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.
- EDU – *IUSE: Innovation in Two-Year College STEM Education (IUSE: TYC):* Supports STEM education initiatives that enhance STEM teaching and learning at two-year colleges; approximately 20 awards.
- BIO – *IUSE: Research Coordination Networks – Undergraduate Biology Education (RCN-UBE)*: Supports collaborative networks to improve undergraduate biology education; approximately 8-12 awards.
- ENG – *IUSE/Professional Formation of Engineers: Revolutionizing Engineering Departments (IUSE/PFE: RED)*: Supports organizational change strategies to transform undergraduate engineering education; approximately five to ten awards.
- CISE – *IUSE: Computing in Undergraduate Education (IUSE: CUE)*: Supports collaborative partnerships to re-envision the role of computing in undergraduate education, leading to a larger, more diverse population of students; approximately three to six 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.