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117TH CONGRESS
1ST SESSION

H. R. 2225

[Report No. 117–73]

To authorize appropriations for fiscal years 2022, 2023, 2024, 2025, and 2026 for the National Science Foundation, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

MARCH 26, 2021

Ms. JOHNSON of Texas (for herself, Mr. LUCAS, Ms. STEVENS, and Mr. WALTZ) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

JUNE 28, 2021

Additional sponsors: Ms. ROSS, Ms. MOORE of Wisconsin, Mr. BAIRD, Mr. MEIJER, Mr. COHEN, Mrs. HAYES, Mr. KILDEE, Mr. KHANNA, Mr. FITZPATRICK, Mrs. LURIA, Ms. LOFGREN, Mr. TONKO, Mr. CASE, Ms. BONAMICI, Ms. WILD, Ms. JACKSON LEE, Mr. PERLMUTTER, Mr. LAMB, Ms. HOULAHAN, Mr. AUCHINCLOSS, Mr. SIRES, Mr. PAPPAS, Mr. MCGOVERN, Mr. COOPER, Mr. SHERMAN, Mr. SAN NICOLAS, Mrs. KIM of California, Miss GONZÁLEZ-COLÓN, Mr. GONZALEZ of Ohio, Mr. BEYER, Mr. MCNERNEY, Mr. MORELLE, Mrs. BICE of Oklahoma, Mr. CRIST, Mr. FOSTER, Ms. LEGER FERNANDEZ, Mr. LATURNER, Mr. OBERNOLTE, Mr. BABIN, Mr. FEENSTRA, Mr. NORCROSS, Mr. TAKANO, Mr. BOWMAN, Mr. BERA, Ms. SHERRILL, Ms. STANSBURY, and Mrs. FLETCHER

JUNE 28, 2021

Reported with an amendment, committed to the Committee of the Whole House on the State of the Union, and ordered to be printed

[Strike out all after the enacting clause and insert the part printed in italic]

[For text of introduced bill, see copy of bill as introduced on March 26, 2021]

A BILL

To authorize appropriations for fiscal years 2022, 2023, 2024, 2025, and 2026 for the National Science Foundation, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the ''National Science Foundation for the Future Act''.

SEC. 2. FINDINGS.

Congress finds the following:

(1) Over the past seven decades, the National Science Foundation has played a critical role in advancing the United States academic research enterprise by supporting fundamental research and education across science and engineering disciplines.

(2) Discoveries enabled by sustained investment in fundamental research and the education of the United States science and engineering workforce have led to transformational innovations and spawned new industries.

(3) While the traditional approach to investment in research has delivered myriad benefits to society, a concerted effort is needed to ensure the benefits of federally funded science and engineering are enjoyed by all Americans.

(4) As countries around the world increase investments in research and STEM education, United States global leadership in science and engineering is

eroding, posing significant risks to economic competitiveness, national security, and public well-being.

(5) To address major societal challenges and sustain United States leadership in innovation, the Federal Government must increase investments in research, broaden participation in the STEM workforce, and bolster collaborations among universities, National Laboratories, field stations and marine laboratories, companies, labor organizations, non-profit funders of research, local policymakers, civil societies and stakeholder communities, and international partners.

SEC. 3. DEFINITIONS.

In this Act:

(1) ACADEMIES.—The term "Academies" means the National Academies of Sciences, Engineering, and Medicine.

(2) ARTIFICIAL INTELLIGENCE.—The term "artificial intelligence" has the meaning given such term in section 5002 of the William M. (MAC) Thornberry National Defense Authorization Act for Fiscal Year 2021.

(3) AWARDEE.—The term "awardee" means the legal entity to which Federal assistance is awarded

and that is accountable to the Federal Government for the use of the funds provided.

(4) BOARD.—The term "Board" means the National Science Board.

(5) DIRECTOR.—The term "Director" means the Director of the National Science Foundation.

(6) EMERGING RESEARCH INSTITUTION.—The term "emerging research institution" means an institution of higher education with an established undergraduate student program that has, on average for 3 years prior to the time of application for an award, received less than $35,000,000 in Federal research funding.

(7) FEDERAL SCIENCE AGENCY.—The term "Federal science agency" means any Federal agency with an annual extramural research expenditure of over $100,000,000.

(8) FOUNDATION.—The term "Foundation" means the National Science Foundation.

(9) INSTITUTION OF HIGHER EDUCATION.—The term "institution of higher education" has the meaning given the term in section 101(a) of the Higher Education Act of 1965 (20 U.S.C. 1001(a)).

(10) LABOR ORGANIZATION.—The term "labor organization" has the meaning given the term in sec-

tion 2(5) of the National Labor Relations Act (29 U.S.C. 152(5)), except that such term shall also include—

(A) any organization composed of labor organizations, such as a labor union federation or a State or municipal labor body; and

(B) any organization which would be included in the definition for such term under such section (5) but for the fact that the organization represents—

(i) individuals employed by the United States, any wholly owned Government corporation, any Federal Reserve Bank, or any State or political subdivision thereof;

(ii) individuals employed by persons subject to the Railway Labor Act (45 U.S.C. 151 et seq.); or

(iii) individuals employed as agricultural laborers.

(11) NON-PROFIT ORGANIZATION.—The term "non-profit organization" means an organization which is described in section 501(c)(3) of the Internal Revenue Code of 1986 and exempt from tax under section 501(a) of such code.

(12) NSF INCLUDES.—The term "NSF includes" means the initiative carried out under section 6(c).

(13) PREK-12.—The term "preK-12" means pre-kindergarten through grade 12.

(14) SKILLED TECHNICAL WORK.—The term "skilled technical work" means an occupation that requires a high level of knowledge in a technical domain and does not require a bachelor's degree for entry.

(15) STEM.—The term "STEM" has the meaning given the term in section 2 of the America COMPETES Reauthorization Act of 2010 (42 U.S.C. 6621 note).

(16) STEM EDUCATION.—The term "STEM education" has the meaning given the term in section 2 of the STEM Education Act of 2015 (42 U.S.C. 6621 note).

SEC. 4. AUTHORIZATION OF APPROPRIATIONS.

(a) FISCAL YEAR 2022.—

(1) IN GENERAL.—There are authorized to be appropriated to the Foundation $12,504,890,000 for fiscal year 2022.

(2) SPECIFIC ALLOCATIONS.—Of the amount authorized under paragraph (1)—

(A) $10,025,000,000 shall be made available to carry out research and related activities, of which—

(i) $55,000,000 shall be for the Mid-Scale Research Infrastructure Program; and

(ii) $1,400,000,000 shall be for the Directorate for Science and Engineering Solutions;

(B) $1,583,160,000 shall be made available for education and human resources, of which—

(i) $73,700,000 shall be for the Robert Noyce Teacher Scholarship Program;

(ii) $59,500,000 shall be for the NSF Research Traineeship Program;

(iii) $416,300,000 shall be for the Graduate Research Fellowship Program; and

(iv) $70,000,000 shall be for the Cybercorps Scholarship for Service Program;

(C) $249,000,000 shall be made available for major research equipment and facilities construction, of which $76,250,000 shall be for the Mid-Scale Research Infrastructure Program;

(D) $620,000,000 shall be made available for agency operations and award management;

(E) $4,620,000 shall be made available for the Office of the National Science Board; and

(F) $23,120,000 shall be made available for the Office of the Inspector General.

(b) FISCAL YEAR 2023.—

(1) IN GENERAL.—There are authorized to be appropriated to the Foundation $14,620,800,000 for fiscal year 2023.

(2) SPECIFIC ALLOCATIONS.—Of the amount authorized under paragraph (1)—

(A) $11,870,000,000 shall be made available to carry out research and related activities, of which—

(i) $60,000,000 shall be for the Mid-Scale Research Infrastructure Program; and

(ii) $2,300,000,000 shall be for the Directorate for Science and Engineering Solutions;

(B) $1,654,520,000 shall be made available for education and human resources, of which—

(i) $80,400,000 shall be for the Robert Noyce Teacher Scholarship Program;

(ii) $64,910,000 shall be for the NSF Research Traineeship Program;

(iii) $454,140,000 shall be for the Graduate Research Fellowship Program; and

(iv) $72,000,000 shall be for the Cybercorps Scholarship for Service Program;

(C) $355,000,000 shall be made available for major research equipment and facilities construction, of which $80,000,000 shall be for the Mid-Scale Research Infrastructure Program;

(D) $710,000,000 shall be made available for agency operations and award management;

(E) $4,660,000 shall be made available for the Office of the National Science Board; and

(F) $26,610,000 shall be made available for the Office of the Inspector General.

(c) FISCAL YEAR 2024.—

(1) IN GENERAL.—There are authorized to be appropriated to the Foundation $15,945,020,000 for fiscal year 2024.

(2) SPECIFIC ALLOCATIONS.—Of the amount authorized under paragraph (1)—

(A) $13,050,000,000 shall be made available to carry out research and related activities, of which—

(i) $70,000,000 shall be for the Mid-Scale Research Infrastructure Program; and

(ii) $2,900,000,000 shall be for the Directorate for Science and Engineering Solutions;

(B) $1,739,210,000 shall be made available for education and human resources, of which—

(i) $87,100,000 shall be for the Robert Noyce Teacher Scholarship Program;

(ii) $70,320,000 shall be for the NSF Research Traineeship Program;

(iii) $491,990,000 shall be for the Graduate Research Fellowship Program; and

(iv) $78,000,000 shall be for the Cybercorps Scholarship for Service Program;

(C) $370,000,000 shall be made available for major research equipment and facilities construction, of which $85,000,000 shall be for the Mid-Scale Research Infrastructure Program;

(D) $750,000,000 shall be made available for agency operations and award management;

(E) $4,700,000 shall be made available for the Office of the National Science Board; and

(F) $31,110,000 shall be made available for the Office of the Inspector General.

(d) FISCAL YEAR 2025.—

(1) IN GENERAL.—There are authorized to be appropriated to the Foundation $17,004,820,000 for fiscal year 2025.

(2) SPECIFIC ALLOCATIONS.—Of the amount authorized under paragraph (1)—

(A) $14,000,000,000 shall be made available to carry out research and related activities, of which—

(i) $75,000,000 shall be for the Mid-Scale Research Infrastructure Program; and

(ii) $3,250,000,000 shall be for the Directorate for Science and Engineering Solutions;

(B) $1,823,470,000 shall be made available for education and human resources, of which—

(i) $93,800,000 shall be for the Robert Noyce Teacher Scholarship Program;

(ii) $75,730,000 shall be for the NSF Research Traineeship Program;

(iii) $529,830,000 shall be for the Graduate Research Fellowship Program; and

(iv) $84,000,000 shall be for the Cybercorps Scholarship for Service Program;

(C) $372,000,000 shall be made available for major research equipment and facilities construction, of which $90,000,000 shall be for the Mid-Scale Research Infrastructure Program;

(D) $770,000,000 shall be made available for agency operations and award management;

(E) $4,740,000 shall be made available for the Office of the National Science Board; and

(F) $34,610,000 shall be made available for the Office of the Inspector General.

(e) FISCAL YEAR 2026.—

(1) IN GENERAL.—There are authorized to be appropriated to the Foundation $17,939,490,000 for fiscal year 2026.

(2) SPECIFIC ALLOCATIONS.—Of the amount authorized under paragraph (1)—

(A) $14,800,000,000 shall be made available to carry out research and related activities, of which—

(i) $80,000,000 shall be for the Mid-Scale Research Infrastructure Program; and

(ii) $3,400,000,000 shall be for the Directorate for Science and Engineering Solutions;

(B) $1,921,600,000 shall be made available for education and human resources, of which—

(i) $100,500,000 shall be for the Robert Noyce Teacher Scholarship Program;

(ii) $81,140,000 shall be for the NSF Research Traineeship Program;

(iii) $567,680,000 shall be for the Graduate Research Fellowship Program; and

(iv) $90,000,000 shall be for the Cybercorps Scholarship for Service Program;

(C) $375,000,000 shall be made available for major research equipment and facilities construction, of which $100,000,000 shall be for the Mid-Scale Research Infrastructure Program;

(D) $800,000,000 shall be made available for agency operations and award management;

(E) $4,780,000 shall be made available for the Office of the National Science Board; and

(F) $38,110,000 shall be made available for the Office of the Inspector General.

SEC. 5. STEM EDUCATION.

(a) PREK-12 STEM EDUCATION.—

(1) DECADAL SURVEY OF STEM EDUCATION RESEARCH.—Not later than 45 days after the date of enactment of this Act, the Director shall enter into a contract with the Academies to review and assess the status and opportunities for PreK–12 STEM education research and make recommendations for research priorities over the next decade.

(2) SCALING INNOVATIONS IN PREK-12 STEM EDUCATION.—

(A) IN GENERAL.—The Director shall establish a program to award grants, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to establish no fewer than 3 multidisciplinary Centers for Transformative Education Research and Translation (in this section referred to as "Centers") to sup-

port research and development on widespread and sustained implementation of STEM education innovations.

(B) APPLICATION.—An institution of higher education or non-profit organization (or a consortium of such institutions or organizations) seeking funding under subparagraph (A) shall submit an application to the Director at such time, in such manner, and containing such information as the Director may require. The application shall include, at a minimum, a description of how the proposed Center will—

(i) establish partnerships among academic institutions, local or State education agencies, and other relevant stakeholders in supporting programs and activities to facilitate the widespread and sustained implementation of promising, evidence-based STEM education practices, models, programs, curriculum, and technologies;

(ii) support enhanced STEM education infrastructure, including cyberlearning technologies, to facilitate the widespread adoption of promising, evidence-based practices;

(iii) support research and development on scaling practices, partnerships, and alternative models to current approaches, including approaches sensitive to the unique combinations of capabilities, resources, and needs of varying localities, educators, and learners;

(iv) include a focus on the learning needs of under resourced schools and learners in low-resource or underachieving local education agencies in urban and rural communities and the development of high-quality curriculum that engages these learners in the knowledge and practices of STEM fields;

(v) include a focus on the learning needs and unique challenges facing students with disabilities; and

(vi) support research and development on scaling practices and models to support and sustain highly-qualified STEM educators in urban and rural communities.

(C) ADDITIONAL CONSIDERATIONS.—In awarding a grant under this paragraph, the Di-

rector may also consider the extent to which the proposed Center will—

(i) leverage existing collaborations, tools, and strategies supported by the Foundation, including NSF INCLUDES and the Convergence Accelerators;

(ii) support research on and the development and scaling of innovative approaches to distance learning and education for various student populations;

(iii) support education innovations that leverage new technologies or deepen understanding of the impact of technology on educational systems; and

(iv) include a commitment from local or State education administrators to making the proposed reforms and activities a priority.

(D) PARTNERSHIP.—In carrying out the program under subparagraph (A), the Director shall explore opportunities to partner with the Department of Education, including through jointly funding activities under this paragraph.

(E) ANNUAL MEETING.—The Director shall encourage and facilitate an annual meeting of

the Centers to foster collaboration among the Centers and to further disseminate the results of the Centers' activities.

(F) REPORT.—Not later than 5 years after the date of enactment of this Act, the Director shall submit to Congress a report describing the activities carried out pursuant to this paragraph that includes—

(i) a description of the focus and proposed goals of each Center; and

(ii) an assessment of the program's success in helping to promote scalable solutions in PreK-12 STEM education.

(3) NATIONAL ACADEMIES STUDY.—Not later than 45 days after the date of enactment of this Act, the Director shall enter into an agreement with the Academies to conduct a study to—

(A) review the research literature and identify research gaps regarding the interconnected factors that foster and hinder successful implementation of promising, evidence-based PreK-12 STEM education innovations at the local, regional, and national level;

(B) present a compendium of promising, evidence-based PreK-12 STEM education practices, models, programs, and technologies;

(C) identify barriers to widespread and sustained implementation of such innovations; and

(D) make recommendations to the Foundation, the Department of Education, the National Science and Technology Council's Committee on Science, Technology, Engineering, and Mathematics Education, State and local educational agencies, and other relevant stakeholders on measures to address such barriers.

(4) SUPPORTING PRE-K–8 INFORMAL STEM OPPORTUNITIES.—Section 3 of the STEM Education Act of 2015 (42 U.S.C. 1862q) is amended by adding at the end the following:

"(c) PRE-K–8 INFORMAL STEM PROGRAM.—

"(1) IN GENERAL.—The Director of the National Science Foundation shall provide grants to institutions of higher education or a non-profit organizations (or a consortia of such intuitions or organization) on a merit-reviewed, competitive basis for research on programming that engages students in grades PREK-8, including underrepresented and

rural students, in STEM in order to prepare such students to pursue degrees or careers in STEM.

"(2) USE OF FUNDS.—

"(A) IN GENERAL.—Grants awarded under this section shall be used toward research to advance the engagement of students, including underrepresented and rural students, in grades PREK-8 in STEM through providing before-school, after-school, out-of-school, or summer activities, including in single-gender environments or programming, that are designed to encourage interest, engagement, and skills development for students in STEM.

"(B) PERMITTED ACTIVITIES.—The activities described in subparagraph (A) may include—

"(i) the provision of programming described in such subparagraph for the purpose of research described in such subparagraph;

"(ii) the use of a variety of engagement methods, including cooperative and hands-on learning;

"(iii) exposure of students to role models in the fields of STEM and near-peer mentors;

"(iv) training of informal learning educators, youth-serving professionals, and volunteers who lead informal STEM programs in using evidence-based methods consistent with the target student population being served;

"(v) education of students on the relevance and significance of STEM careers, provision of academic advice and assistance, and activities designed to help students make real-world connections to STEM content;

"(vi) the attendance of students at events, competitions, and academic programs to provide content expertise and encourage career exposure in STEM, which may include the purchase of parts and supplies needed to participate in such competitions;

"(vii) activities designed to engage parents and families of students in grades PREK-8 in STEM;

"(viii) innovative strategies to engage students, such as using leadership skills and outcome measures to impart youth with the confidence to pursue STEM coursework and academic study;

"(ix) coordination with STEM-rich environments, including other nonprofit, nongovernmental organizations, out-of-classroom settings, single-gender environments, institutions of higher education, vocational facilities, corporations, museums, or science centers; and

"(x) the acquisition of instructional materials or technology-based tools to conduct applicable grant activity.

"(3) APPLICATION.—An applicant seeking funding under the section shall submit an application at such time, in such manner, and containing such information as may be required. Applications that include or partner with a nonprofit, nongovernmental organization that has extensive experience and expertise in increasing the participation of students in PREK-8 in STEM are encouraged. The application may include the following:

"(A) A description of the target audience to be served by the research activity or activities for which such funding is sought.

"(B) A description of the process for recruitment and selection of students to participate in such activities.

"(C) A description of how such activity or activities may inform programming that engages students in grades PREK-8 in STEM.

"(D) A description of how such activity or activities may inform programming that promotes student academic achievement in STEM.

"(E) An evaluation plan that includes, at a minimum, the use of outcome-oriented measures to determine the impact and efficacy of programming being researched.

"(4) EVALUATIONS.—Each recipient of a grant under this section shall provide, at the conclusion of every year during which the grant funds are received, an evaluation in a form prescribed by the Director.

"(5) ACCOUNTABILITY AND DISSEMINATION.—

"(A) EVALUATION REQUIRED.—The Director shall evaluate the activities established under this section. Such evaluation shall—

"(i) use a common set of benchmarks and tools to assess the results of research conducted under such grants; and

"(ii) to the extent practicable, integrate the findings of the research resulting from the activity or activities funded through the grant with the current research on serving students with respect to the pursuit of degrees or careers in STEM, including underrepresented and rural students, in grades PREK-8.

"(B) REPORT ON EVALUATIONS.—Not later than 180 days after the completion of the evaluation under subparagraph (A), the Director shall submit to Congress and make widely available to the public a report that includes—

"(i) the results of the evaluation; and

"(ii) any recommendations for administrative and legislative action that could optimize the effectiveness of the program under this section.

"(6) COORDINATION.—In carrying out this section, the Director shall, for purposes of enhancing program effectiveness and avoiding duplication of activities, consult, cooperate, and coordinate with the

programs and policies of other relevant Federal agencies.".

(b) UNDERGRADUATE STEM EDUCATION.—

(1) RESEARCH ON STEM EDUCATION AND WORKFORCE NEEDS.—The Director shall award grants, on a competitive basis, to four-year institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support research and development activities to—

(A) encourage greater collaboration and coordination between institutions of higher education and industry to enhance education, foster hands-on learn experiences, and improve alignment with workforce needs;

(B) understand the current composition of the STEM workforce and the factors that influence growth, retention, and development of that workforce;

(C) increase the size, diversity, capability, and flexibility of the STEM workforce; and

(D) increase dissemination and widespread adoption of effective practices in undergraduate education and workforce development.

(2) ADVANCED TECHNOLOGICAL EDUCATION PROGRAM UPDATE.—Section 3(b) of the Scientific and

Advanced-Technology Act of 1992 (42 U.S.C. 1862i(b)) is amended to read as follows:

"(b) NATIONAL COORDINATION NETWORK FOR SCIENCE AND TECHNICAL EDUCATION.—The Director shall award grants to institutions of higher education, non-profit organizations, and associate-degree granting colleges (or consortia of such institutions or organizations) to establish a network of centers for science and technical education. The centers shall—

"(1) coordinate research, training, and education activities funded by awards under subsection (a) and share information and best practices across the network of awardees;

"(2) serve as a national and regional clearinghouse and resource to communicate and coordinate research, training, and educational activities across disciplinary, organizational, geographic, and international boundaries and disseminate best practices; and

"(3) develop national and regional partnerships between PreK–12 schools, two-year colleges, institutions of higher education, workforce development programs, labor organizations, and industry to meet workforce needs.".

(3) INNOVATIONS IN STEM EDUCATION AT COMMUNITY COLLEGES.—

(A) IN GENERAL.—The Director shall award grants on a merit-reviewed, competitive basis to institutions of higher education or nonprofit organizations (or consortia of such institutions or organizations) to advance research on the nature of learning and teaching at community colleges and to improve outcomes for students who enter the workforce upon completion of their STEM degree or credential or transfer to 4-year institutions, including by—

(i) examining how to scale up successful programs at Community Colleges that are improving student outcomes in foundational STEM courses;

(ii) supporting research on effective STEM teaching practices in community college settings;

(iii) designing and developing new STEM curricula;

(iv) providing STEM students with hands-on training and research experiences, internships, and other experiential learning opportunities;

(v) increasing access to high quality STEM education through new technologies;

(vi) re-skilling or up-skilling incumbent workers for new STEM jobs;

(vii) building STEM career and seamless transfer pathways; and

(viii) developing novel mechanisms to identify and recruit talent into STEM programs, in particular talent from groups historically underrepresented in STEM.

(B) PARTNERSHIPS.—In carrying out activities under this paragraph, the Director shall encourage applications to develop, enhance, or expand cooperative STEM education and training partnerships between institutions of higher education, industry, and labor organizations.

(c) ADVANCED TECHNOLOGICAL MANUFACTURING ACT.—

(1) FINDINGS AND PURPOSE.—Section 2 of the Scientific and Advanced-Technology Act of 1992 (42 U.S.C. 1862h) is amended—

(A) in subsection (a)—

(i) in paragraph (3), by striking "science, mathematics, and technology" and

inserting "science, technology, engineering, and mathematics or STEM";

(ii) in paragraph (4), by inserting "educated" and before "trained"; and

(iii) in paragraph (5), by striking "scientific and technical education and training" and inserting "STEM education and training"; and

(B) in subsection (b)—

(i) in paragraph (2), by striking "mathematics and science" and inserting "STEM fields"; and

(ii) in paragraph (4), by striking "mathematics and science instruction" and inserting "STEM instruction".

(2) MODERNIZING REFERENCES TO STEM.—Section 3 of the Scientific and Advanced-Technology Act of 1992 (42 U.S.C. 1862i) is amended—

*(A) in the section heading, by striking "**SCIENTIFIC AND TECHNICAL EDUCATION** " and inserting "**STEM EDUCATION**";*

(B) in subsection (a)—

(i) in the subsection heading, by striking "SCIENTIFIC AND TECHNICAL EDU-

CATION ” and inserting “STEM EDUCATION”;

(ii) in the matter preceding paragraph (1)—

(I) by inserting “and education to prepare the skilled technical workforce to meet workforce demands” before “, and to improve”;

(II) by striking “core education courses in science and mathematics” and inserting “core education courses in STEM fields”;

(III) by inserting “veterans and individuals engaged in” before “work in the home”; and

(IV) by inserting “and on building a pathway from secondary schools, to associate-degree-granting institutions, to careers that require technical training” before “, and shall be designed”;

(iii) in paragraph (1)—

(I) by inserting “and study” after “development”; and

(II) by striking "core science and mathematics courses" and inserting "core STEM courses";

(iv) in paragraph (2), by striking "science, mathematics, and advanced-technology fields" and inserting "STEM and advanced-technology fields";

(v) in paragraph (3)(A), by inserting "to support the advanced-technology industries that drive the competitiveness of the United States in the global economy" before the semicolon at the end;

(vi) in paragraph (4), by striking "scientific and advanced-technology fields" and inserting "STEM and advanced-technology fields"; and

(vii) in paragraph (5), by striking "advanced scientific and technical education" and inserting "advanced STEM and advanced-technology";

(C) in subsection (c)—

(i) in paragraph (1)—

(I) in subparagraph (A)—

(aa) in the matter preceding clause (i), by striking "to encour-

age" and all that follows through "such means as—" and inserting "to encourage the development of career and educational pathways with multiple entry and exit points leading to credentials and degrees, and to assist students pursuing pathways in STEM fields to transition from associate-degree-granting colleges to bachelor-degree-granting institutions, through such means as—";

(bb) in clause (i), by striking "to ensure" and inserting "to develop articulation agreements that ensure"; and

(cc) in clause (ii), by striking "courses at the bachelor-degree-granting institution" and inserting "the career and educational pathways supported by the articulation agreements";

(II) in subparagraph (B)—

(aa) in clause (i), by inserting "veterans and individuals en-

gaged in" before "work in the home";

(bb) in clause (iii)—

(AA) by striking "bachelor's-degree-granting institutions" and inserting "institutions or work sites"; and

(BB) by inserting "or industry internships" after "summer programs"; and

(cc) by striking the flush text following clause (iv); and

(III) by striking subparagraph (C);

(ii) in paragraph (2)—

(I) by striking "mathematics and science programs" and inserting "STEM programs";

(II) by inserting "and, as appropriate, elementary schools," after "with secondary schools";

(III) by striking "mathematics and science education" and inserting "STEM education";

(IV) by striking "secondary school students" and inserting "students at these schools";

(V) by striking "science and advanced-technology fields" and inserting "STEM and advanced-technology fields"; and

(VI) by striking "agreements with local educational agencies" and inserting "articulation agreements or dual credit courses with local secondary schools, or other means as the Director determines appropriate,"; and

(iii) in paragraph (3)—

(I) by striking subparagraph (B);

(II) by striking "shall—"and all that follows through "establish a" and inserting "shall establish a";

(III) by striking "the fields of science, technology, engineering, and mathematics" and inserting "STEM fields"; and

(IV) by striking "; and" and inserting ", including jobs at Federal and academic laboratories.";

(D) in subsection (c)—

(i) in paragraph (1)—

(I) in subparagraph (A)—

(aa) in the matter preceding clause (i), by striking "to encourage" and all that follows through "such means as—" and inserting "to encourage the development of career and educational pathways with multiple entry and exit points leading to credentials and degrees, and to assist students pursuing pathways in STEM fields to transition from associate-degree-granting colleges to bachelor-degree-granting institutions, through such means as—";

(bb) in clause (i), by striking "to ensure" and inserting "to develop articulation agreements that ensure"; and

(cc) in clause (ii), by striking "courses at the bachelor-degree-granting institution" and inserting "the career and edu-

cational pathways supported by the articulation agreements";

(II) in subparagraph (B)—

(aa) in clause (i), by inserting "veterans and individuals engaged in" before "work in the home";

(bb) in clause (iii)—

(AA) by striking "bachelor's-degree-granting institutions" and inserting "institutions or work sites"; and

(BB) by inserting "or industry internships" after "summer programs"; and

(cc) by striking the flush text following clause (iv); and

(III) by striking subparagraph (C);

(ii) in paragraph (2)—

(I) by striking "mathematics and science programs" and inserting "STEM programs";

(II) by inserting "and, as appropriate, elementary schools," after "with secondary schools";

(III) by striking "mathematics and science education" and inserting "STEM education";

(IV) by striking "secondary school students" and inserting "students at these schools";

(V) by striking "science and advanced-technology fields" and inserting "STEM and advanced-technology fields"; and

(VI) by striking "agreements with local educational agencies" and inserting "articulation agreements or dual credit courses with local secondary schools, or other means as the Director determines appropriate,"; and

(iii) in paragraph (3)—

(I) by striking subparagraph (B);

(II) by striking "shall—"and all that follows through "establish a" and inserting "shall establish a";

(III) by striking "the fields of science, technology, engineering, and mathematics" and inserting "STEM fields"; and

(IV) by striking "; and" and inserting ", including jobs at Federal and academic laboratories.";

(E) in subsection (d)(2)—

(i) in subparagraph (D), by striking "and" after the semicolon;

(ii) in subparagraph (E), by striking the period at the end and inserting a "; and"; and

(iii) by adding at the end the following:

"(F) as appropriate, applications that apply the best practices for STEM education and technical skills education through distance learning or in a simulated work environment, as determined by research described in subsection (f); and";

(F) in subsection (g), by striking the second sentence;

(G) in subsection (h)(1)—

(i) in subparagraph (A), by striking "2022" and inserting "2026";

(ii) in subparagraph (B), by striking "2022" and inserting "2026"; and

(iii) in subparagraph (C)—

(I) by striking "up to $2,500,000" and inserting "not less than $3,000,000"; and

(II) by striking "2022" and inserting "2026";

(H) in subsection (i)—

(i) by striking paragraph (3); and

(ii) by redesignating paragraphs (4) and (5) as paragraphs (3) and (4), respectively; and

(I) in subsection (j)—

(i) by striking paragraph (1) and inserting the following:

"(1) the term advanced-technology includes technological fields such as advanced manufacturing, agricultural-, biological- and chemical-technologies, energy and environmental technologies, engineering technologies, information technologies, micro and nano-technologies, cybersecurity technologies,

geospatial technologies, and new, emerging technology areas;";

(ii) in paragraph (4), by striking "separate bachelor-degree-granting institutions" and inserting "other entities";

(iii) by striking paragraph (7);

(iv) by redesignating paragraphs (8) and (9) as paragraphs (7) and (8), respectively;

(v) in paragraph (7), as redesignated by subparagraph (D), by striking "and" after the semicolon;

(vi) in paragraph (8), as redesignated by subparagraph (D)—

(I) by striking "mathematics, science, engineering, or technology" and inserting "science, technology, engineering, or mathematics"; and

(II) by striking the period at the end and inserting "; and"; and

(vii) by adding at the end the following:

"(9) the term skilled technical workforce means workers—

"(A) in occupations that use significant levels of science and engineering expertise and technical knowledge; and

"(B) whose level of educational attainment is less than a bachelor degree.".

(3) AUTHORIZATION OF APPROPRIATIONS.—Section 5 of the Scientific and Advanced-Technology Act of 1992 (42 U.S.C. 1862j) is amended to read as follows:

"SEC. 5. AUTHORIZATION OF APPROPRIATIONS.

"There are authorized to be appropriated to the Director for carrying out sections 2 through 4, $150,000,000 for fiscal years 2022 through 2026.".

(d) GRADUATE STEM EDUCATION.—

(1) MENTORING AND PROFESSIONAL DEVELOPMENT.—

(A) MENTORING PLANS.—

(i) UPDATE.—Section 7008 of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (42 U.S.C. 1862o) is amended by—

(I) inserting "and graduate student" after "postdoctoral"; and

(II) inserting "The requirement may be satisfied by providing such individuals with access to mentors, including individuals not listed on the grant." after "review criterion.".

(ii) EVALUATION.—Not later than 45 days after the date of enactment of this Act, the Director shall enter into an agreement with a qualified independent organization to evaluate the effectiveness of the postdoctoral mentoring plan requirement for improving mentoring for Foundation-supported postdoctoral researchers.

(B) CAREER EXPLORATION.—

(i) IN GENERAL.—The Director shall award grants, on a competitive basis, to institutions of higher education and non-profit organizations (or consortia of such institutions or organizations) to develop innovative approaches for facilitating career exploration of academic and non-academic career options and for providing opportunity-broadening experiences, including work-integrated opportunities, for graduate students and postdoctoral scholars that can

then be considered, adopted, or adapted by other institutions and to carry out research on the impact and outcomes of such activities.

(ii) REVIEW OF PROPOSALS.—In selecting grant recipients under this subparagraph, the Director shall consider, at a minimum—

(I) the extent to which the administrators of the institution are committed to making the proposed activity a priority; and

(II) the likelihood that the institution or organization will sustain or expand the proposed activity effort beyond the period of the grant.

(C) DEVELOPMENT PLANS.—The Director shall require that annual project reports for awards that support graduate students and postdoctoral scholars include certification by the principal investigator that each graduate student and postdoctoral scholar receiving substantial support from such award, as determined by the Director, in consultation with faculty advisors, has developed and annually updated an indi-

vidual development plan to map educational goals, career exploration, and professional development.

(D) PROFESSIONAL DEVELOPMENT SUPPLEMENT.—The Director shall carry out a five-year pilot initiative to award up to 2,500 administrative supplements of up to $2,000 to existing research grants annually, on a competitive basis, to support professional development experiences for graduate students and postdoctoral researchers who receive a substantial portion of their support under such grants, as determined by the Director. Not more than 10 percent of supplements awarded under this subparagraph may be used to support professional development experiences for postdoctoral researchers.

(E) GRADUATE EDUCATION RESEARCH.—The Director shall award grants, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support research on the graduate education system and outcomes of various interventions and policies, including—

(i) the effects of traineeships, fellowships, internships, and teaching and research assistantships on outcomes for graduate students;

(ii) the effects of graduate education and mentoring policies and procedures on degree completion, including differences by—

(I) gender, race and ethnicity, sexual orientation, gender identity, and citizenship; and

(II) student debt load;

(iii) the development and assessment of new or adapted interventions, including approaches that improve mentoring relationships, develop conflict management skills, and promote healthy research teams; and

(iv) research, data collection, and assessment of the state of graduate student mental health and wellbeing, factors contributing to and consequences of poor graduate student mental health, and the development, adaptation, and assessment of evidence-based strategies and policies to support emotional wellbeing and mental health.

(2) GRADUATE RESEARCH FELLOWSHIP PROGRAM UPDATE.—

(A) SENSE OF CONGRESS.—It is the sense of Congress that the Foundation should increase the number of new graduate research fellows supported annually over the next 5 years to no fewer than 3,000 fellows.

(B) PROGRAM UPDATE.—Section 10 of the National Science Foundation Act of 1950 (42 U.S.C. 1869) is amended—

(i) in subsection (a), by inserting "and as will address national workforce demand in critical STEM fields" after "throughout the United States";

(ii) in subsection (b), by striking "of $12,000" and inserting "of at least $16,000"; and

(iii) by adding at the end the following:

"(c) OUTREACH.—The Director shall ensure program outreach to recruit fellowship applicants from fields of study that are in areas of critical national need, from all regions of the country, and from historically underrepresented populations in STEM.".

(C) CYBERSECURITY SCHOLARSHIPS AND GRADUATE FELLOWSHIPS.—The Director shall ensure that students pursuing master's degrees and doctoral degrees in fields relating to cybersecurity are considered as applicants for scholarships and graduate fellowships under the Graduate Research Fellowship Program under section 10 of the National Science Foundation Act of 1950 (42 U.S.C. 1869).

(3) STUDY ON GRADUATE STUDENT FUNDING.—

(A) IN GENERAL.—Not later than 45 days after the date of enactment of this Act, the Director shall enter into an agreement with a qualified independent organization to evaluate—

(i) the role of the Foundation in supporting graduate student education and training through fellowships, traineeships, and other funding models; and

(ii) the impact of different funding mechanisms on graduate student experiences and outcomes, including whether such mechanisms have differential impacts on subsets of the student population.

(B) REPORT.—Not later than 1 year after the date of enactment of this Act, the organiza-

tion charged with carrying out the study under subparagraph (A) shall publish the results of its evaluation, including a recommendation for the appropriate balance between fellowships, traineeships, and other funding models.

(4) FELLOWSHIPS AND TRAINEESHIPS FOR EARLY-CAREER AI RESEARCHERS.—

(A) ARTIFICIAL INTELLIGENCE TRAINEESHIPS.—

(i) IN GENERAL.—The Director of the National Science Foundation shall award grants to institutions of higher education to establish traineeship programs for graduate students who pursue artificial intelligence-related research leading to a masters or doctorate degree by providing funding and other assistance, and by providing graduate students opportunities for research experiences in government or industry related to the students' artificial intelligence studies.

(ii) USE OF FUNDS.—A institution of higher education shall use grant funds provided under clause (i) for the purposes of—

(I) providing traineeships to students who are pursuing research in ar-

tificial intelligence leading to a masters or doctorate degree;

(II) paying tuition and fees for students receiving traineeships;

(III) creating and requiring courses or training programs in technology ethics for students receiving traineeships;

(IV) creating opportunities for research in technology ethics for students receiving traineeships;

(V) establishing scientific internship programs for students receiving traineeships in artificial intelligence at for-profit institutions, nonprofit research institutions, or government laboratories; and

(VI) other costs associated with the administration of the program.

(B) ARTIFICIAL INTELLIGENCE FELLOWSHIPS.—The Director of the National Science Foundation shall award fellowships to masters and doctoral students and postdoctoral researchers who are pursuing degrees or research in artificial intelligence and related fields, including in

the field of technology ethics. In making such awards, the Director shall conduct outreach, including through formal solicitations, to solicit proposals from students and postdoctoral researchers seeking to carry out research in aspects of technology ethics with relevance to artificial intelligence systems.

(e) STEM WORKFORCE DATA.—

(1) SKILLED TECHNICAL WORKFORCE PORTFOLIO REVIEW.—

(A) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, the Director shall conduct a full portfolio analysis of the Foundation's skilled technical workforce investments across all Directorates in the areas of education, research, infrastructure, data collection, and analysis.

(B) REPORT.—Not later than 180 days after the date of the review under subparagraph (A) is complete, the Director shall submit to Congress and make widely available to the public a summary report of the portfolio review.

(2) SURVEY DATA.—

(A) ROTATING TOPIC MODULES.—To meet evolving needs for data on the state of the science

and engineering workforce, the Director shall assess, through coordination with other Federal statistical agencies and drawing on input from relevant stakeholders, the feasibility and benefits of incorporating questions or topic modules to existing National Center for Science and Engineering Statistics surveys that would vary from cycle to cycle.

(B) NEW DATA.—Not later than 1 year after the date of enactment of this Act, the Director shall submit to Congress and the Board the results of an assessment, carried out in coordination with other Federal agencies and with input from relevant stakeholders, of the feasibility and benefits of incorporating new questions or topic modules to existing National Center for Science and Engineering Statistics surveys on—

(i) the skilled technical workforce;

(ii) working conditions and work-life balance;

(iii) harassment and discrimination;

(iv) sexual orientation and gender identity;

(v) immigration and emigration; and

(vi) any other topics at the discretion of the Director.

(C) LONGITUDINAL DESIGN.—The Director shall continue and accelerate efforts to enhance the usefulness of National Center for Science and Engineering Statistics survey data for longitudinal research and analysis.

(D) GOVERNMENT ACCOUNTABILITY OFFICE REVIEW.—Not later than 1 year after the date of enactment of this Act, the Comptroller General of the United States shall submit a report to Congress that—

(i) evaluates Foundation processes for ensuring the data and analysis produced by the National Center for Science and Engineering Statistics meets current and future needs; and

(ii) includes such recommendations as the Comptroller General determines are appropriate to improve such processes.

(f) CYBER WORKFORCE DEVELOPMENT RESEARCH AND DEVELOPMENT.—

(1) IN GENERAL.—The Director shall award grants on a merit-reviewed, competitive basis to institutions of higher education or non-profit organiza-

tions (or a consortia of such institutions or organizations) to carry out research on the cyber workforce.

(2) RESEARCH.—In carrying out research pursuant to paragraph (1), the Director shall support research and development activities to—

(A) Understand the current state of the cyber workforce, including factors that influence growth, retention, and development of that workforce;

(B) examine paths to entry and re-entry into the cyber workforce;

(C) understand trends of the cyber workforce, including demographic representation, educational and professional backgrounds present, competencies available, and factors that shape employee recruitment, development, and retention and how to increase the size, diversity, and capability of the cyber workforce;

(D) examine and evaluate training practices, models, programs, and technologies; and

(E) other closely related topics as the Director determines appropriate.

(3) REQUIREMENTS.—In carrying out the activities described in paragraph (1), the Director shall—

(A) collaborate with the National Institute for Standards and Technology, including the National Initiative for Cybersecurity Education, the Department of Homeland Security, the Department of Defense, the Office of Personnel Management, and other Federal departments and agencies, as appropriate;

(B) align with or build on the National Initiative on Cybersecurity Education Cybersecurity Workforce Framework wherever practicable and applicable;

(C) leverage the collective body of knowledge from existing cyber workforce development research and education activities; and

(D) engage with other Federal departments and agencies, research communities, and potential users of information produced under this subsection.

(g) FEDERAL CYBER SCHOLARSHIP-FOR-SERVICE PROGRAM.—

(1) SENSE OF CONGRESS.—It is the sense of Congress that—

(A) since cybersecurity risks are constant in the growing digital world, it is critical that the United States stay ahead of malicious cyber ac-

tivity with a workforce that can safeguard our innovation, research, and work environments; and

(B) Federal investments into the Federal Cyber Scholarship-for-Service Program at the National Science Foundation play a critical role in preparing and sustaining a strong, talented, and much-needed national cybersecurity workforce and should be strengthened.

(2) IN GENERAL.—Section 302(b)(1) of the Cybersecurity Enhancement Act of 2014 (15 U.S.C. 7442(b)(1)) is amended by striking the semicolon at the end and inserting the following "and cybersecurity-related aspects of other related fields as appropriate, including artificial intelligence, quantum computing and aerospace.".

(h) CYBERSECURITY WORKFORCE DATA INITIATIVE.—The Director, acting through the National Center for Science and Engineering Statistics established in section 505 of the America COMPETES Reauthorization Act of 2010 (42 U.S.C. 1862p) and in coordination with the Director of the National Institute of Standards and Technology and other appropriate Federal statistical agencies, shall establish a cybersecurity workforce data initiative that—

(1) assesses the feasibility of providing nationally representative estimates and statistical information on the cybersecurity workforce;

(2) utilizes the National Initiative for Cybersecurity Education (NICE) Cybersecurity Workforce Framework (NIST Special Publication 800–181), or other frameworks, as appropriate, to enable a consistent measurement of the cybersecurity workforce;

(3) utilizes and complements existing data on employer requirements and unfilled positions in the cybersecurity workforce;

(4) consults key stakeholders and the broader community of practice in cybersecurity workforce development to determine data requirements needed to strengthen the cybersecurity workforce;

(5) evaluates existing Federal survey data for information pertinent to developing national estimates of the cybersecurity workforce;

(6) evaluates administrative data and other supplementary data sources, as available, to describe and measure the cybersecurity workforce; and

(7) collects statistical data, to the greatest extent practicable, on credential attainment and employment outcomes information for the cybersecurity workforce.

SEC. 6. BROADENING PARTICIPATION.

(a) PRESIDENTIAL AWARDS FOR EXCELLENCE IN MATHEMATICS AND SCIENCE TEACHING.—

(1) IN GENERAL.—Section 117(a) of the National Science Foundation Authorization Act of 1988 (42 U.S.C.1881b(a)) is amended—

(A) in subparagraph (B)—

(i) by striking "108" and inserting "110";

(ii) by striking clause (iv);

(iii) in clause (v), by striking the period at the end and inserting "; and";

(iv) by redesignating clauses (i), (ii), (iii), and (v) as subclauses (I), (II), (III), and (IV), respectively, and moving the margins of such subclauses (as so redesignated) two ems to the right; and

(v) by striking "In selecting teachers" and all that follows through "two teachers—" and inserting the following:

"(C) In selecting teachers for an award authorized by this subsection, the President shall select—

"(i) at least two teachers—"; and

(B) in subparagraph (C), as designated by paragraph (1)(A)(v), by adding at the end the following:

"(ii) at least one teacher—

"(I) from the Commonwealth of the Northern Mariana Islands;

"(II) from American Samoa;

"(III) from the Virgin Islands of the United States; and

"(IV) from Guam.".

(2) EFFECTIVE DATE.—The amendments made by paragraph (1) shall apply with respect to awards made on or after the date of the enactment of this Act.

(b) ROBERT NOYCE TEACHER SCHOLARSHIP PROGRAM UPDATE.—

(1) SENSE OF CONGRESS.—It is the sense of Congress that over the next five years the Foundation should increase the number of scholarships awarded under the Robert Noyce Teacher Scholarship program established under section 10 of the National Science Foundation Authorization Act of 2002 (42 U.S.C. 1862n–1) by 50 percent.

(2) OUTREACH.—To increase the diversity of participants, the Director shall support symposia, forums, conferences, and other activities to expand and enhance outreach to—

(A) historically Black colleges and universities that are part B institutions, as defined in

section 322(2) of the Higher Education Act of 1965 (20 U.S.C. 1061(2));

(B) minority institutions, as defined in section 365(3) of the Higher Education Act of 1965 (20 U.S.C. 1067k(3));

(C) institutions of higher education that are located near or serve rural communities;

(D) labor organizations;

(E) emerging research institutions; and

(F) higher education programs that serve or support veterans.

(c) NSF INCLUDES INITIATIVE.—The Director shall award grants and cooperative agreements, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to carry out a comprehensive national initiative to facilitate the development of networks and partnerships to build on and scale up effective practices in broadening participation in STEM studies and careers of groups historically underrepresented in such studies and careers.

(d) BROADENING PARTICIPATION ON MAJOR FACILITIES AWARDS.—The Director shall require organizations seeking a cooperative agreement for the management of the operations and maintenance of a Foundation project to demonstrate prior experience and current capabilities in

employing best practices in broadening participation in science and engineering and ensure implementation of such practices is considered in oversight of the award.

(e) PARTNERSHIPS WITH EMERGING RESEARCH INSTITUTIONS.—The Director shall establish a five-year pilot program to enhance partnerships between emerging research institutions and institutions classified as very high research activity by the Carnegie Classification of Institutions of Higher Education at the time of application. In carrying out this program, the Director shall—

(1) require that each proposal submitted by a multi-institution collaboration for an award, including those under section 9, that exceeds $1,000,000, as appropriate, specify how the applicants will support substantive, meaningful, and mutually-beneficial partnerships with one or more emerging research institutions;

(2) require awardees funded under paragraph (1) to direct no less than 25 percent of the total award to one or more emerging research institutions to build research capacity, including through support for faculty salaries and training, field and laboratory research experiences for undergraduate and graduate students, and maintenance and repair of research equipment and instrumentation;

(3) require awardees funded under paragraph (1) to report on the partnership activities as part of the annual reporting requirements of the Foundation;

(4) solicit feedback on the partnership directly from partner emerging research institutions, in such form as the Director deems appropriate; and

(5) submit a report to Congress after the third year of the pilot program that includes—

(A) an assessment, drawing on feedback from the research community and other sources of information, of the effectiveness of the pilot program for improving the quality of partnerships with emerging research institutions; and

(B) if deemed effective, a plan for permanent implementation of the pilot program.

(f) TRIBAL COLLEGES AND UNIVERSITIES PROGRAM UPDATE.—

(1) IN GENERAL.—Section 525 of the America COMPETES Reauthorization Act of 2010 (42 U.S.C. 1862p–13) is amended—

(A) in subsection (a) by—

(i) striking "Native American" and inserting "American Indian, Alaska Native, and Native Hawaiian"; and

(ii) inserting "post-secondary credentials and" before "associate's"; and

(iii) striking "or baccalaureate degrees" and inserting ", baccalaureate, and graduate degrees"; and

(B) in subsection (b) by striking "undergraduate"; and

(C) in subsection (c) by inserting "and STEM" after "laboratory".

(2) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Director to carry out this program $107,250,000 for fiscal year 2022 through fiscal year 2026.

(g) DIVERSITY IN TECH RESEARCH.—The Director shall award grants, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support basic and applied research that yields a scientific evidence base for improving the design and emergence, development and deployment, and management and ultimate effectiveness of organizations of all kinds, including research related to diversity, equity, and inclusion in the technology sector.

(h) CONTINUING SUPPORT FOR EPSCOR.—

(1) SENSE OF CONGRESS.—

(A) IN GENERAL.—It is the sense of Congress that—

(i) since maintaining the Nation's scientific and economic leadership requires the participation of talented individuals nationwide, EPSCoR investments into State research and education capacities are in the Federal interest and should be sustained; and

(ii) EPSCoR should maintain its experimental component by supporting innovative methods for improving research capacity and competitiveness.

(B) DEFINITION OF EPSCOR.—In this subsection, the term "EPSCoR" has the meaning given the term in section 502 of the America COMPETES Reauthorization Act of 2010 (42 U.S.C. 1862p note).

(2) UPDATE OF EPSCOR.—Section 517(f)(2) of the America COMPETES Reauthorization Act of 2010 (42 U.S.C. 1862p–9(f)(2)) is amended—

(A) in subparagraph (A), by striking "and" at the end; and

(B) by adding at the end the following:

"(C) to increase the capacity of rural communities to provide quality STEM education and STEM workforce development programming to students, and teachers; and".

(i) FOSTERING STEM RESEARCH DIVERSITY AND CAPACITY PROGRAM.—

(1) IN GENERAL.—The Director shall establish a program to make awards on a competitive, merit-reviewed basis to eligible institutions to implement and study innovative approaches for building research capacity in order to engage and retain students from a range of institutions and diverse backgrounds in STEM.

(2) ELIGIBLE INSTITUTION DEFINED.—In this subsection the term "eligible institution" means an institution of higher education that, according to the data published by the National Center for Science and Engineering Statistics, is not, on average, among the top 100 institutions in Federal research and development expenditures during the 3 year period prior to the year of the award.

(3) PURPOSE.—The program established in paragraph (1) shall be focused on achieving simultaneous impacts at the student, faculty, and institutional levels by increasing the research capacity at el-

igible institutions and the number of undergraduate and graduate students pursuing STEM degrees from eligible institutions.

(4) REQUIREMENTS.—In carrying out this program, the Director shall—

(A) require eligible institutions seeking funding under this subsection to submit an application to the Director at such time, in such manner, containing such information and assurances as the Director may require. The application shall include, at a minimum a description of how the eligible institution plans to sustain the proposed activities beyond the duration of the grant;

(B) require applicants to identify disciplines and focus areas in which the eligible institution can excel, and explain how the applicant will use the award to build capacity to bolster the institutional research competitiveness of eligible entities to support grants awarded by the Foundation and increase regional and national capacity in STEM;

(C) require the awards funded under this subsection to support research and related activities, which may include—

(i) development or expansion of research programs in disciplines and focus areas in subparagraph (B);

(ii) faculty recruitment and professional development in disciplines and focus areas in subparagraph (B), including for early-career researchers;

(iii) stipends for undergraduate and graduate students participating in research in disciplines and focus areas in subparagraph (B);

(iv) acquisition of instrumentation necessary to build research capacity at an eligible institution in disciplines and focus areas in subparagraph (B);

(v) an assessment of capacity-building and research infrastructure needs;

(vi) administrative research development support; and

(vii) other activities necessary to build research capacity; and

(D) require that no eligible institution should receive more than $10,000,000 in any single year of funds made available under this section.

(5) ADDITIONAL CONSIDERATIONS.—In awarding a grant under this subsection, the Director may also consider—

(A) the extent to which the applicant will support students from diverse backgrounds, including first-generation undergraduate students;

(B) the geographic and institutional diversity of the applying institutions; and

(C) how the applicants can leverage public-private partnerships and existing partnerships with Federal Research Agencies.

(6) DUPLICATION.—The Director shall ensure the awards made under this subsection are complementary and not duplicative of existing program;

(7) REPORT.—The Director shall submit a report to Congress after the third year of the program that includes—

(A) an assessment of the effectiveness of the program for growing the geographic and institutional diversity of Institutions of Higher Education receiving research awards from the Foundation;

(B) an assessment of the quality, quantity and geographic and institutional diversity of Institutions of Higher Education conducting Foun-

dation sponsored research since the establishment of the program in this subsection;

(C) an assessment of the quantity and diversity of undergraduate and graduate students graduating from eligible institutions with STEM degrees; and

(D) statistical summary data on the program, including the geographic and institutional allocation of award funding, the number and diversity of supported graduate and undergraduate students, and how it contributes to capacity building at eligible entities.

(8) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Director $150,000,000 for each of the fiscal years 2022 through 2026 to carry out the activities under this subsection.

(j) CAPACITY-BUILDING PROGRAM FOR DEVELOPING UNIVERSITIES.—

(1) IN GENERAL.—The Director of the National Science Foundation shall make awards, on a competitive basis, to eligible institutions described in paragraph (2) to support the mission of the Foundation and to build institutional research capacity at eligible institutions.

(2) ELIGIBLE INSTITUTION.—

(A) IN GENERAL.—To be eligible to receive an award under this subsection, an institution—

(i) shall be—

(I) a historically Black college or university;

(II) a Tribal College or University;

(III) a minority-serving institution; or

(IV) an institution of higher education with an established STEM capacity building program focused on traditionally underrepresented populations in STEM, including Native Hawaiians, Alaska Natives, and Indians; and

(ii) shall have not more than $50,000,000 in annual federally-financed research and development expenditures for science and engineering as reported through the National Science Foundation Higher Education Research and Development Survey.

(B) PARTNERSHIPS.—An eligible institution receiving a grant under this subsection may

carry out the activities of the grant through a partnership with other entities, including community colleges and other eligible institutions.

(3) PROPOSALS.—To receive an award under this subsection, an eligible institution shall submit an application to the Director at such time, in such manner, and containing such information as the Director may require, including a plan that describes how the eligible institution will establish or expand research office capacity and how such award would be used to—

(A) conduct an assessment of capacity-building and research infrastructure needs of an eligible institution;

(B) enhance institutional resources to provide administrative research development support to faculty at an eligible institution;

(C) bolster the institutional research competitiveness of an eligible institution to support grants awarded by the Foundation;

(D) support the acquisition of instrumentation necessary to build research capacity at an eligible institution in research areas directly associated with the Foundation;

(E) increase capability of an eligible institution to move technology into the marketplace;

(F) increase engagement with industry to execute research through the SBIR and STTR programs (as defined in section 9(e) of the Small Business Act (15 U.S.C. 638(e)) and direct contracts at an eligible institution;

(G) provide student engagement and research training opportunities at the undergraduate, graduate, and postdoctoral levels at an eligible institution;

(H) further faculty development initiatives and strengthen institutional research training infrastructure, capacity, and competitiveness of an eligible institution; or

(I) address plans and prospects for long-term sustainability of institutional enhancements at an eligible institution resulting from the award including, if applicable, how the award may be leveraged by an eligible institution to build a broader base of support.

(4) AWARDS.—Awards made under this subsection shall be for periods of 3 years, and may be extended for periods of not more than 5 years.

(5) DEFINITIONS.—In this subsection:

(A) HISTORICALLY BLACK COLLEGE OR UNIVERSITY.—The term "historically Black college or university" has the meaning given the term "part B institution" in section 322 of the Higher Education Act of 1965 (20 U.S.C. 1061).

(B) MINORITY-SERVING INSTITUTION.—The term "minority-serving institution" or "MSI" means—

(i) a Hispanic-serving institution as defined in section 502 of the Higher Education Act of 1965 (20 U.S.C. 1101a);

(ii) an Alaska Native-serving Institution or a Native Hawaiian-serving institution as such terms are defined in section 317 of the Higher Education Act of 1965 (20 U.S.C. 1059d); and

(iii) a Predominantly Black institution, an Asian American and Native American Pacific Islander-serving institution, or a Native American-serving nontribal institution as such terms are defined in section 371 of the Higher Education Act of 1965 (20 U.S.C. 1067q(c)).

(C) TRIBAL COLLEGE OR UNIVERSITY.—The term "Tribal College or University" has the

meaning given such term in section 316 of the Higher Education Act of 1965 (20 U.S.C. 1059c).

(6) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Director of the National Science Foundation $100,000,000 for each of fiscal years 2022 through 2026 to carry out the activities in this Act.

(k) CHIEF DIVERSITY OFFICER OF THE NSF.—

(1) CHIEF DIVERSITY OFFICER.—

(A) APPOINTMENT.—The Director shall appoint a senior agency official within the Office of the Director as a Chief Diversity Officer.

(B) QUALIFICATIONS.—The Chief Diversity Officer shall have significant experience, within the Federal Government and the science community, with diversity- and inclusion-related matters, including—

(i) civil rights compliance;

(ii) harassment policy, reviews, and investigations;

(iii) equal employment opportunity; and

(iv) disability policy.

(C) OVERSIGHT.—The Chief Diversity Officer shall direct the Office of Diversity and Inclusion of the Foundation and report directly to the Director in the performance of the duties of the Chief Diversity Officer under this subsection.

(2) DUTIES.—The Chief Diversity Officer is responsible for providing advice on policy, oversight, guidance, and coordination with respect to matters of the Foundation related to diversity and inclusion, including ensuring the geographic diversity of the Foundation programs. Other duties may include—

(A) establishing and maintaining a strategic plan that publicly states a diversity definition, vision, and goals for the Foundation;

(B) defining a set of strategic metrics that are—

(i) directly linked to key organizational priorities and goals;

(ii) actionable; and

(iii) actively used to implement the strategic plan under paragraph (1);

(C) advising in the establishment of a strategic plan for diverse participation by individuals and institutions of higher education, including community colleges, historically Black col-

leges and universities, Tribal colleges or universities, minority-serving institutions, institutions of higher education with an established STEM capacity building program focused on traditionally underrepresented populations in STEM, including Native Hawaiians, Alaska Natives, and Indians, and institutions from jurisdictions eligible to participate under section 113 of the National Science Foundation Authorization Act of 1988 (42 U.S.C. 1862g);

(D) advising in the establishment of a strategic plan for outreach to, and recruiting from, untapped locations and underrepresented populations;

(E) advising on a diversity and inclusion strategy for the Foundation's portfolio of PreK-12 STEM education focused programs and activities, including goals for addressing barriers to participation;

(F) advising on the application of the Foundation's broader impacts review criterion; and

(G) performing such additional duties and exercise such powers as the Director may prescribe.

(3) FUNDING.—From any amounts appropriated for the Foundation for each of fiscal years 2022 through 2026, the Director shall allocate $5,000,000 to carry out this subsection for each such year.

SEC. 7. FUNDAMENTAL RESEARCH.

(a) BROADER IMPACTS.—

(1) ASSESSMENT.—Not later than 45 days after the date of enactment of this Act, the Director shall enter into an agreement with a qualified independent organization to assess how the Broader Impacts review criterion is applied across the Foundation and make recommendations for improving the effectiveness for meeting the goals established in section 526 of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Reauthorization Act of 2010 (42 U.S.C. 1862p-14).

(2) ACTIVITIES.—The Director shall award grants on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support activities to increase the efficiency, effectiveness, and availability of resources for implementing the Broader Impacts review criterion, including—

(A) training and workshops for program officers, merit review panelists, grant office administrators, faculty, and students to improve understanding of the goals and the full range of potential broader impacts available to researchers to satisfy this criterion;

(B) repositories and clearinghouses for sharing best practices and facilitating collaboration; and

(C) tools for evaluating and documenting societal impacts of research.

(b) SENSE OF CONGRESS.—It is the sense of Congress that the Director should continue to identify opportunities to reduce the administrative burden on researchers.

(c) RESEARCH INTEGRITY AND SECURITY.—

(1) OFFICE OF RESEARCH SECURITY AND POLICY.—The Director shall maintain a Research Security and Policy office within the Office of the Director with no fewer than 4 full time equivalent positions, in addition to the Chief of Research Security established in paragraph (2) of this subsection. The functions of the Research Security and Policy office shall be to coordinate all research security policy issues across the Foundation, including by—

(A) consulting and coordinating with the Foundation Office of Inspector General and with other Federal science agencies and intelligence and law enforcement agencies, as appropriate, through the National Science and Technology Council in accordance with the authority provided under section 1746 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92; 42 U.S.C. 6601 note), to identify and address potential security risks that threaten research integrity and other risks to the research enterprise;

(B) serving as the Foundation's primary resource for all issues related to the security and integrity of the conduct of Foundation-supported research;

(C) conducting outreach and education activities for awardees on research policies and potential security risks;

(D) educating Foundation program managers and other directorate staff on evaluating Foundation awards and awardees for potential security risks; and

(E) communicating reporting and disclosure requirements to awardees and applicants for funding.

(2) CHIEF OF RESEARCH SECURITY.—The Director shall appoint a senior agency official within the Office of the Director as a Chief of Research Security, whose primary responsibility is to manage the office established under paragraph (1).

(3) REPORT TO CONGRESS.—No later than 180 days after the date of enactment of this Act, the Director shall provide a report to the Committee on Science, Space, and Technology of the House of Representatives, the Committee on Commerce, Science, and Transportation of the Senate, the Committee on Appropriations of the House of Representatives, and the Committee on Appropriations of the Senate on the resources and the number of full time employees needed to carry out the functions of the Office established in paragraph (1).

(4) ONLINE RESOURCE.—The Director shall develop an online resource hosted on the Foundation's website containing up-to-date information, tailored for institutions and individual researchers, including—

(A) an explanation of Foundation research security policies;

(B) unclassified guidance on potential security risks that threaten scientific integrity and other risks to the research enterprise;

(C) examples of beneficial international collaborations and how such collaborations differ from foreign government interference efforts that threaten research integrity;

(D) promising practices for mitigating security risks that threaten research integrity; and

(E) additional reference materials, including tools that assist organizations seeking Foundation funding and awardees in information disclosure to the Foundation.

(5) RISK ASSESSMENT CENTER.—The Director shall enter into an agreement with a qualified independent organization to create a new risk assessment center to—

(A) help the Foundation develop the online resources under paragraph (4); and

(B) help awardees in assessing and identifying issues related to nondisclosure of current and pending research funding, risks to the Foundation merit review process, and other issues

that may negatively affect the Foundation proposal and award process due to undue foreign interference.

(6) RESEARCH GRANTS.—The Director shall continue to award grants, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support research on the conduct of research and the research environment, including research on research misconduct or breaches of research integrity and detrimental research practices.

(7) AUTHORITIES.—

(A) IN GENERAL.—In addition to existing authorities for preventing waste, fraud, abuse, and mismanagement of federal funds, the Director, acting through the Office of Research Security and Policy and in coordination with the Foundation's Office of Inspector General, shall have the authority to—

(i) conduct risk assessments, including through the use of open-source analysis and analytical tools, of research and development award applications and disclosures to the Foundation, in coordination with the

Risk Assessment Center established in paragraph (5);

(ii) request the submission to the Foundation, by an institution of higher education or other organization applying for a research and development award, of supporting documentation, including copies of contracts, grants, or any other agreement specific to foreign appointments, employment with a foreign institution, participation in a foreign talent program and other information reported as current and pending support for all covered individuals in a research and development award application; and

(iii) upon receipt and review of the information provided under clause (ii) and in consultation with the institution of higher education or other organization submitting such information, initiate the substitution or removal of a covered individual from a research and development award, reduce the award funding amount, or suspend or terminate the award if the Director determines

such contracts, grants, or agreements include obligations that—

(I) interfere with the capacity for Foundation-supported activities to be carried out; or

(II) create duplication with Foundation-supported activities.

(B) LIMITATIONS.—In exercising the authorities under this paragraph, the Director shall—

(i) take necessary steps, as practicable, to protect the privacy of all covered individuals and other parties involved in the application and disclosure assessments under clause (A)(i);

(ii) endeavor to provide justification for requests for supporting documentation made under clause (A)(ii);

(iii) require that allegations be proven by a preponderance of evidence; and

(iv) as practicable, afford subjects an opportunity to provide comments and rebuttal and an opportunity to appeal before final administrative action is taken.

(8) MALIGN FOREIGN TALENT RECRUITMENT PROGRAM PROHIBITION.—

(A) IN GENERAL.—Not later than 12 months after the date of enactment of this Act, the Director shall establish a requirement that, as part of an application for a research and development award from the agency—

(i) each covered individual listed on the application for a research and development award certify that they are not an active participant of a malign foreign talent recruitment program from a foreign country of concern and will not be a participant in such a program for the duration of the award; and

(ii) each institution of higher education or other organization applying for such an award certify that each covered individual who is employed by the institution of higher education or other organization has been made aware of the requirement under this subsection.

(B) INTERNATIONAL COLLABORATION.—Each policy developed under subparagraph (A) shall not prohibit—

(i) making scholarly presentations regarding scientific information not otherwise controlled under current law;

(ii) participation in international conferences or other international exchanges, partnerships or programs that involve open and reciprocal exchange of scientific information, and which are aimed at advancing international scientific understanding; and

(iii) other international activities deemed appropriate by the Director.

(C) LIMITATION.—The policy developed under subparagraph (A) shall not apply retroactively to research and development awards made prior to the establishment of the policy by the Director.

(D) DEFINITIONS.—In this subsection:

(i) COVERED INDIVIDUAL.—The term "covered individual" means the principal investigator, co-principal investigators, and any other person at the institution who is responsible for the design, conduct, or reporting of research or educational activities funded or proposed for funding by the Foundation.

(ii) FOREIGN COUNTRY OF CONCERN.—The term "foreign country of concern" means the People's Republic of China, the Democratic People's Republic of Korea, the Russian Federation, the Islamic Republic of Iran, or any other country deemed to be a country of concern as determined by the Department of State.

(iii) MALIGN FOREIGN GOVERNMENT TALENT RECRUITMENT PROGRAM.—The term "malign foreign government talent recruitment program" means any program or activity that includes compensation, including cash, research funding, honorific titles, promised future compensation, or other types of remuneration, provided by the foreign state or an entity sponsored by the foreign state to the targeted individual in exchange for the individual transferring knowledge and expertise to the foreign country.

(9) SECURITY TRAINING MODULES.—

(A) IN GENERAL.—Not later than 90 days after the date of enactment of this Act, the Director, in collaboration with the Director of the Na-

tional Institutes of Health and other relevant Federal research agencies, shall enter into an agreement or contract with a qualified entity for the development of online research security training modules for the research community, including modules focused on international collaboration and international travel, foreign interference, and rules for proper use of funds, disclosure, conflict of commitment, and conflict of interest.

(B) STAKEHOLDER INPUT.—Prior to entering into the agreement under clause (A), the Director shall seek input from academic, private sector, intelligence, and law enforcement stakeholders regarding the scope and content of training modules, including the diversity of needs across institutions of higher education and other grantees of different sizes and types, and recommendations for minimizing administrative burden on institutions of higher education and researchers.

(C) DEVELOPMENT.—The Director shall ensure that the entity identified in (A)—

(i) develops modules that can be adapted and utilized across Federal science agencies; and

(ii) develops and implements a plan for regularly updating the modules as needed.

(D) GUIDELINES.—The Director, in collaboration with the Director of the National Institutes of Health, shall develop guidelines for institutions of higher education and other organizations receiving Federal research and development funds to use in developing their own training programs to address the unique needs, challenges, and risk profiles of such institutions, including adoption of training modules developed under this paragraph.

(E) IMPLEMENTATION.—Drawing on stakeholder input under subparagraph (B), not later than 12 months after the date of enactment of this Act, the Director shall establish a requirement that, as part of an application for a research and development award from the Foundation—

(i) each covered individual listed on the application for a research and develop-

ment award certify that they have completed research security training that meets the guidelines developed under clause (D) within one year of the application; and

(ii) each institution of higher education or other organization applying for such award certify that each covered individual who is employed by the institution or organization and listed on the application has been made aware of the requirement under this subparagraph.

(F) DEFINITIONS.—In this subsection:

(i) COVERED INDIVIDUAL.—The term "covered individual" means the principal investigator, co-principal investigators, and any other person at the institution who is responsible for the design, conduct, or reporting of research or educational activities funded or proposed for funding by the Foundation.

(ii) FEDERAL RESEARCH AGENCY.—The term "Federal research agency" means any Federal agency with an annual extramural research expenditure of over $100,000,000.

(iii) RESEARCH AND DEVELOPMENT AWARD.—The term "research and development award" means support provided to an individual or entity by a Federal research agency to carry out research and development activities, which may include support in the form of a grant, contract, cooperative agreement, or other such transaction. The term does not include a grant, contract, agreement or other transaction for the procurement of goods or services to meet the administrative needs of a Federal research agency.

(10) RESPONSIBLE CONDUCT IN RESEARCH TRAINING.—Section 7009 of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (42 U.S.C. 1862o-1) is amended by—

(A) striking "and postdoctoral researchers" and inserting "postdoctoral researchers, faculty, and other senior personnel"; and

(B) by inserting before the period at the end the following ", including mentor training".

(11) NATIONAL ACADEMIES GUIDE TO RESPONSIBLE CONDUCT IN RESEARCH.—

(A) IN GENERAL.—Not later than 180 days after the date of enactment of this Act, the Director shall enter into an agreement with the Academies to update the report entitled "On Being a Scientist: A Guide to Responsible Conduct in Research" issued by the Academies. The report, as so updated, shall include—

(i) updated professional standards of conduct in research;

(ii) promising practices for preventing, addressing, and mitigating the negative impact of harassment, including sexual harassment and gender harassment as defined in the 2018 Academies report entitled "Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine"; and

(iii) promising practices for mitigating potential security risks that threaten research integrity.

(B) REPORT.—Not later than 18 months after the effective date of the agreement under subparagraph (A), the Academies, as part of such agreement, shall submit to the Director and the Committee on Science, Space, and Tech-

nology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate the report referred to in such subparagraph, as updated pursuant to such subparagraph.

(d) RESEARCH ETHICS.—

(1) SENSE OF CONGRESS.—It is the sense of Congress that—

(A) a number of emerging areas of research have potential ethical, social, safety, and security implications that might be apparent as early as the basic research stage;

(B) the incorporation of ethical, social, safety, and security considerations into the research design and review process for Federal awards, may help mitigate potential harms before they happen;

(C) the Foundation's agreement with the Academies to conduct a study and make recommendations with respect to governance of research in emerging technologies is a positive step toward accomplishing this goal; and

(D) the Foundation should continue to work with stakeholders to understand and adopt policies that promote best practices for governance of

research in emerging technologies at every stage of research.

(2) ETHICS STATEMENTS.—Drawing on stakeholder input, not later than 18 months after the date of enactment of this Act, the Director shall amend award proposal instructions to include a requirement for an ethics statement to be included as part of any proposal for funding prior to making the award. Such statement shall be considered by the Director in the review of proposals, taking into consideration any relevant input from the peer-reviewers for the proposal, and shall factor into award decisions as deemed necessary by the Director. Such statements may include, as appropriate—

(A) any foreseeable or quantifiable risks to society, including how the research could enable products, technologies, or other outcomes that could intentionally or unintentionally cause significant societal harm;

(B) how technical or social solutions can mitigate such risks and, as appropriate, a plan to implement such mitigation measures; and

(C) how partnerships and collaborations in the research can help mitigate potential harm and amplify potential societal benefits.

(3) GUIDANCE.—The Director shall solicit stakeholder input to develop clear guidance on what constitutes a foreseeable or quantifiable risk as described in paragraph (2)(A), and to the extent practicable harmonize this policy with existing ethical policies or related requirements for human subjects.

(4) RESEARCH.—The Director shall award grants, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support—

(A) research to assess the potential ethical and societal implications of Foundation-supported research and products or technologies enabled by such research, including the benefits and risks identified pursuant to paragraph (2)(A); and

(B) the development and verification of approaches to proactively mitigate foreseeable risks to society, including the technical and social solutions identified pursuant to paragraph (2)(B).

(5) ANNUAL REPORT.—The Director shall encourage awardees to update their ethics statements as appropriate as part of the annual reports required by all awardees under the award terms and conditions.

(e) RESEARCH REPRODUCIBILITY AND REPLICABILITY.—Consistent with existing Federal law for privacy, intellectual property, and security, the Director shall facilitate the public access to research products, including data, software, and code, developed as part of Foundation-supported projects.

(1) DATA MANAGEMENT PLANS.—

(A) The Director shall require that every proposal for funding for research include a machine-readable data management plan that includes a description of how the awardee will archive and preserve public access to data, software, and code developed as part of the proposed project.

(B) In carrying out the requirement in subparagraph (A), the Director shall—

(i) provide necessary resources, including trainings and workshops, to educate researchers and students on how to develop and review high quality data management plans;

(ii) ensure program officers and merit review panels are equipped with the resources and training necessary to review the quality of data management plans; and

(iii) ensure program officers and merit review panels treat data management plans as essential elements of grant proposals, where appropriate.

(2) OPEN REPOSITORIES.—The Director shall—

(A) coordinate with the heads of other Federal science agencies, and solicit input from the scientific community, to develop and widely disseminate a set of criteria for trusted open repositories, accounting for discipline-specific needs and necessary protections for sensitive information, to be used by Federally funded researchers for the sharing of data, software, and code;

(B) work with stakeholders to identify significant gaps in available repositories meeting the criteria developed under subparagraph (A) and options for supporting the development of additional or enhanced repositories;

(C) award grants on a competitive basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) for the development, upgrades, and maintenance of open data repositories that meet the criteria developed under subparagraph (A);

(D) work with stakeholders and build on existing models, where appropriate, to establish a single, public, web-based point of access to help users locate repositories storing data, software, and code resulting from or used in Foundation-supported projects;

(E) work with stakeholders to establish the necessary policies and procedures and allocate the necessary resources to ensure, as practicable, data underlying published findings resulting from Foundation-supported projects are deposited in repositories meeting the criteria developed under subparagraph (A) at the time of publication;

(F) incentivize the deposition of data, software, and code into repositories that meet the criteria developed under subparagraph (A); and

(G) coordinate with the scientific publishing community to develop uniform consensus standards around data archiving and sharing.

(3) RESEARCH, DEVELOPMENT, AND EDUCATION.—The Director shall award grants, on a competitive basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to—

(A) support research and development of open source, sustainable, usable tools and infrastructure that support reproducibility for a broad range of studies across different disciplines;

(B) support research on computational reproducibility, including the limits of reproducibility and the consistency of computational results in the development of new computation hardware, tools, and methods; and

(C) support the education and training of students, faculty, and researchers on computational methods, tools, and techniques to improve the quality and sharing of data, code, and supporting metadata to produce reproducible research.

(f) CLIMATE CHANGE RESEARCH.—

(1) IN GENERAL.—The Director shall award grants, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support research to improve our understanding of the climate system and related human and environmental systems.

(2) USE OF FUNDS.—Activities funded by a grant under this subsection may include—

(A) fundamental research on climate forcings, feedbacks, responses, and thresholds in the earth system, including impacts on and contributions from local and regional systems;

(B) research on climate-related human behaviors and institutions;

(C) research on climate-related risk, vulnerability, resilience, and adaptive capacity of coupled human-environment systems, including risks to ecosystem stability and risks to vulnerable populations;

(D) research to support the development and implementation of effective strategies and tools for mitigating and adapting to climate change, including social strategies and research focused on local level forecasting, impacts, and challenges;

(E) research on the design, development, and assessment of effective information and decision-support systems, including understanding and developing effective dissemination pathways;

(F) improved modeling, projections, analyses, and assessments of climate and other Earth system changes;

(G) research to understand the atmospheric processes related to solar radiation management strategies and technologies and examine related economic, geopolitical, societal, environmental, and ethical implications, not including research designed to advance future deployment of these strategies and technologies.

(H) the development of effective strategies for educating and training future climate change researchers, and climate change response and mitigation professionals, in both research and development methods, as well as community engagement and science communication;

(I) the development of effective strategies for public and community engagement in the all stages of the research and development process; and

(J) partnerships with other agencies to address climate related challenges for specific agency missions.

(g) VIOLENCE RESEARCH.—

(1) IN GENERAL.—The Director shall award grants, on a competitive basis, to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support research to improve our understanding of the nature, scope, causes, consequences, prevention, and response to all forms of violence.

(2) USE OF FUNDS.—Activities funded by a grant under this subsection may include—

(A) research on the magnitude and distribution of fatal and nonfatal violence;

(B) research on risk and protective factors;

(C) research on the design, development, implementation, and evaluation of interventions for preventing and responding to violence;

(D) research on scaling up effective interventions; and

(E) one or more interdisciplinary research centers to conduct violence research, foster new and expanded collaborations, and support capacity building activities to increase the number and diversity of new researchers trained in cross-disciplinary violence research.

(h) SOCIAL, BEHAVIORAL, AND ECONOMIC SCIENCES.—The Director shall—

(1) actively communicate opportunities and solicit proposals for social, behavioral, and economic science researchers to participate in cross-cutting and interdisciplinary programs, including the Convergence Accelerator and Big Ideas activities, and the Mid-Scale Research Infrastructure program; and

(2) ensure social, behavioral, and economic science researchers are represented on relevant merit review panels for such activities.

(i) MEASURING IMPACTS OF FEDERALLY FUNDED R&D.——The Director shall award grants on a competitive, merit-reviewed basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to support research and development of data, models, indicators, and associated analytical tools to improve our understanding of the impacts of Federally funded research on society, the economy, and the workforce, including domestic job creation.

(j) FOOD-ENERGY-WATER RESEARCH.—The Director shall award grants on a competitive basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to—

(1) support research to significantly advance our understanding of the food-energy-water system

through quantitative and computational modeling, including support for relevant cyberinfrastructure;

(2) develop real-time, cyber-enabled interfaces that improve understanding of the behavior of food-energy-water systems and increase decision support capability;

(3) support research that will lead to innovative solutions to critical food-energy-water system problems; and

(4) grow the scientific workforce capable of studying and managing the food-energy-water system, through education and other professional development.

(k) BIOLOGICAL FIELD STATIONS AND MARINE LABORATORIES.—The Director shall continue to support enhancing, repairing and maintaining research instrumentation, laboratories, telecommunications and housing at biological field stations and marine laboratories.

(l) SUSTAINABLE CHEMISTRY RESEARCH AND EDUCATION.—In accordance with section 263 of the National Defense Authorization Act for Fiscal Year 2021, the Director shall carry out activities in support of sustainable chemistry, including—

(1) establishing a program to award grants, on a competitive basis, to institutions of higher edu-

cation or non-profit organizations (or consortia of such institutions or organizations) to support—

(A) individual investigators and teams of investigators, including to the extent practicable, early career investigators for research and development;

(B) collaborative research and development partnerships among universities, industry, and non-profit organizations; and

(C) integrating sustainable chemistry principles into elementary, secondary, undergraduate, and graduate chemistry and chemical engineering curriculum and research training, as appropriate to that level of education and training; and

(2) incorporating sustainable chemistry into existing Foundation research and development programs.

(m) RISK AND RESILIENCE RESEARCH.—The Director shall award grants on a competitive basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to advance knowledge of risk assessment and predictability and to support the creation of tools and technologies, including ad-

vancing data analytics and utilization of artificial intelligence, for increased resilience through—

(1) improvements in our ability to understand, model, and predict extreme events and natural hazards, including pandemics;

(2) the creation of novel engineered systems solutions for resilient complex infrastructures, particularly those that address critical interdependence among infrastructures and leverage the growing infusion of cyber-physical-social components into the infrastructures;

(3) development of equipment and instrumentation for innovation in resilient engineered infrastructures;

(4) multidisciplinary research on the behaviors individuals and communities engage in to detect, perceive, understand, predict, assess, mitigate, and prevent risks and to improve and increase resilience.

(5) advancements in multidisciplinary wildfire science, including those related to air quality impacts, human behavior, and early detection and warning; and

(n) UAV TECHNOLOGIES.—The Director shall carry out a program of research and related activities for unmanned aerial vehicle technologies, which may include a

prize competition pursuant to section 24 of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3719) and support for undergraduate and graduate curriculum development.

(o) LEVERAGING INTERNATIONAL EXPERTISE IN RESEARCH.—The Director shall explore and advance opportunities for leveraging international capabilities and resources that align with the Foundation and United States research community priorities and have the potential to benefit United States prosperity, security, health, and well-being, including through binational research and development organizations and foundations and by sending teams of Foundation scientific staff for site visits of scientific facilities and agencies in other countries.

(p) BIOLOGICAL RESEARCH COLLECTIONS.—

(1) IN GENERAL.—The Director shall continue to support databases, tools, methods, and other activities that secure and improve existing physical and digital biological research collections, improve the accessibility of collections and collection-related data for research and educational purposes, develop capacity for curation and collection management, and to transfer ownership of collections that are significant to the biological research community, including to museums and universities.

(2) SPECIMEN MANAGEMENT PLAN.—In consultation with other relevant Federal science agencies, the Director shall require that every proposal for funding for research that involves collecting or generating specimens include a specimen management plan that includes a description of how the specimens and associated data will be accessioned into and permanently maintained in an established biological collection.

(3) ACTION CENTER FOR BIOLOGICAL COLLECTIONS.—The Director shall award grants on a competitive basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to establish an Action Center for Biological Collections to facilitate coordination and data sharing among communities of practice for research, education, workforce training, evaluation, and business model development.

(q) CLEAN WATER RESEARCH AND TECHNOLOGY ACCELERATION.—The Director shall award grants on a competitive, merit-reviewed basis to institutions of higher education or non-profit organizations (or consortia of such institutions or organizations) to—

(1) support transdisciplinary research to significantly advance our understanding of water availability, quality, and dynamics and the impact of

human activity and a changing climate on urban and rural water and wastewater systems;

(2) develop, pilot and deploy innovative technologies, systems, and other approaches to identifying and addressing challenges that affect water availability, quality, and security, including through direct engagement with affected communities and partnerships with the private sector, State, tribal, and local governments, non-profit organizations and water management professionals; and

(3) grow the scientific workforce capable of studying and managing water and wastewater systems, through education, training, and other professional development.

(r) TECHNOLOGY AND BEHAVIORAL SCIENCE RESEARCH.—The Director shall award grants on a merit-based, competitive basis for research to—

(1) increase understanding of social media and consumer technology access and use patterns and related psychological and behavioral issues, particularly for adolescents; and

(2) explore the role of social media and consumer technology in rising rates of depressive symptoms, suicidal ideation, drug use, and deaths of despair, par-

ticularly for communities experiencing long-term economic distress.

(s) MANUFACTURING RESEARCH AMENDMENT.—Section 506(a) of the America COMPETES Reauthorization Act of 2010 (42 U.S.C. 1862p–1(a)) is amended—

(1) in paragraph (5), by striking "and" at the end;

(2) in paragraph (6)—

(A) by striking "and" before "virtual manufacturing"; and

(B) by striking the period at the end and inserting "; and artificial intelligence and machine learning;"; and

(3) by adding at the end the following:

"(7) additive manufacturing, including new material designs, complex materials, rapid printing techniques, and real-time process controls; and

"(8) continuous manufacturing of biological products and similar innovating monitoring and control techniques.".

(t) CRITICAL MINERALS MINING RESEARCH AND DEVELOPMENT.—

(1) IN GENERAL.—The Director of the National Science Foundation shall award grants, on a competitive basis, to institutions of higher education or

nonprofit organizations (or consortium of such institutions or organizations) to support basic research that will accelerate innovation to advance critical minerals mining strategies and technologies for the purpose of making better use of domestic resources and eliminating national reliance on minerals and mineral materials that are subject to supply disruptions.

(2) USE OF FUNDS.—Activities funded by a grant under this subsection may include—

(A) advancing mining research and development activities to develop new mapping and mining technologies and techniques, including advanced critical mineral extraction, production, separation, alloying, or processing techniques and technologies that can decrease energy intensity, potential environmental impact and costs of those activities;

(B) conducting long-term earth observation of reclaimed mine sites, including the study of the evolution of microbial diversity at such sites;

(C) examining the application of artificial intelligence for geological exploration of critical minerals, including what the size and diversity of data sets would be required;

(D) examining the application of machine learning for detection and sorting of critical minerals, including what the size and diversity of data sets would be required;

(E) conducting detailed isotope studies of critical minerals and the development of more refined geologic models;

(F) improved understanding of the geological and geochemical processes through which critical minerals form and are concentrated into economically viable deposits; or

(G) providing training and researcher opportunities to undergraduate and graduate students to prepare the next generation of mining engineers and researchers.

(3) EXISTING PROGRAMS.—The Director shall ensure awards made under this subsection are complementary and not duplicative of existing programs across the foundation and Federal Government.

(u) STUDY OF AI RESEARCH CAPACITY.—

(1) IN GENERAL.—The Director of the National Science Foundation shall conduct a study, or support the development of a study through the Science and Technology Policy Institute or by any other appropriate organization as determined by the Director, on

artificial intelligence research capacity at U.S. institutions of higher education.

(2) STUDY CONTENTS.—The Director shall ensure that, at a minimum, the study under subsection (a) addresses the following topics:

(A) Which universities are putting out significant peer-reviewed artificial intelligence research, including based on quantity and number of citations.

(B) For each of the universities described in paragraph (1), what specific factors enable their AI research, including computing power, data sets and availability, specialized curriculum, and industry and other partnerships.

(C) How universities not included in paragraph (1) could implement the factors in paragraph (2) to produce AI research, as well as case studies that universities can look to as examples and potential pilot programs that the Federal Government could develop or support to help universities produce AI research.

(3) WORKSHOPS.—The Director may support workshops to help inform the study required under this subsection.

(4) PUBLICATION.—The Director shall ensure that the study carried out under this subsection is made publicly available not later than 12 months after the date of enactment of this Act.

(v) ADVANCING IOT FOR PRECISION AGRICULTURE.—

(1) NATIONAL SCIENCE FOUNDATION DIRECTIVE ON AGRICULTURAL SENSOR RESEARCH.—In awarding grants under its sensor systems and networked systems programs, the Director shall include in consideration of portfolio balance research and development on sensor connectivity in environments of intermittent connectivity and intermittent computation—

(A) to improve the reliable use of advance sensing systems in rural and agricultural areas; and

(B) that considers—

(i) direct gateway access for locally stored data;

(ii) attenuation of signal transmission;

(iii) loss of signal transmission; and

(iv) at-scale performance for wireless power.

(2) UPDATING CONSIDERATIONS FOR PRECISION AGRICULTURE TECHNOLOGY WITHIN THE NSF ADVANCED TECHNICAL EDUCATION PROGRAM.—Section 3

of the Scientific and Advanced-Technology Act of 1992 (42 U.S.C. 1862i) is amended in subsection (e)(3)—

(A) in subparagraph (C), by striking "and" after the semicolon;

(B) in subparagraph (D), by striking the period at the end and inserting "; and"; and

(C) by adding at the end the following:

"(E) applications that incorporate distance learning tools and approaches.".

(3) GAO REVIEW.—Not later than 18 months after the date of enactment of this Act, the Comptroller General of the United States shall provide—

(A) a technology assessment of precision agriculture technologies, such as the existing use of—

(i) sensors, scanners, radio-frequency identification, and related technologies that can monitor soil properties, irrigation conditions, and plant physiology;

(ii) sensors, scanners, radio-frequency identification, and related technologies that can monitor livestock activity and health;

(iii) network connectivity and wireless communications that can securely support

digital agriculture technologies in rural and remote areas;

(iv) aerial imagery generated by satellites or unmanned aerial vehicles;

(v) ground-based robotics;

(vi) control systems design and connectivity, such as smart irrigation control systems;

(vii) Global Positioning System-based applications; and

(viii) data management software and advanced analytics that can assist decision making and improve agricultural outcomes; and

(B) a review of Federal programs that provide support for precision agriculture research, development, adoption, education, or training, in existence on the date of enactment of this Act.

(w) ASTRONOMY AND SATELLITE CONSTELLATIONS.—The Director shall support research into and the design, development, and testing of mitigation measures to address the impact of satellite constellations on Foundation scientific programs by—

(1) awarding grants on a competitive basis to support investigations into the impacts of satellite

constellations on ground-based optical, infrared, and radio astronomy, including through existing programs such Spectrum and Wireless Innovation enabled by Future Technologies (SWIFT) and the Spectrum Innovation Initiative;

(2) supporting research on satellite impacts and benefits and mitigation strategies to be carried out at one or more Foundation supported Federally Funded Research and Development Centers or large facilities, as appropriate; and

(3) supporting workshops related to the impact of satellite constellations on scientific research and how those constellations could be used to improve scientific research.

SEC. 8. RESEARCH INFRASTRUCTURE.

(a) FACILITY OPERATION AND MAINTENANCE.—

(1) IN GENERAL.—The Director shall continue the Facility Operation Transition pilot program for a total of five years.

(2) COST SHARING.—The Facility Operation Transition program shall provide funding for 10–50 percent of the operations and maintenance costs for major research facilities that are within the first five years of operation, where the share is determined based on—

(A) the operations and maintenance costs of the major research facility; and

(B) the capacity of the managing directorate or division to absorb such costs.

(3) REPORT.—After the fifth year of the pilot program, the Director shall transmit a report to Congress that includes—

(A) an assessment, that includes feedback from the research community, of the effectiveness of the pilot program for—

(i) supporting research directorates and divisions in balancing investments in research grants and funding for the initial operation and maintenance of major facilities;

(ii) incentivizing the development of new world-class facilities;

(iii) facilitating interagency and international partnerships;

(iv) funding core elements of multi-disciplinary facilities; and

(v) supporting facility divestment costs; and

(B) if deemed effective, a plan for permanent implementation of the pilot program.

(b) REVIEWS.—The Director shall periodically carry out reviews within each of the directorates and divisions to assess the cost and benefits of extending the operations of research facilities that have exceeded their planned operational lifespan.

(c) HELIUM CONSERVATION.—

(1) MAJOR RESEARCH INSTRUMENTATION SUPPORT.—

(A) IN GENERAL.—The Director shall support, through the Major Research Instrumentation program, proposal requests that include the purchase, installation, operation, and maintenance of equipment and instrumentation to reduce consumption of helium.

(B) COST SHARING.—The Director may waive the cost-sharing requirement for helium conservation measures for non-Ph.D.-granting institutions of higher education and Ph.D.-granting institutions of higher education that are not ranked among the top 100 institutions receiving Federal research and development funding, as documented by the National Center for Science and Engineering Statistics.

(2) ANNUAL REPORT.—No later than 1 year after the date of enactment of this Act and annually

for the subsequent two years, the Director shall submit an annual report to Congress on the use of funding awarded by the Foundation for the purchase and conservation of helium. The report should include—

(A) the volume and price of helium purchased;

(B) changes in pricing and availability of helium; and

(C) any supply disruptions impacting a substantial number of institutions.

(d) ADVANCED COMPUTING.—

(1) COMPUTING NEEDS.—To gather information about the computational needs of Foundation-funded projects, the Director shall require grant proposals submitted to the Foundation, as appropriate, to include estimates of computational resource needs for projects that require use of advanced computing. The Director shall encourage and provide access to tools that facilitate the inclusion of these measures, including those identified in the 2016 Academies report entitled "Future Directions for NSF Advanced Computing Infrastructure to Support U.S. Science and Engineering in 2017–2020".

(2) REPORTS.—The Director shall document and publish every two years a summary of the amount

and types of advanced computing capabilities that are needed to fully meet the Foundation's project needs as identified under paragraph (1).

(3) ROADMAP.—To set priorities and guide strategic decisions regarding investments in advanced computing capabilities, the Director shall develop, publish, and regularly update a 5-year advanced computing roadmap that—

(A) describes the advanced computing resources and capabilities that would fully meet anticipated project needs, including through investments in the Mid-Scale Research Infrastructure program and the Major Research Equipment and Facilities Construction account;

(B) draws on community input, information contained in research proposals, allocation requests, insights from Foundation-funded cyberinfrastructure operators, and Foundation-wide information gathering regarding community needs;

(C) considers computational needs of planned major facilities;

(D) reflects anticipated technology trends;

(E) informs users and potential partners about future facilities and services;

(F) addresses the needs of groups historically underrepresented in STEM and geographic regions with low availability and high demand for advanced computing resources;

(G) considers how Foundation-supported advanced computing capabilities can be leveraged for activities through the Directorate for Science and Engineering Solutions; and

(H) provides an update to Congress about the level of funding necessary to fully meet computational resource needs for the research community.

(4) SECURING AMERICAN RESEARCH FROM CYBER THEFT.—

(A) NETWORKING AND INFORMATION TECHNOLOGY RESEARCH AND DEVELOPMENT UPDATE.—Section 101(a)(1) of the High-Performance Computing Act of 1991 (15 U.S.C. 5511) is amended—

(i) by moving the margins of subparagraphs (D) and (J) through (O) two ems to the left;

(ii) by redesignating subparagraphs (J) through (O) as subparagraphs (K) through (P), respectively; and

(iii) by inserting after subparagraph (I) the following:

"(J) provide for improving the security, reliability, and resiliency of computing and networking systems used by institutions of higher education and other nonprofit research institutions for the processing, storage and transmission of sensitive federally funded research and associated data;".

(B) COMPUTING ENCLAVE PILOT PROGRAM.—

(i) IN GENERAL.—The Director of the National Science Foundation, in consultation with the Director of the National Institute of Standards and Technology and the Secretary of Energy, shall establish a pilot program to award grants to ensure the security of federally-supported research data and to assist regional institutions of higher education and their researchers in compliance with regulations regarding the safeguarding of sensitive information and other relevant regulations and Federal guidelines.

(ii) STRUCTURE.—In carrying out the pilot program established pursuant to clause (i), the Director shall select three in-

stitutions of higher education from among institutions classified under the Indiana University Center for Postsecondary Research Carnegie Classification as a doctorate-granting university with a very high level of research activity, and with a history of working with secure information for the development, installation, maintenance, or sustainment of secure computing enclaves.

(iii) REGIONALIZATION.—

(I) IN GENERAL.—In selecting universities pursuant to clause (ii), the Director shall give preference to institutions of higher education with the capability of serving other regional universities.

(II) GEOGRAPHIC DISPERSAL.—The enclaves should be geographically dispersed to better meet the needs of regional interests.

(iv) PROGRAM ELEMENTS.—The Director shall work with institutions of higher education selected pursuant to clause (ii) to—

(I) develop an approved design blueprint for compliance with Federal data protection protocols;

(II) develop a comprehensive and confidential list, or a bill of materials, of each binary component of the software, firmware, or product that is required to deploy additional secure computing enclaves;

(III) develop templates for all policies and procedures required to operate the secure computing enclave in a research setting;

(IV) develop a system security plan template; and

(V) develop a process for managing a plan of action and milestones for the secure computing enclave.

(v) DURATION.—Subject to other availability of appropriations, the pilot program established pursuant to clause (i) shall operate for not less than 3 years.

(vi) REPORT.—

(I) IN GENERAL.—The Director of the National Science Foundation shall

report to Congress not later than 6 months after the completion of the pilot program under clause (i).

(II) CONTENTS.—The report required under subclause (I) shall include—

(aa) an assessment of the pilot program under clause (i), including an assessment of the security benefits provided by such secure computing enclaves;

(bb) recommendations related to the value of expanding the network of secure computing enclaves; and

(cc) recommendations on the efficacy of the use of secure computing enclaves by other Federal agencies in a broader effort to expand security of Federal research.

(vii) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Director, $38,000,000 for fiscal years 2022 through 2024, to carry out the activities outlined in this section.

(e) NATIONAL SECURE DATA SERVICE.—

(1) IN GENERAL.—The Director, in consultation with the Chief Statistician of the United States, shall establish a demonstration project to develop, refine and test models to inform the full implementation of the Commission on Evidence-Based Policymaking recommendation for a government-wide data linkage and access infrastructure for statistical activities conducted for statistical purposes, as defined in chapter 35 of title 44, United States Code.

(2) ESTABLISHMENT.—Not later than one year after the date of enactment of this Act, the Director shall establish a National Secure Data Service demonstration project. The National Secure Data Service demonstration project shall be—

(A) aligned with the principles, best practices, and priority actions recommended by the Advisory Committee on Data for Evidence Building, to the extent feasible; and

(B) operated directly by or via a contract that is managed by the National Center for Science and Engineering Statistics.

(3) DATA.—In carrying out this subsection, the Director shall engage with Federal and State agencies to collect, acquire, analyze, report, and disseminate

statistical data in the United States and other nations to support governmentwide evidence-building activities consistent with the Foundations for Evidence-Based Policymaking Act of 2018.

(4) PRIVACY AND CONFIDENTIALITY PROTECTIONS.—If the Director issues a management contract under paragraph (2), the awardee shall be designated as an "agent" under chapter 35 of title 44, United States Code, subchapter III, section 3561 et seq., with all requirements and obligations for protecting confidential information delineated in the Confidential Information Protection and Statistical Efficiency Act of 2018 and the Privacy Act of 1974.

(5) TECHNOLOGY.—In carrying out this subsection, the Director shall consider application and use of systems and technologies that incorporate protection measures to reasonably ensure confidential data and statistical products are protected in accordance with obligations under chapter 35 of title 44, United States Code, subchapter III, section 3561 et seq., including systems and technologies that ensure raw data and other sensitive inputs are not accessible to recipients of statistical outputs from the National Secure Data Service demonstration project.

(6) TRANSPARENCY.—The National Secure Data Service established under paragraph (2) shall maintain a public website with up-to-date information on supported projects.

(7) REPORT.—Not later than 2 years after the date of enactment of this Act, the National Secure Data Service demonstration project established under paragraph (2) shall submit a report to Congress that includes—

(A) a description of policies for protecting data, consistent with applicable federal law;

(B) a comprehensive description of all completed or active data linkage activities and projects;

(C) an assessment of the effectiveness of the demonstration project for mitigating risks and removing barriers to a sustained implementation of the National Secure Data Service as recommended by the Commission on Evidence-Based Policymaking; and

(D) if deemed effective by the Director, a plan for scaling up the demonstration project to facilitate data access for evidence building while ensuring transparency and privacy.

(8) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Director to carry out this subsection $9,000,000 for each of fiscal years 2022 through 2026.

SEC. 9. DIRECTORATE FOR SCIENCE AND ENGINEERING SOLUTIONS.

(a) ESTABLISHMENT.—Subject to the availability of appropriated funds, there is established within the Foundation the Directorate for Science and Engineering Solutions to advance research and development solutions to address societal and national challenges for the benefit of all Americans.

(b) PURPOSE.—The purpose of the Directorate established under subsection (a) is to support use-inspired research, accelerate the translation of Foundation-supported fundamental research and to advance technologies, facilitate commercialization and use of Federally funded research, and expand the pipeline of United States students and researchers in areas of societal and national importance.

(c) ACTIVITIES.—The Director shall achieve the purposes described in subsection (b) by awarding financial assistance through the Directorate to—

(1) support transformational advances in use-inspired and translational research through diverse

funding mechanisms and models, including convergence accelerators;

(2) translate research into science and engineering innovations, including through developing innovative approaches to connect research with societal outcomes, developing approaches to technology transfer that do not rely only on traditional market and commercialization tools, education and training for students and researchers on engaging with end users and the public, partnerships that facilitate research uptake, application, and scaling, prototype development, entrepreneurial education, developing tech-to-market strategies, and partnerships that connect research products to businesses, accelerators, and incubators and encourage the formation and growth of new companies;

(3) develop and expand sustainable and mutually-beneficial use-inspired and translational research and development partnerships and collaborations among institutions of higher education, including minority serving institutions and emerging research institutions, non-profit organizations, labor organizations, businesses and other for-profit entities, Federal or State agencies, community organizations, other Foundation directorates, national labs, field stations

and marine laboratories, international entities as appropriate, binational research and development foundations and funds, excluding foreign entities of concern, and other organizations;

(4) build capacity for use-inspired and translational research at institutions of higher education, including necessary administrative support;

(5) expand opportunities for researchers to contribute to use-inspired and translational research including through support for workshops and conferences, targeted incentives and training, and multidisciplinary research centers;

(6) support the education, mentoring, and training of undergraduate students, graduate students, and postdoctoral researchers in use-inspired and translational approaches to research and entrepreneurship in key focus areas identified under subsection (g) through scholarships, fellowships, and traineeships;

(7) support translational research infrastructure, including platforms and testbeds, data management and software tools, and networks and communication platforms for interactive and collective learning and information sharing;

(8) identify social, behavioral, and economic drivers and consequences of technological innovations; and

(9) ensure the programmatic work of the Directorate and Foundation incorporates a worker perspective through participation by labor organizations and workforce training organizations.

(d) ASSISTANT DIRECTOR.—

(1) IN GENERAL.—The Director shall appoint an Assistant Director responsible for the management of the Directorate established under this section.

(2) TERM LIMIT.—The Assistant Director appointed under paragraph (1) shall serve a term lasting no longer than 4 years.

(3) QUALIFICATIONS.—The Assistant Director shall be an individual, who by reason of professional background and experience, is specially qualified to—

(A) advise the Director on all matters pertaining to use-inspired and translational research, development, and commercialization at the Foundation, including partnership with the private sector and other users of Foundation funded research; and

(B) develop and implement the necessary policies and procedures to promote a culture of

use-inspired and translational research within the Directorate and across the Foundation and carry out the responsibilities under paragraph (4).

(4) RESPONSIBILITIES.—The responsibilities of the Assistant Director shall include—

(A) advising the Director on all matters pertaining to use-inspired and translational research and development activities at the Foundation, including effective practices for convergence research;

(B) identifying opportunities for and facilitating coordination and collaboration, where appropriate, on use-inspired and translational research, development, commercialization, and societal application activities—

(i) among the offices, directorates, and divisions within the Foundation; and

(ii) between the Foundation and stakeholders in academia, the private sector, including non-profit entities, labor organizations, Federal or State agencies, and international entities, as appropriate;

(C) ensuring that the activities carried out under this section are not duplicative of activi-

ties supported by other parts of the Foundation or other relevant Federal agencies;

(D) approving all new programs within the Directorate;

(E) developing and testing diverse merit-review models and mechanisms for selecting and providing awards for use-inspired and translational research and development at different scales, from individual investigator awards to large multi-institution collaborations;

(F) assessing the success of programs;

(G) administering awards to achieve the purposes described in subsection (b); and

(H) performing other such duties pertaining to the purposes in subsection (b) as are required by the Director.

(5) RELATIONSHIP TO THE DIRECTOR.—The Assistant Director shall report to the Director.

(6) RELATIONSHIP TO OTHER PROGRAMS.—No other directorate within the Foundation shall report to the Assistant Director.

(e) ADVISORY COMMITTEE.—

(1) IN GENERAL.—In accordance with the Federal Advisory Committee Act (5 U.S.C. App.) the Director shall establish an advisory committee to assess,

and make recommendations regarding, the activities carried out under this section.

(2) MEMBERSHIP.—The advisory committee members shall—

(A) be individuals with relevant experience or expertise, including individuals from industry and national labs, educators, academic subject matter experts, including individuals with knowledge of the technical and social dimensions of science and technology, technology transfer experts, labor organizations, and representatives of civil society, community organizations, and other nongovernmental organizations; and

(B) consist of at least 10 members broadly representative of stakeholders, including no less than 3 members from the private sector, none of whom shall be an employee of the Federal Government.

(3) RESPONSIBILITIES.—The Committee shall be responsible for—

(A) reviewing and evaluating activities carried out under this section; and

(B) assessing the success of the Directorate in and proposing new strategies for fulfilling the purposes in subsection (b).

(f) EXISTING PROGRAMS.—The Convergence Accelerator, the Growing Convergence Research Big Idea, and any other program, at the discretion of the Director, may be managed by the Directorate.

(g) FOCUS AREAS.—In consultation with the Assistant Director, the Board, and other Federal agencies and taking into account advice under subsection (e), the Director shall identify, and regularly update, up to 5 focus areas to guide activities under this section. In selecting such focus areas, the Director shall consider the following societal challenges:

(1) Climate change and environmental sustainability.

(2) Global competitiveness and domestic job creation in critical technologies.

(3) Cybersecurity.

(4) National security.

(5) STEM education and workforce.

(6) Social and economic inequality.

(h) TECHNOLOGY RESEARCH INSTITUTES.—

(1) IN GENERAL.—The Director may award grants and cooperative agreements to institutions of higher education, or consortia thereof, for the planning, establishment, and support of Technology Research Institutes in key technology areas, as determined by the Director.

(2) USES OF FUNDS.—Funds awarded under this section may be used by a Technology Research Institute to—

(A) conduct fundamental research to advance innovation in a key technology;

(B) conduct research involving a key technology to solve challenges with social, economic, health, scientific, and national security implications;

(C) further the development, adoption, and commercialization of innovations in key technology focus areas, including through partnership with other Federal agencies and Federal laboratories, industry, including startup companies, labor organizations, civil society organizations, and state and local, and Tribal governments.

(D) develop and manage multi-user research testbeds and instrumentation for key technologies;

(E) develop and manage an accessible repository, as appropriate, for research data and computational models relevant to the relevant key technology field, consistent with applicable privacy and intellectual property laws;

(F) convene national workshops for researchers and other stakeholders in that technology area;

(G) establish traineeship programs for graduate students who pursue research related to the technology leading to a masters or doctorate degree by providing funding and other assistance, and by providing graduate students opportunities for research experiences in government or industry related to the students' studies in that technology area;

(H) engage in outreach and engagement to broaden participation in technology research and education; and

(I) support such other activities that the Director determines appropriate.

(3) CONSIDERATIONS.—In making awards under this section, the Director may consider the extent to which the activities proposed—

(A) have the potential to create an innovation ecosystem, or enhance existing ecosystems, to translate Technology Research Institute research into applications and products, as appropriate to the topic of each Institute;

(B) support transdisciplinary research and development across multiple institutions of higher education and organizations;

(C) support transdisciplinary education activities, including curriculum development, research experiences, and faculty professional development across undergraduate, graduate, and professional academic programs;

(D) involve partnerships with multiple types of institutions, including emerging research institutions, HBCUs, and minority serving institutions, and with other Federal agencies, Federal laboratories, industry, state, local, and Tribal governments, labor organizations, civil society organizations, and other entities that may use or be affected by the technology; and

(E) include a component that addresses the ethical, societal, safety, and security implications relevant to the application of the technology.

(4) DURATION.—

(A) INITIAL PERIOD.—An award under this section shall be for an initial period of 5 years.

(B) RENEWAL.—An established Technology Institute may apply for, and the Director may

grant, extended funding for periods of 5 years on a merit-reviewed basis.

(5) APPLICATION.—An institution of higher education or consortia thereof seeking financial assistance under this section shall submit to the Director an application at such time, in such manner, and containing such information as the Director may require.

(6) COMPETITIVE, MERIT-REVIEW.—In making awards under the section, the Director shall—

(A) use a competitive, merit review process that includes peer review by a diverse group of individuals with relevant expertise from both the private and public sectors; and

(B) ensure the focus areas of the Institute do not substantially and unnecessarily duplicate the efforts of any other Technology Research Institute or any other similar effort at another Federal agency.

(7) COLLABORATION.—In making awards under this section, the Director may collaborate with Federal departments and agencies whose missions contribute to or are affected by the technology focus area of the institute.

(i) ENTREPRENEURIAL FELLOWSHIPS.—

(1) IN GENERAL.—The Director shall award fellowships to Ph.D.-trained scientists and engineers to help develop leaders capable of maturing promising ideas and technologies from lab to market and forge connections between academic research and government, industry, and finance.

(2) APPLICATIONS.—An applicant for a fellowship under this subsection shall submit to the Director an application at such time, in such manner, and containing such information as the Director may require. At a minimum, the Director shall require that applicants

(A) have completed a doctoral degree in a STEM field no more than 5 years prior to the data of the application; and

(B) have included in the application a letter of support from the intended host institution that describes how the fellow will be embedded in that institution's research environment.

(3) OUTREACH.—The Director shall conduct program outreach to recruit fellowship applicants—

(A) from diverse research institutions;

(B) from all regions of the country; and

(C) from groups historically underrepresented in STEM fields;

(4) The Director may enter into an agreement with a third-party entity to administer the fellowships, subject to the provisions of this subsection.

(5) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Director $100,000,000 for fiscal years 2022 through 2026, to carry out the activities outlined in this subsection.

(j) LOW-INCOME SCHOLARSHIP PROGRAM.—

(1) IN GENERAL.—The Director of the National Science Foundation (referred to in this section as the "Director") shall award scholarships to low-income individuals to enable such individuals to pursue associate, undergraduate, or graduate level degrees in mathematics, engineering, or computer science.

(2) ELIGIBILITY.—

(A) IN GENERAL.—To be eligible to receive a scholarship under this section, an individual—

(i) must be a citizen of the United States, a national of the United States (as defined in section 1101(a) of title 8), an alien admitted as a refugee under section 1157 of title 8, or an alien lawfully admitted to the United States for permanent residence;

(ii) shall prepare and submit to the Director an application at such time, in such manner, and containing such information as the Director may require; and

(iii) shall certify to the Director that the individual intends to use amounts received under the scholarship to enroll or continue enrollment at an institution of higher education (as defined in section 1001(a) of title 20) in order to pursue an associate, undergraduate, or graduate level degree in mathematics, engineering, computer science, or other technology and science programs designated by the Director.

(B) ABILITY.—Awards of scholarships under this section shall be made by the Director solely on the basis of the ability of the applicant, except that in any case in which 2 or more applicants for scholarships are deemed by the Director to be possessed of substantially equal ability, and there are not sufficient scholarships available to grant one to each of such applicants, the available scholarship or scholarships shall be awarded to the applicants in a manner that will

tend to result in a geographically wide distribution throughout the United States of recipients' places of permanent residence.

(3) SCHOLARSHIP AMOUNT AND RENEWAL.—The amount of a scholarship awarded under this section shall be determined by the Director. The Director may renew scholarships for up to 5 years.

(4) AUTHORIZATION.—Of amounts authorized for the Directorate for Science and Engineering Solutions, $100,000,000 shall be authorized for this program.

(k) TRANSFER OF FUNDS.—

(1) IN GENERAL.—Funds made available to carry out this section shall be available for transfer to other offices, directorates, or divisions within the Foundation for such use as is consistent with the purposes for which such funds are provided.

(2) PROHIBITION ON TRANSFER FROM OTHER OFFICES.—No funds shall be available for transfer to the Directorate established under this section from other offices, directorates, or divisions within the Foundation.

(l) AUTHORITIES.—In addition to existing authorities available to the Foundation, the Director may exercise the

following authorities in carrying out the activities under this section:

(1) AWARDS.—In carrying out this section, the Director may provide awards in the form of grants, contracts, cooperative agreements, cash prizes, and other transactions.

(2) APPOINTMENTS.—The Director shall have the authority to make appointments of scientific, engineering, and professional personnel for carrying out research and development functions which require the services of specially qualified personnel relating to the focus areas identified under subsection (g) and such other areas of national research priorities as the Director may determine.

(m) ETHICAL, LEGAL, AND SOCIETAL CONSIDERATIONS.—The Director shall establish policies regarding engagement with experts in the social dimensions of science and technology and set up formal avenues for public input, as appropriate, to ensure that ethical, legal, and societal considerations are explicitly integrated into the priorities for the Directorate, including the selection of focus areas under subsection (g), the award-making process, and throughout all stages of supported projects.

(n) REPORTS AND ROADMAPS.—

(1) ANNUAL REPORT.—The Director shall provide to the relevant authorizing and appropriations committees of Congress an annual report describing projects supported by the Directorate during the previous year.

(2) ROADMAP.—Not later than 1 year after the date of enactment of this Act, the Director shall provide to the relevant authorizing and appropriations committees of Congress a roadmap describing the strategic vision that the Directorate will use to guide investment decisions over the following 3 years.

(o) EVALUATION.—

(1) IN GENERAL.—After the Directorate has been in operation for 6 years, the National Science Board shall evaluate how well the Directorate is achieving the purposes identified in subsection (b), including an assessment of the impact of Directorate activities on the Foundation's primary science mission.

(2) INCLUSIONS.—The evaluation shall include—

(A) a recommendation on whether the Directorate should be continued or terminated; and

(B) a description of lessons learned from operation of the Directorate.

(3) AVAILABILITY.—On completion of the evaluation, the evaluation shall be made available to Congress and the public.

(p) LIMITATION.—No amounts may be appropriated for the Directorate for each of fiscal years 2022, 2023, 2024, 2025, or 2026 unless—

(1) a specific appropriation is made for the Directorate; and

(2) the amount appropriated for the activities of the Foundation, other than the activities authorized under this section, for each such fiscal year exceeds the amount appropriated for the Foundation for fiscal year 2021, as adjusted for inflation in accordance with the Consumer Price Index published by the Bureau of Labor Statistics of the Department of Labor.

SEC. 10. ADMINISTRATIVE AMENDMENTS.

(a) SUPPORTING VETERANS IN STEM CAREERS.—Section 3(c) of the Supporting Veterans in STEM Careers Act is amended by striking "annual" and inserting "biennial".

(b) SUNSHINE ACT COMPLIANCE.—Section 15 of the National Science Foundation Authorization Act of 2002 is amended—

(1) so that paragraph (3) reads as follows:

"(3) COMPLIANCE REVIEW.—The Inspector General of the Foundation shall conduct a review of the

compliance by the Board with the requirements described in paragraph (2) as necessary based on a triennial risk assessment. Any review deemed necessary shall examine the proposed and actual content of closed meetings and determine whether the closure of the meetings was consistent with section 552b of title 5, United States Code.''; and

(2) by striking paragraphs (4) and (5) and inserting the following:

''(4) MATERIALS RELATING TO CLOSED PORTIONS OF MEETING.—To facilitate the risk assessment required under paragraph (3) of this subsection, and any subsequent review conducted by the Inspector General, the Office of the National Science Board shall maintain the General Counsel's certificate, the presiding officer's statement, and a transcript or recording of any closed meeting, for at least 3 years after such meeting.''.

(c) SCIENCE AND ENGINEERING INDICATORS REPORT SUBMISSION.—Section 4(j)(1) of the National Science Foundation Act of 1950 (42 U.S.C. 1863(j)(1)) is amended by striking ''January 15'' and inserting ''March 15''.

SEC. 11. PLANNING AND CAPACITY BUILDING GRANTS.

Section 602 of the American Innovation and Competitiveness Act (42 U.S.C. 1862s–9) is amended—

(1) by redesignating subsection (e) as subsection (f); and

(2) by inserting after subsection (d), the following:

"(e) PLANNING AND CAPACITY BUILDING GRANTS.—

"(1) IN GENERAL.—Under the program established in section 508 of the America COMPETES Reauthorization Act of 2010 (42 U.S.C. 1862p–2) and the activities authorized under this section, the Director shall award grants to eligible entities for planning and capacity building at institutions of higher education.

"(2) ELIGIBLE ENTITY DEFINED.—In this subsection, the term 'eligible entity' means an institution of higher education (or a consortium of such institutions) that, according to the data published by the National Center for Science and Engineering Statistics, is not, on average, among the top 100 institutions in Federal R&D expenditures during the 3 year period prior to the year of the award.

"(3) USE OF FUNDS.—In addition to activities listed under subsection (c), an eligible entity receiving a grant under this subsection may use funds to—

"(A) ensure the availability of staff, including technology transfer professionals, entre-

preneurs in residence, and other mentors as required to accomplish the purpose of this subsection;

"(B) revise institution policies, including policies related to intellectual property and faculty entrepreneurship, and taking other necessary steps to implement relevant best practices for academic technology transfer;

"(C) develop new local and regional partnerships among institutions of higher education and between institutions of higher education and private sector entities and other relevant organizations with the purpose of building networks, expertise, and other capacity to identify promising research that may have potential market value and enable researchers to pursue further development and transfer of their ideas into possible commercial or other use;

"(D) develop seminars, courses, and other educational opportunities for students, post-doctoral researchers, faculty, and other relevant staff at institutions of higher education to increase awareness and understanding of entrepreneurship, patenting, business planning, and other areas relevant to technology transfer, and con-

nect students and researchers to relevant resources, including mentors in the private sector; and

"(E) create and fund competitions to allow entrepreneurial students and faculty to illustrate the commercialization potential of their ideas.

"(4) MINIMUM DURATION AND SIZE OF AWARD.—Grants awarded under this subsection shall be at least 3 years in duration and $500,000 in total amount.

"(5) APPLICATION.—An eligible entity seeking funding under this subsection shall submit an application to the Director of the Foundation at such time, in such manner, and containing such information and assurances as such Director may require. The application shall include, at a minimum, a description of how the eligible entity submitting an application plans to sustain the proposed activities beyond the duration of the grant.

"(6) AUTHORIZATION OF APPROPRIATIONS.—From within funds authorized under section 9, there are authorized to carry out the activities under this subsection $40 million for each of fiscal years 2022 through 2026.".

Union Calendar No. 51

117TH CONGRESS
1ST SESSION

H. R. 2225

[Report No. 117–73]

A BILL

To authorize appropriations for fiscal years 2022, 2023, 2024, 2025, and 2026 for the National Science Foundation, and for other purposes.

JUNE 28, 2021

Reported with an amendment, committed to the Committee of the Whole House on the State of the Union, and ordered to be printed