MAJOR INVESTMENTS IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM) GRADUATE STUDENTS AND GRADUATE EDUCATION

Overview

A U.S. science, technology, engineering, and mathematics (STEM) workforce with advanced preparation in research and innovation and in professional fields such as cybersecurity and STEM teaching, is essential for the progress of science and engineering (S&E). Today, emerging fields of S&E increasingly demand collaborations that span institutions, disciplines, and national boundaries, and require the use of sophisticated data infrastructure, instruments, and networks of researchers. Computationally intensive and data-enabled science is dramatically changing the knowledge and experience required of researchers and other STEM professionals across all fields. Thus, the preparation of graduate students in STEM must continue to evolve to provide a supply of scientists and engineers who not only meet the needs of the STEM enterprise, but who also have the knowledge, skills, and preparation to advance it and lead innovation in academia and the private and public sectors.

Investing in discoverers—that is, building a diverse and talented next-generation of STEM research leaders and professionals across sectors through inclusive processes—is an important NSF focus. A major portion of NSF's overall investment in graduate education and graduate students supports research assistants funded through research grants. NSF also supports graduate students through other mechanisms such as fellowships and traineeships.

Goals

The goal of NSF's investments in STEM graduate education and STEM graduate students is to prepare a diverse workforce with advanced research training that is equipped to transform the frontiers of S&E, and to prepare professionals to participate and innovate in STEM intensive careers.

NSF's graduate STEM investments will do the following:
- Support training in areas of national S&E priority.
- Catalyze development of innovative models for graduate education with potential for scalability.
- Build the research knowledge base to inform improvements in graduate education.
- Promote professional development of graduate students for both academic and non-academic careers.

FY 2019 Investments

NSF's two major agency-wide programs in graduate education are the Graduate Research Fellowship Program (GRFP) and the NSF Research Traineeship (NRT) program. EHR leads administration for both programs. NSF-wide working groups guide the management of these programs. Both programs contain design elements recommended in major national reports[1] as ways to better prepare graduates for a broad range of careers. GRFP has identified and supported outstanding, basic STEM researchers since 1952. The program also provides opportunities for graduate students to gain research experience internationally and in federal agencies. GRFP provides rich data that will be used for monitoring career outcomes longitudinally and will contribute to improving the understanding of STEM professional workforce development.

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[1] American Chemical Society Presidential Commission (2012). Advancing graduate education in the chemical sciences. American Chemical Society, Washington, DC. Retrieved from www.acs.org/content/dam/acsorg/about/governance/acs-presidential-graduate-education-commission-full-report.pdf; Biomedical Research Workforce Working Group (2012). Biomedical Research Workforce Working Group Draft Report. National Institutes of Health, Bethesda. Retrieved from http://acd.od.nih.gov/bmw_report.pdf

There are several other programs at NSF that focus on developing sectors of the STEM workforce, and provide support to students in testing new models and approaches to graduate education. For example, the CyberCorps®: Scholarship for Service (SFS) program, led by EHR, addresses national need for a cybersecurity workforce as authorized by Public Law 113-274, Cybersecurity Enhancement Act of 2014. In addition to scholarships for undergraduate and graduate students, the program supports the expansion of existing educational opportunities and resources in cybersecurity through research on the teaching and learning of cybersecurity. Collaborators include CISE, the U.S. Department of Homeland Security, and the Office of Personnel Management. The Robert Noyce Teacher Scholarship program (Noyce) provides fellowship support to members of the master teacher cohort at the graduate level and funds innovation and development in STEM teacher education approaches. In addition to GRFP, NRT, SFS, and Noyce, the Louis Stokes Alliances for Minority Participation's Bridge to the Doctorate (LSAMP-BD) track, and NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) support the successful entry and transition of underrepresented and underserved populations into STEM graduate education and into the STEM workforce. This broad suite of programs contributes substantially to the NSF investment in graduate education of the STEM research and education workforce of the future.

In FY 2019, NSF directorates will be engaged in considering how to extend the range of professional development opportunities for graduate students across all NSF disciplines and will undertake several pilot activities. EHR is pursuing collaborations with other directorates to establish additional partnerships with industry for internship opportunities to give graduate students the professional development needed to pursue successful careers in STEM and STEM-related occupations. With OISE, EHR is seeking to expand graduate students' international research and professional development opportunities. The Dear Colleague Letter: Non-Academic Research Internships for Graduate Students (INTERN), NSF 17-091,[2] will provide supplemental funding in FY 2018 and FY 2019 for non-academic research internships for graduate students to support career opportunities. The Division of Graduate Education's (DGE) component of EHR's core research program will also emphasize research on the development of the STEM workforce.

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[2] www.nsf.gov/funding/pgm_summ.jsp?pims_id=504991