

cation or eligible nonprofit organizations (or consortia thereof).

(b) Program components

(1) In general

In carrying out the program under subsection (a), the Director of the National Science Foundation shall carry out activities that—

(A) support basic interdisciplinary quantum information science and engineering research; and

(B) support human resources development in all aspects of quantum information science and engineering.

(2) Requirements

The activities described in paragraph (1) shall include—

(A) using the existing programs of the National Science Foundation, in collaboration with other Federal departments and agencies, as appropriate—

(i) to improve the teaching and learning of quantum information science and engineering at the undergraduate, graduate, and postgraduate levels; and

(ii) to increase participation in the quantum fields, including by individuals identified in sections 1885a and 1885b of title 42;

(B) formulating goals for quantum information science and engineering research and education activities to be supported by the National Science Foundation;

(C) leveraging the collective body of knowledge from existing quantum information science and engineering research and education activities;

(D) coordinating research efforts funded through existing programs across the directorates of the National Science Foundation; and

(E) engaging with other Federal departments and agencies, research communities, and potential users of information produced under this section.

(c) Graduate traineeships

The Director of the National Science Foundation may establish a program to provide traineeships to graduate students at institutions of higher education within the United States who are citizens of the United States and who choose to pursue masters or doctoral degrees in quantum information science.

(d) Incorporating QISE into STEM curriculum

(1) In general

The Director of the National Science Foundation shall, through programs carried out or supported by the National Science Foundation, seek to increase the integration of quantum information science and engineering (referred to in this subsection as “QISE”) into the STEM curriculum at all education levels, including community colleges, as considered appropriate by the Director.

(2) Curriculum integration

The curriculum integration under paragraph (1) may include the following:

(A) Methods to conceptualize QISE for elementary, middle, and high school curricula.

(B) Methods for strengthening foundational mathematics and science curricula.

(C) Methods for integrating students who are underserved or historically underrepresented groups in STEM.

(D) Age-appropriate materials that apply the principles of quantum information science in STEM fields.

(E) Recommendations for the standardization of key concepts, definitions, and curriculum criteria across government, academia, and industry.

(F) Materials that specifically address the findings and outcomes of the study to evaluate and make recommendations for the quantum information science workforce pursuant to subsection (d) of section 19261 of title 42 and strategies to account for the skills and workforce needs identified through such study.

(3) Coordination

In carrying out this subsection, the Director shall coordinate with relevant Federal agencies, and consult with nongovernmental entities with expertise in QISE, as appropriate, which may include institutions eligible to participate in the Established Program to Stimulate Competitive Research (EPSCoR).

(4) Definition

In this subsection, the term “STEM” means the academic and professional disciplines of science, technology, engineering, and mathematics, including computer science.

(Pub. L. 115-368, title III, §301, Dec. 21, 2018, 132 Stat. 5099; Pub. L. 117-167, div. B, title VI, §10661(e)(1), Aug. 9, 2022, 136 Stat. 1685.)

Editorial Notes

AMENDMENTS

2022—Subsec. (d). Pub. L. 117-167 added subsec. (d).

§ 8842. Multidisciplinary centers for quantum research and education

(a) In general

The Director of the National Science Foundation, in consultation with other Federal departments and agencies, as appropriate, shall award grants to institutions of higher education or eligible nonprofit organizations (or consortia thereof) to establish at least 2, but not more than 5, Multidisciplinary Centers for Quantum Research and Education (referred to in this section as “Centers”).

(b) Collaborations

A collaboration receiving an award under this subsection may include institutions of higher education, nonprofit organizations, and private sector entities.

(c) Purpose

The purpose of the Centers shall be to conduct basic research and education activities in support of the goals and priorities established under section 8813(d)(2) of this title, including by—

(1) continuing to advance quantum information science and engineering;

(2) supporting curriculum and workforce development in quantum information science and engineering; and

(3) fostering innovation by bringing industry perspectives to quantum research and workforce development, including by leveraging industry knowledge and resources.

(d) Requirements

(1) In general

An institution of higher education or an eligible nonprofit organization (or a consortium thereof) seeking funding under this section shall submit an application to the Director of the National Science Foundation at such time, in such manner, and containing such information as the Director may require.

(2) Applications

Each application under paragraph (1) shall include a description of—

(A) how the Center will work with other research institutions and industry partners to leverage expertise in quantum science, education and curriculum development, and technology transfer;

(B) how the Center will promote active collaboration among researchers in multiple disciplines involved in quantum research, including physics, engineering, mathematics, computer science, chemistry, and material science;

(C) how the Center will support long-term and short-term workforce development in the quantum field;

(D) how the Center can support an innovation ecosystem to work with industry to translate Center research into applications; and

(E) a long-term plan to become self-sustaining after the expiration of funding under this section.

(e) Selection and duration

(1) In general

Each Center established under this section is authorized to carry out activities for a period of 5 years.

(2) Reapplication

An awardee may reapply for additional, subsequent periods of 5 years on a competitive, merit-reviewed basis.

(3) Termination

Consistent with the authorities of the National Science Foundation, the Director of the National Science Foundation may terminate an underperforming Center for cause during the performance period.

(f) Funding

The Director of the National Science Foundation shall allocate up to \$10,000,000 for each Center established under this section for each of fiscal years 2019 through 2023, subject to the availability of appropriations. Amounts made available to carry out this section shall be derived from amounts appropriated or otherwise made available to the National Science Foundation.

(Pub. L. 115-368, title III, §302, Dec. 21, 2018, 132 Stat. 5100.)

SUBCHAPTER IV—DEPARTMENT OF ENERGY QUANTUM ACTIVITIES

§ 8851. Quantum information science research program

(a) In general

The Secretary of Energy shall carry out a basic research program on quantum information science.

(b) Program components

In carrying out the program under subsection (a), the Secretary of Energy shall—

(1) formulate goals for quantum information science research to be supported by the Department of Energy;

(2) leverage the collective body of knowledge from existing quantum information science research;

(3) provide research experiences and training for additional undergraduate and graduate students in quantum information science, including in the fields of—

(A) quantum information theory;

(B) quantum physics;

(C) quantum computational science;

(D) applied mathematics and algorithm development;

(E) quantum networking;

(F) quantum sensing and detection; and

(G) materials science and engineering;

(4) coordinate research efforts funded through existing programs across the Department of Energy, including—

(A) the Nanoscale Science Research Centers;

(B) the Energy Frontier Research Centers;

(C) the Energy Innovation Hubs;

(D) the National Laboratories;

(E) the Advanced Research Projects Agency; and

(F) the National Quantum Information Science Research Centers; and

(5) coordinate with other Federal departments and agencies, research communities, and potential users of information produced under this section.

(Pub. L. 115-368, title IV, §401, Dec. 21, 2018, 132 Stat. 5101.)

§ 8852. National Quantum Information Science Research Centers

(a) Establishment

(1) In general

The Secretary of Energy, acting through the Director of the Office of Science (referred to in this section as the “Director”), shall ensure that the Office of Science carries out a program, in consultation with other Federal departments and agencies, as appropriate, to establish and operate at least 2, but not more than 5, National Quantum Information Science Research Centers (referred to in this section as “Centers”) to conduct basic research to accelerate scientific breakthroughs in quantum information science and technology and to support research conducted under section 8851 of this title.