

**Calendar No. 198**

117TH CONGRESS }  
*2d Session* }

SENATE

{ REPORT  
117-108

ADVANCED TECHNOLOGICAL  
MANUFACTURING ACT

---

R E P O R T

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND  
TRANSPORTATION

ON

S. 735



MAY 17, 2022.—Ordered to be printed

---

U.S. GOVERNMENT PUBLISHING OFFICE

29-010

WASHINGTON : 2022

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

MARIA CANTWELL, Washington, *Chair*

AMY KLOBUCHAR, Minnesota	ROGER WICKER, Mississippi
RICHARD BLUMENTHAL, Connecticut	JOHN THUNE, South Dakota
BRIAN SCHATZ, Hawaii	ROY BLUNT, Missouri
EDWARD MARKEY, Massachusetts	TED CRUZ, Texas
GARY PETERS, Michigan	DEB FISCHER, Nebraska
TAMMY BALDWIN, Wisconsin	JERRY MORAN, Kansas
TAMMY DUCKWORTH, Illinois	DAN SULLIVAN, Alaska
JON TESTER, Montana	MARSHA BLACKBURN, Tennessee
KYRSTEN SINEMA, Arizona	TODD YOUNG, Indiana
JACKY ROSEN, Nevada	MIKE LEE, Utah
BEN RAY LUJAN, New Mexico	RON JOHNSON, Wisconsin
JOHN HICKENLOOPER, Colorado	SHELLEY MOORE CAPITO, West Virginia
RAPHAEL WARNOCK, Georgia	RICK SCOTT, Florida
	CYNTHIA LUMMIS, Wyoming

LILA HELMS, *Staff Director*

JOHN KEAST, *Minority Staff Director*

## Calendar No. 198

117TH CONGRESS }  
2d Session }

SENATE

{ REPORT  
{ 117-108

---

---

### ADVANCED TECHNOLOGICAL MANUFACTURING ACT

\_\_\_\_\_  
MAY 17, 2022.—Ordered to be printed  
\_\_\_\_\_

Ms. CANTWELL, from the Committee on Commerce, Science, and  
Transportation, submitted the following

### R E P O R T

[To accompany S. 735]

[Including cost estimate of the Congressional Budget Office]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 735) to amend the Scientific and Advanced-Technology Act of 1992 to further support advanced technological manufacturing, and for other purposes, having considered the same, reports favorably thereon with an amendment (in the nature of a substitute) and recommends that the bill (as amended) do pass.

#### PURPOSE OF THE BILL

S. 735 would modernize the Scientific and Advanced-Technology Act of 1992 to further support advanced technological manufacturing through improved technician education in science, technology, engineering, and mathematics (STEM) fields. This bill would also direct the Director of the National Science Foundation (NSF) to establish a program to expand the number of institutions of higher education that are successfully able to compete for NSF grants.

#### BACKGROUND AND NEEDS

##### SCIENTIFIC COMPETITIVENESS

Science and technology (S&T) impacts a wide range of issues confronting the Nation. Public and private research and development spur scientific and technological advancement. Such advances can drive economic growth, help address national priorities, improve

health, and bolster quality of life. Prior U.S. investment in research and innovation has enabled the United States to become the strongest economy in the world. The Federal Government supports scientific and technological advancement directly by funding and performing research and development and indirectly by creating and maintaining policies that encourage private sector efforts.

#### TECHNICAL EDUCATION AT COMMUNITY COLLEGES

As U.S. advanced technology industries continue to grow, there will be an increasing demand for a qualified STEM technical workforce. While development of the future STEM-literate American workforce will require many educational pathways, community colleges are a key contributor to meeting technical workforce needs.<sup>1</sup> Annually, U.S. community colleges support roughly 11.8 million students, or 41 percent of undergraduates as of 2019.<sup>2</sup> These institutions provide not only a traditional education curriculum, but also hands-on training to develop the technical skills that students will need in the workplace. As highlighted by the National Academy of Sciences, Engineering, and Medicine, community colleges are well positioned within local communities; have relationships with organizations, governments, and businesses; and serve as a model for educating a highly prepared technical workforce.<sup>3</sup> These partnerships allow community colleges to respond quickly to community needs through curriculum development and retraining of displaced workers for skills needed by local businesses. Community colleges also serve as an affordable and flexible option, enabling them to support the most diverse student body within the U.S. higher education system.<sup>4</sup>

#### PARTNERSHIPS WITH INDUSTRY

Building a strong STEM technical workforce requires cooperation and coordination between Federal and non-Federal entities, to develop the curriculum and programs that provide the technical skills needed to enter the workforce.<sup>5</sup> Strategic partnerships between educational institutions and employers will help ensure that educational preparation is aligned with workforce needs. The promotion of these community-connected STEM ecosystems can help respond more quickly and efficiently to rapidly changing career readiness standards and expectations, while ensuring students that their degree or certification will have considerable economic value.<sup>6</sup>

<sup>1</sup>National Academies of Sciences, Engineering, and Medicine, *Community Colleges in the Evolving STEM Education Landscape: Summary of a Summit*, 2012 (<https://www.nap.edu/catalog/13399/community-colleges-in-the-evolving-stem-education-landscape-summary-of>).

<sup>2</sup>American Association of Community Colleges, “Fast Facts 2021,” March 2021 (<https://www.aacc.nche.edu/research-trends/fast-facts/>).

<sup>3</sup>National Academies of Sciences, Engineering, and Medicine, *Community Colleges in the Evolving STEM Education Landscape: Summary of a Summit*, 2012 (<https://www.nap.edu/catalog/13399/community-colleges-in-the-evolving-stem-education-landscape-summary-of>).

<sup>4</sup>Ibid.

<sup>5</sup>Executive Office of the President [Donald Trump], National Science & Technology Council, Committee on STEM Education, *Charting a Course for Success: America’s Strategy for STEM Education*, December 2018, pp. 13–14 (<https://www.energy.gov/sites/default/files/2019/05/f62/STEM-Education-Strategic-Plan-2018.pdf>).

<sup>6</sup>Ibid.

## ADVANCED TECHNOLOGICAL EDUCATION PROGRAM

The NSF's Advanced Technological Education (ATE) program funds projects that improve technician education, including through partnerships between accredited associate-degree-granting colleges, government, other institutions of higher education, and industry. These programs aim to improve the education of science and engineering technicians through curriculum development, professional development of academic faculty, and other activities.<sup>7</sup> To receive funding, ATE principal investigators (typically academic institution faculty) submit proposals that advance technical education and culminate in new curricula or programs educators can use to respond to evolving employer needs. For example, the Kenai Peninsula College (Alaska) and Washington State University teamed up to create low-cost miniature industrial equipment and an associated curriculum for 2-year colleges to improve instruction of bio and chemical technology process technicians.<sup>8</sup> Mississippi Gulf Coast Community College received an ATE grant to develop a certificate program for highly skilled technicians needed for smart homes and connected cities.<sup>9</sup> Through this program, investigators will not only modify and design new curricula for connected technology solutions, but also provide professional development opportunities for faculty and help recruit and retain underrepresented groups in STEM, such as women and minorities. Following the completion of each project, ATE grantees share their results and make them available for others to use, expanding and extending the benefit of their work as well as preventing duplicative efforts.<sup>10</sup>

Over the last 25 years, the ATE program has funded a wide array of centers and projects in areas including advanced manufacturing technologies and biotechnology to meet the evolving needs of the industries of the future.<sup>11</sup> The ATE program has also helped provide a career pathway for populations that have been historically underrepresented in STEM fields and added diversity to the technical workforce.<sup>12</sup> With existing shortages in scientifically and technically educated workers and continued expansion of advanced technology industries, the ATE program helps to ensure a better prepared U.S. workforce.

## HIGHER EDUCATION INSTITUTION GRANT COMPETITIVENESS

Just under one-third (approximately 27 percent) of Federal research funding per capita in 2017 went to two States—Maryland

<sup>7</sup>National Science Foundation, "Advanced Technological Education (ATE)" ([https://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=5464](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5464)).

<sup>8</sup>National Science Foundation, *Advanced Technological Education IMPACTS 2018–2019: Twenty-Five Years of Advancing Technician Education* (<https://atecentral.net/downloads/12339/ATE-Impacts-2018-2019.pdf>).

<sup>9</sup>National Science Foundation, "Training Technicians for Connected Technologies in Businesses and Smart Homes" ([https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=2000073&HistoricalAwards=false](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2000073&HistoricalAwards=false)).

<sup>10</sup>National Science Foundation, *Advanced Technological Education IMPACTS 2018–2019: Twenty-Five Years of Advancing Technician Education* (<https://atecentral.net/downloads/12339/ATE-Impacts-2018-2019.pdf>).

<sup>11</sup>Ibid.

<sup>12</sup>Ibid.

and California.<sup>13</sup> More than half of Federal research funding is received by just nine States, while the bottom 10 States combined had only 4.4 percent of public research spending per capita.<sup>14</sup> This funding disparity is also prevalent amongst institutions of higher education.

This funding disparity between institutions of higher education is, in part, driven by the disadvantages that smaller universities face when competing for grants with major institutions. Large universities have staff members who both help researchers navigate the grant application process and assist with technical grant writing.<sup>15</sup> Additionally, because smaller universities generally prioritize teaching, lack of grant writing administrative support causes even greater challenges, with professors struggling to maintain both excellence in the classroom and the production of competitive grant applications.<sup>16</sup>

#### SUMMARY OF PROVISIONS

If enacted, S. 735, the Advanced Technological Manufacturing Act, would do the following:

- Reauthorize and modernize the Scientific and Advanced-Technology Act of 1992, showing continued support of the ATE program's role in supplying the United States with a scientifically and technically educated workforce.
- Direct the NSF Director to establish a series of pilot programs to expand the number of institutions of higher education that can successfully compete for NSF grants.

#### LEGISLATIVE HISTORY

S. 735, the Advanced Technological Manufacturing Act, was introduced on March 11, 2021, by Senator Wicker (for himself and Senator Cantwell) and was referred to the Committee on Commerce, Science, and Transportation of the Senate. Senators Rosen, Collins, Peters, and Blackburn are additional cosponsors. On April 28, 2021, the Committee met in open Executive Session and, by voice vote, ordered S. 735 reported favorably with amendments.

H.R. 3828, the Advanced Technological Manufacturing Act, was introduced on June 11, 2021, by Representative Kildee (for himself and Representative Meijer) and was referred to the Committee on Science, Space, and Technology in the House of Representatives.

In the 115th Congress, S. 3074, the Advanced Technological Manufacturing Act, was introduced on May 13, 2020, by Senator Wicker and favorably reported May 20, 2020, by the Committee on Commerce, Science, and Transportation of the Senate. A related bill, H.R. 5685, the Securing American Leadership in Science and Technology Act of 2020, was introduced on January 28, 2020, by Representative Frank Lucas (for himself and Representatives Weber, Babin, Marshall, Baird, Gonzalez, Waltz, Olson, Murphy,

<sup>13</sup> Laurie A. Harris, *Established Program to Stimulate Competitive Research (EPSCoR): Background and Selected Issues*, CRS Report No. R44689, Congressional Research Service, January 12, 2017 (<https://fas.org/sgp/crs/misc/R44689.pdf>).

<sup>14</sup> *Ibid.*

<sup>15</sup> Karen M. Markin, "Big Research Small College," *The Chronicle of Higher Education*, February 19, 2008 (<https://www.chronicle.com/article/Big-Research-Small-College/45957>).

<sup>16</sup> Jacqueline Ruttimann Oberst, "Big Thinking at Small Universities," *Science*, September 10, 2010 (<https://www.sciencemag.org/features/2010/09/big-thinking-small-universities>).

Balderson, Posey, and Rooney) and was referred to the Committee on Science, Space, and Technology (in addition to the Committees on the Judiciary, Small Business, Natural Resources, and Foreign Affairs) in the House of Representatives. Section 602 of H.R. 5685 would have reauthorized the ATE Program. Representatives Riggleman and Jackson Lee were additional cosponsors.

#### ESTIMATED COSTS

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

U.S. CONGRESS,  
CONGRESSIONAL BUDGET OFFICE,  
*Washington, DC, May 18, 2021.*

Hon. MARIA CANTWELL,  
*Chair, Committee on Commerce, Science, and Transportation,  
U.S. Senate, Washington, DC.*

DEAR MADAM CHAIR: The Congressional Budget Office has prepared the enclosed cost estimate for S. 735, a bill to amend the Scientific and Advanced-Technology Act of 1992 to further support advanced technological manufacturing, and for other purposes.

If you wish further details on this estimate, we will be pleased to provide them. The CBO staff contact is Janani Shankaran.

Sincerely,

PHILLIP L. SWAGEL,  
*Director.*

Enclosure.

<b>S. 735, a bill to amend the Scientific and Advanced-Technology Act of 1992 to further support advanced technological manufacturing, and for other purposes</b>			
As ordered reported by the Senate Committee on Commerce, Science, and Transportation on April 28, 2021			
By Fiscal Year, Millions of Dollars	2021	2021-2026	2021-2031
Direct Spending (Outlays)	0	0	0
Revenues	0	0	0
Increase or Decrease (-) in the Deficit	0	0	0
Spending Subject to Appropriation (Outlays)	*	480	not estimated
Statutory pay-as-you-go procedures apply?	No	<b>Mandate Effects</b>	
Increases on-budget deficits in any of the four consecutive 10-year periods beginning in 2032?	No	Contains intergovernmental mandate?	No
		Contains private-sector mandate?	No
* = between zero and \$500,000.			

S. 735 would authorize the annual appropriation of \$150 million over the 2022–2027 period for the National Science Foundation’s (NSF’s) Advanced Technological Education (ATE) program, which provides grants to educators and students for technical science and

engineering education. The bill also would direct the agency to conduct pilot programs to increase the number of institutions of higher education that can compete for NSF grants.

For this estimate, CBO assumes that the legislation will be enacted in fiscal year 2021.

Based on historical spending patterns for the ATE program, CBO estimates that providing those grants would cost \$478 million over the 2021–2026 period and roughly \$400 million after 2026, assuming appropriation of the authorized amounts. In 2021, the NSF allocated \$75 million for the ATE program.

Using information from the NSF, and based on the costs of similar activities, CBO estimates that conducting the pilot programs would require two additional employees at an average annual cost of \$175,000 each over the 2021–2026 period. In total, implementing that provision would cost \$2 million. Such spending would be subject to the availability of appropriated funds.

The costs of the legislation, detailed in Table 1, fall within budget function 250 (general science, space, and technology).

TABLE 1.—ESTIMATED INCREASES IN SPENDING SUBJECT TO APPROPRIATION UNDER S. 735

	By fiscal year, millions of dollars—						2021–2026
	2021	2022	2023	2024	2025	2026	
<b>Advanced Technological Education:</b>							
Authorization .....	0	150	150	150	150	150	750
Estimated Outlays .....	0	18	71	110	132	147	478
<b>Pilot Programs:</b>							
Estimated Authorization .....	*	*	*	*	*	*	2
Estimated Outlays .....	*	*	*	*	*	*	2
<b>Total Changes:</b>							
Estimated Authorization .....	*	150	150	150	150	150	752
Estimated Outlays .....	*	18	71	110	132	147	480

CBO estimates that outlays for the Advanced Technological Education program after 2026 would total about \$400 million, assuming appropriation of the authorized amounts.

Components may not sum to totals because of rounding; \* = between zero and \$500,000.

The CBO staff contact for this estimate is Janani Shankaran. The estimate was reviewed by H. Samuel Papenfuss, Deputy Director of Budget Analysis.

#### REGULATORY IMPACT STATEMENT

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation, as reported:

##### NUMBER OF PERSONS COVERED

S. 735, as reported, would not impose any new significant regulatory requirements, and, therefore, would not subject any individuals or businesses to new significant regulations.

##### ECONOMIC IMPACT

S. 735, as reported, is not expected to have any significant adverse impacts on the Nation's economy. This legislation would likely assist post-pandemic economic recovery by bringing research and development, workforce education, and industry into new partnerships that foster economic development and help the workforce



adapt to and contribute to the growth of advanced technological sectors.

#### PRIVACY

S. 735, as reported, would not have any adverse impact on the privacy of individuals.

#### PAPERWORK

S. 735, as reported, would not impose a substantial paperwork burden on individuals or businesses.

#### CONGRESSIONALLY DIRECTED SPENDING

In compliance with paragraph 4(b) of rule XLIV of the Standing Rules of the Senate, the Committee provides that no provisions contained in the bill, as reported, meet the definition of congressionally directed spending items under the rule.

#### SECTION-BY-SECTION ANALYSIS

##### *Section 1. Harnessing our Nation's research potential.*

This section would require the NSF Director to conduct multiple pilot programs within NSF to expand the number of higher education institutions able to successfully compete for NSF grants. Pilot programs could provide mentorship, grant writing technical assistance, targeted outreach (including to minority-serving institutions, historically Black colleges and universities, Hispanic-serving institutions, and Tribal colleges), support for institutions without an experienced grant management office, and increases in the number of grant reviewers from institutions that have not traditionally received NSF funds. The pilots could also include increasing the grant term and funding, for a period of 3 years or less, to a principal investigator that is a first-time grant awardee, when paired with regular mentoring on the administrative aspects of grant management. Pilot programs should aim to reduce administrative burdens. Five years after enactment, the NSF would be required to review the results of each pilot program and develop agency-wide best practices for implementation across the NSF.

##### *Section 2. Advanced scientific and technical manufacturing.*

This section would modernize the Scientific and Advanced-Technology Act of 1992. It would utilize the term “STEM” throughout the Act to better reflect current education terminology and standards. It would redefine the term “advanced-technology” to better reflect 21st century advanced technological fields, such as advanced manufacturing and engineering, information, cybersecurity, geospatial, and other emerging technologies and define the term “skilled technical workforce”. It would also remove references to sections of the Higher Education Act that have been eliminated since 1992.

Further modifications would require the NSF Director to place emphasis on the needs of veterans when awarding grants and remove the limitation on the number of Centers of Scientific and Technical Education.

Additionally, this section would make grants available to partnerships that encourage the development of career and educational pathways to meet skilled technical workforce demands. To encourage the interest and aptitude of students in STEM and advanced-technology fields, it would instruct the NSF Director to award grants that promote articulation agreements between associate-degree-granting and bachelor-degree-granting institutions or dual credit courses between community colleges with outstanding STEM programs and secondary schools or elementary schools, as appropriate. Partnerships that receive funding would be required to counsel students, including veterans, on requirements and course offerings at bachelor-degree-granting institutions and to provide research experiences through summer programs and industry internships.

In awarding grants to develop associate degree programs, this section would further require the Director to prioritize applications that leverage best practices for distance learning or utilize simulated work environments. Finally, it would authorize appropriations of \$150 million for each of fiscal years 2022 through 2027 and expand the list of activities that can be federally funded.

#### CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new material is printed in italic, existing law in which no change is proposed is shown in roman):

## SCIENTIFIC AND ADVANCED- TECHNOLOGY ACT OF 1992

\* \* \* \* \*

[42 U.S.C. 1862h-j]

### SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS.—The Congress finds that—

(1) the position of the United States in the world economy faces great challenges from highly trained foreign competition;

(2) the workforce of the United States must be better prepared for the technologically advanced, competitive, global economy;

(3) the improvement of our work force's productivity and our international economic position depend upon the strengthening of our educational efforts in [science, mathematics, and technology] *science, technology, engineering, and mathematics or STEM*, especially at the associate-degree level;

(4) shortages of scientifically and technically *educated and* trained workers in a wide variety of fields will best be addressed by collaboration among the Nation's associate-degree-granting colleges and private industry to produce skilled, advanced technicians; and

(5) the National Science Foundation's traditional role in developing model curricula, disseminating instructional materials, enhancing faculty development, and stimulating partner-

ships between educational institutions and industry, makes an enlarged role for the Foundation in [scientific and technical education and training] *STEM education and training* particularly appropriate.

(b) PURPOSES.—It is the purpose of this Act to—

(1) improve science and technical education at associate-degree-granting colleges;

(2) improve secondary school and postsecondary curricula in [mathematics and science] *STEM fields*;

(3) improve the educational opportunities of postsecondary students by creating comprehensive articulation agreements and planning between 2-year and 4-year institutions; and

(4) promote outreach to secondary schools to improve [mathematics and science instruction] *STEM instruction*.

**SEC. 3. [SCIENTIFIC AND TECHNICAL EDUCATION] *STEM EDUCATION*.**

(a) NATIONAL ADVANCED [SCIENTIFIC AND TECHNICAL EDUCATION] *STEM EDUCATION* PROGRAM.—The Director of the National Science Foundation (hereafter in this Act referred to as the “Director”) shall award grants to associate-degree-granting colleges, and consortia thereof, to assist them in providing education in advanced-technology fields *and education to prepare the skilled technical workforce to meet workforce demands*, and to improve the quality of their [core education courses in science and mathematics] *core education courses in STEM fields*. The grant program shall place emphasis on the needs of students who have been in the workforce (including *veterans and individuals engaged in work in the home*) *and on building a pathway from secondary schools, to associate-degree-granting institutions, to careers that require technical training*, and shall be designed to strengthen and expand the scientific and technical education and training capabilities of associate-degree-granting colleges through such methods as—

(1) the development *and study* of model instructional programs in advanced-technology fields and in [core science and mathematics courses] *core STEM courses*;

(2) the professional development of faculty and instructors, both full- and part-time, who provide instruction in [science, mathematics, and advanced-technology fields] *STEM and advanced-technology fields*;

(3) the establishment of innovative partnership arrangements that—

(A) involve associate-degree-granting colleges and other appropriate public and private sector entities *to support the advanced-technology industries that drive the competitiveness of the United States in the global economy*;

(B) provide for private sector donations, faculty opportunities to have short-term assignments with industry, sharing of program costs, equipment loans, and the cooperative use of laboratories, plants, and other facilities, and provision for state-of-the-art work experience opportunities for students enrolled in such programs; and

(C) encourage participation of individuals identified in section 33 or 34 of the Science and Engineering Equal Opportunities Act (42 U.S.C. 1885a or 1885b);

(4) the acquisition of state-of-the-art instrumentation essential to programs designed to prepare and upgrade students in

【scientific and advanced-technology fields】 *STEM and advanced-technology fields*; and

(5) the development and dissemination of instructional materials in support of improving the 【advanced scientific and technical education】 *advanced STEM and advanced-technology* and training capabilities of associate-degree-granting colleges, including programs for students who are not pursuing a science degree.

(b) 【NATIONAL CENTERS OF SCIENTIFIC AND TECHNICAL EDUCATION】 *CENTERS OF SCIENTIFIC AND TECHNICAL EDUCATION*.—The Director shall award grants for the establishment of centers of excellence, 【not to exceed 12 in number】 *in advanced-technology fields*, among associate-degree-granting colleges. Centers shall meet one or both of the following criteria:

(1) Exceptional instructional programs in advanced-technology fields.

(2) Excellence in undergraduate 【education in mathematics and science】 *STEM education*.

The centers shall serve as national and regional clearinghouses and models for the benefit of both colleges and secondary schools, and shall provide seminars and programs to disseminate model curricula and model teaching methods and instructional materials to other associate-degree-granting colleges 【in the geographic region served by the center】.

(c) ARTICULATION PARTNERSHIPS.—

(1) PARTNERSHIP GRANTS.—(A) The Director shall make grants to eligible partnerships 【to encourage students to pursue bachelor degrees in mathematics, science, engineering, or technology, and to assist students pursuing bachelor degrees in mathematics, science, engineering, or technology to make the transition from associate-degree-granting colleges to bachelor-degree-granting institutions, through such means as—】 *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—*

(i) examining curricula 【to ensure】 *to develop articulation agreements that ensure that academic credit earned at the associate-degree-granting college is transferable to bachelor-degree-granting institutions;*

(ii) informing teachers from the associate-degree-granting college on the specific requirements of 【courses at the bachelor-degree-granting institution】 *the career and educational pathways supported by the articulation agreements;* and

(iii) providing summer educational programs for students from the associate-degree-granting college to encourage such students' subsequent matriculation at bachelor-degree-granting institutions.

(B) Each eligible partnership receiving a grant under this paragraph shall, at a minimum—

(i) counsel students, including students who have been in the workforce (including *veterans and individuals engaged in work in the home*), about the requirements and

course offerings of the bachelor-degree-granting institution;

(ii) conduct workshops and orientation sessions to ensure that students are familiar with programs, including laboratories and financial aid programs, at the bachelor-degree-granting institution;

(iii) provide students with research experiences at [bachelor's-degree-granting institutions] *institutions or work sites* participating in the partnership, including stipend support for students participating in summer programs or *industry internships*; and

(iv) provide faculty mentors for students participating in activities under clause (iii), including summer salary support for faculty mentors.

**[Funds used by eligible partnerships to carry out clauses (i) and (ii) shall be from non-Federal sources. In-cash and in-kind resources used by eligible partnerships to carry out clauses (i) and (ii) shall not be considered to be contributions for purposes of applying subsection (f)(3).]**

**[(C) Any institution participating in a partnership that receives a grant under this paragraph shall be ineligible to receive assistance under part B of title I of the Higher Education Act of 1965 for the duration of the grant received under this paragraph.]**

(2) **OUTREACH GRANTS.**—The Director shall make grants to associate-degree-granting colleges with outstanding [mathematics and science programs] *STEM programs* to strengthen relationships with secondary schools and, as appropriate, *elementary schools*, in the community served by the college by improving [mathematics and science education] *STEM education* and encouraging the interest and aptitude of [secondary school students] *students at these schools* for careers in [science and advanced-technology fields] *STEM and advanced-technology fields* through such means as developing [agreements with local educational agencies] *articulation agreements or dual credit courses with local secondary schools, or other means as the Director determines appropriate*, to enable students to satisfy entrance and course requirements at the associate-degree-granting college.

(3) **MENTOR TRAINING GRANTS.**—The Director [shall—]

**[(A) establish a] shall establish a** program to encourage and make grants available to institutions of higher education that award associate degrees to recruit and train individuals from [the fields of science, technology, engineering, and mathematics] *STEM fields* to mentor students who are described in section 33 or 34 of the Science and Engineering Equal Opportunities Act (42 U.S.C. 1885a or 1885b) in order to assist those students in identifying, qualifying for, and entering higher paying technical jobs in those fields[; and], *including jobs at Federal and academic laboratories*.

**[(B) make grants available to associate-degree-granting colleges to carry out the program identified in subsection (A).]**

(d) **GRANTS FOR ASSOCIATE DEGREE PROGRAMS IN STEM FIELDS.**—

(1) IN-DEMAND WORKFORCE GRANTS.—The Director shall award grants to junior or community colleges to develop or improve associate degree or certificate programs in STEM fields, with respect to the region in which the respective college is located, and an in-demand industry sector or occupation.

(2) APPLICATIONS.—In considering applications for grants under paragraph (1), the Director shall prioritize—

(A) applications that consist of a partnership between the applying junior or community college and individual employers or an employer consortia, or industry or sector partnerships, and may include a university or other organization with demonstrated expertise in academic program development;

(B) applications that demonstrate current and future workforce demand in occupations directly related to the proposed associate degree or certificate program;

(C) applications that include commitments by the partnering employers or employer consortia, or industry or sector partnerships, to offer apprenticeships, internships, or other applied learning opportunities to students enrolled in the proposed associate degree or certificate program;

(D) applications that include outreach plans and goals for recruiting and enrolling women and other underrepresented populations in STEM fields in the proposed associate degree or certificate program; **[and]**

(E) applications that describe how the applying junior or community college will support the collection of information and data for purposes of evaluation of the proposed associate degree or certificate program**[.]**; *and*

*(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).*

(e) GRANTS FOR STEM DEGREE APPLIED LEARNING OPPORTUNITIES.—

(1) IN GENERAL.—The Director shall award grants to institutions of higher education partnering with private sector employers or private sector employer consortia, or industry or sector partnerships, that commit to offering apprenticeships, internships, research opportunities, or applied learning experiences to enrolled students in identified STEM baccalaureate degree programs.

(2) PURPOSES.—Awards under this subsection may be used—

(A) to develop curricula and programs for apprenticeship, internships, research opportunities, or applied learning experiences; or

(B) to provide matching funds to incentivize partnership and participation by private sector employers and industry.

(3) APPLICATIONS.—In considering applications for grants under paragraph (1), the Director shall prioritize—

(A) applicants that consist of a partnership between—

(i) the applying institution of higher education; and

(ii) individual employers or an employer consortia, or industry or sector partnerships;

(B) applications that demonstrate current and future workforce demand in occupations directly related to the identified STEM fields;

(C) applications that include outreach plans and goals for recruiting and enrolling women and other underrepresented populations in STEM fields; and

(D) applications that describe how the institution of higher education will support the collection and information of data for purposes of the evaluation of identified STEM degree programs.

(f) GRANTS FOR COMPUTER-BASED AND ONLINE STEM EDUCATION COURSES.—

(1) IN GENERAL.—The Director of the National Science Foundation shall award competitive grants to institutions of higher education or nonprofit organizations to conduct research on student outcomes and determine best practices for STEM education and technical skills education through distance learning or in a simulated work environment.

(2) RESEARCH AREAS.—The research areas eligible for funding under this subsection may include—

(A) post-secondary courses for technical skills development for STEM occupations;

(B) improving high-school level career and technical education in STEM subjects;

(C) encouraging and sustaining interest and achievement levels in STEM subjects among women and other populations historically underrepresented in STEM studies and careers; and

(D) combining computer-based and online STEM education and skills development with traditional mentoring and other mentoring arrangements, apprenticeships, internships, and other applied learning opportunities.

(g) COORDINATION WITH OTHER FEDERAL DEPARTMENTS.—In carrying out this section, the Director shall consult, cooperate, and coordinate, to enhance program effectiveness and to avoid duplication, with the programs and policies of other relevant Federal agencies. **[In carrying out subsection (c), the Director shall coordinate activities with programs receiving assistance under part B of title I of the Higher Education Act of 1965.]**

(h) FUNDING.—

(1) FUNDING.—The Director shall allocate out of amounts made available for the Education and Human Resources Directorate—

(A) up to \$5,000,000 to carry out the activities under subsection (d) for each of fiscal years 2019 through **[2022]** 2026, subject to the availability of appropriations;

(B) up to \$2,500,000 to carry out the activities under subsection (e) for each of fiscal years 2019 through **[2022]** 2026, subject to the availability of appropriations; and

(C) **[up to \$2,500,000]** *not less than \$3,000,000* to carry out the activities under subsection (f) for each of fiscal years 2019 through **[2022]** 2026, subject to the availability of appropriations.

(2) LIMITATION ON FUNDING.—Amounts made available to carry out subsections (d), (e), and (f) shall be derived from amounts appropriated or otherwise made available to the National Science Foundation.

(3) LIMITATION ON FUNDING.—To qualify for a grant under this section, an associate-degree-granting college, or consortium thereof, shall provide assurances adequate to the Director that it will not decrease its level of spending of funds from non-Federal sources on advanced scientific and technical education and training programs.

(i) FUNCTIONS OF THE DIRECTOR.—In carrying out this Act, the Director shall—

(1) award grants on a competitive, merit basis;

(2) ensure an equitable geographic distribution of grant awards;

(3) ensure that an applicant for a grant awarded under subsection (a), (b), or (c)(1) will make an in-cash or in-kind contribution in an amount equal to at least 25 percent of the cost of the program, and for a grant awarded under subsection (c)(2) will make an in-cash or in-kind contribution in an amount at least equal to the amount of the grant award;

(4) establish and maintain a readily accessible inventory of the programs assisted under this Act; and

(5) designate an officer of the National Science Foundation to serve as a liaison with associate-degree-granting institutions for the purpose of enhancing the role of such institutions in the activities of the Foundation.

(j) DEFINITIONS.—As used in this section—

【(1) the term “advanced-technology” includes advanced technical activities such as the modernization, miniaturization, integration, and computerization of electronic, hydraulic, pneumatic, laser, nuclear, chemical, telecommunication, fiber optic, robotic, and other technological applications to enhance productivity improvements in manufacturing, communication, transportation, commercial, and similar economic and national security activities;】

*(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;*

【(2) the term “associate-degree-granting college” means an institution of higher education (as determined under section 101 of the Higher Education Act of 1965) that—

【(A) is a nonprofit institution that offers a 2-year associate-degree program or a 2-year certificate program; or

【(B) is a proprietary institution that offers a 2-year associate-degree program;】

*(2) the term “associate-degree-granting college” means an institution of higher education (as defined in section 102 of the Higher Education Act of 1965 (20 U.S.C. 1002)) that offers a 2-year associate-degree program or 2-year certificate program;*



(3) the term “bachelor-degree-granting institution” means an institution of higher education **[as determined under section 101 of the Higher Education Act of 1965]** *as defined in section 102 of the Higher Education Act of 1965 (20 U.S.C. 1002)* that offers a baccalaureate degree program;

(4) the term “eligible partnership” means one or more associate-degree-granting colleges in partnership with one or more **[separate bachelor-degree-granting institutions]** *other entities*;

(5) the term “in-demand industry sector or occupation” has the meaning given the term in section 3 of the Workforce Innovation and Opportunity Act (29 U.S.C. 3102);

(6) the term “junior or community college” has the meaning given the term in section 312 of the Higher Education Act of 1965 (20 U.S.C. 1058);

**[(7) the term “local educational agency” has the meaning given such term in section 1471(12) of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 2891(12)).]**

**[(8)]** (7) the term “region” means a labor market area, as that term is defined in section 3 of the Workforce Innovation and Opportunity Act (29 U.S.C. 3102); **[and]**

**[(9)]** (8) the terms **[(mathematics, science, engineering, or technology]** *science, technology, engineering, or mathematics*” or “STEM” mean science, technology, engineering, and mathematics, including **[computer science and cybersecurity.]** *computer science and cybersecurity*; and

(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.*

\* \* \* \* \*

#### **SEC. 5. AUTHORIZATION OF APPROPRIATIONS.**

**[(There are authorized to be appropriated, from sums otherwise authorized to be appropriated, to the Director for carrying out this Act—**

**[(1) \$35,000,000 for fiscal year 1992; and**

**[(2) \$35,000,000 for fiscal year 1993.]**

*There are authorized to be appropriated, from sums otherwise authorized to be appropriated, to the Director for carrying out this Act, \$150,000,000 for each of fiscal years 2022 through 2027.*

○