

114TH CONGRESS
2D SESSION

H. R. 5679

To establish a grant program at the National Science Foundation to encourage States and local school districts to develop and implement sustainable engineering education programs in elementary and secondary schools, through public-private partnerships.

IN THE HOUSE OF REPRESENTATIVES

JULY 7, 2016

Mr. RYAN of Ohio (for himself and Mr. REED) introduced the following bill; which was referred to the Committee on Science, Space, and Technology, and in addition to the Committee on Education and the Workforce, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned

A BILL

To establish a grant program at the National Science Foundation to encourage States and local school districts to develop and implement sustainable engineering education programs in elementary and secondary schools, through public-private partnerships.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Pre-College Engineer-
5 ing Education Act”.

1 **SEC. 2. FINDINGS.**

2 The Congress makes the following findings:

3 (1) According to studies by the National Acad-
4 emy of Engineering, there is a widespread interest
5 in improving science, technology, engineering, and
6 mathematics (STEM) education in elementary and
7 secondary schools.

8 (2) STEM education is important in part be-
9 cause it can develop student interest and aptitude in
10 subjects directly relevant to the Nation's capacity for
11 research and innovation. This capacity is largely
12 credited with supporting United States economic
13 health, national security, and quality of life.

14 (3) STEM education contributes to scientific
15 and technological literacy, important attributes for
16 all citizens.

17 (4) Science is the intellectual and practical ac-
18 tivity encompassing the systematic study of the
19 structure and behavior of the physical and natural
20 world through observation and experiment.

21 (5) Engineering is the application of scientific
22 and mathematical principles to innovate, analyze, de-
23 sign, evaluate, and manufacture machines, processes,
24 and systems.

25 (6) The share of engineering education in the
26 Federal STEM education portfolio, according to a

1 survey by the National Science and Technology
2 Council, is only 0.4 percent of the nearly
3 \$3,500,000,000 annual expenditures.

4 (7) Available evidence suggests that pre-college
5 engineering education can stimulate interest and im-
6 prove learning in mathematics and science as well as
7 improve understanding of engineering and tech-
8 nology.

9 (8) Engineering education is a vital component
10 in attaining licensure as a professional engineer that
11 requires rigorous education, training, experience,
12 and continuing education.

13 (9) According to the National Academy of En-
14 gineering there is relatively limited experience with
15 engineering education in elementary and secondary
16 schools.

17 (10) Some States have included engineering in
18 their science or technology and vocational standards,
19 and many school districts provide informal or after-
20 school engineering education.

21 (11) The Next Generation Science Standards
22 developed by a consortium of States, the National
23 Science Teachers Association, the American Associa-
24 tion for the Advancement of Science, the National
25 Research Council, and Achieve has identified content

1 and science and engineering practices that all stu-
2 dents should learn from kindergarten to high school
3 graduation. States and local districts will have the
4 responsibility for providing more detailed guidance
5 to classroom teachers to help students learn the key
6 ideas in the standards.

7 (12) According to the National Academy of En-
8 gineering there is not at present a critical mass of
9 teachers qualified to deliver engineering instruction.

10 (13) It is imperative that teachers have relevant
11 professional training that coordinates concepts in en-
12 gineering with the diverse learning styles of stu-
13 dents.

14 **SEC. 3. DEFINITIONS.**

15 In this Act:

16 (1) DIRECTOR.—The term “Director” means
17 the Director of the National Science Foundation.

18 (2) ELEMENTARY SCHOOL.—The term “elemen-
19 tary school” has the meaning given that term by
20 section 8101 of the Elementary and Secondary Edu-
21 cation Act of 1965 (20 U.S.C. 7801).

22 (3) INSTITUTION OF HIGHER EDUCATION.—The
23 term “institution of higher education” has the
24 meaning given that term by section 101(a) of the
25 Higher Education Act of 1965 (20 U.S.C. 1001(a)).

1 (4) LOCAL EDUCATIONAL AGENCY.—The term
2 “local educational agency” has the meaning given
3 that term by section 8101 of the Elementary and
4 Secondary Education Act of 1965 (20 U.S.C. 7801).

5 (5) SECONDARY SCHOOL.—The term “sec-
6 ondary school” has the meaning given that term by
7 section 8101 of the Elementary and Secondary Edu-
8 cation Act of 1965 (20 U.S.C. 7801).

9 (6) STEM EDUCATION.—The term “STEM
10 education” has the meaning given that term in sec-
11 tion 2 of the STEM Education Act of 2015 (42
12 U.S.C. 6621 note).

13 **SEC. 4. GRANT PROGRAM.**

14 (a) IN GENERAL.—The Director shall establish a
15 grant program to encourage States and local educational
16 agencies to develop and implement sustainable engineering
17 education programs in elementary and secondary schools
18 through public-private partnerships to—

19 (1) conduct research, review, and analyze the
20 effectiveness of existing formal and informal re-
21 search-based instructional materials;

22 (2) select or develop new research-based in-
23 structional materials;

24 (3) teach students the overall analytical ap-
25 proach used in engineering to prepare them to deal

1 with complex technical and non-technical problems
2 and issues;

3 (4) prepare students who may enter STEM-re-
4 lated careers;

5 (5) prepare students who may pursue engineer-
6 ing studies in college;

7 (6) increase participation of underrepresented
8 student groups in the engineering pipeline; and

9 (7) provide professional development for pre-
10 service and in-service teachers to teach pre-college
11 engineering.

12 (b) ELIGIBLE RECIPIENTS.—Grants under this sec-
13 tion shall be provided to an institution of higher education,
14 with at least two co-principal investigators, one from the
15 college of engineering and one from the college of edu-
16 cation, except that if the institution does not have colleges
17 of both engineering and education, faculty from a college
18 of education or engineering from another institution in the
19 area of jurisdiction of the same local educational agency
20 or the same State may participate as a co-principal inves-
21 tigator.

22 (c) CONSORTIA.—Public private partnerships shall be
23 established for program coordination, consisting of, but
24 not limited to—

1 (1) an institution or institutions of higher edu-
2 cation described in subsection (b);

3 (2) one or more local educational agencies in
4 the same State as the institution or institutions de-
5 scribed in paragraph (1), with participation by at
6 least three elementary or secondary schools; and

7 (3) one or more private sector or government
8 organizations in the same State that employ one or
9 more engineers.

10 (d) GRANTS.—

11 (1) DURATION; DISTRIBUTION.—Grants under
12 this section shall be awarded in amounts sufficient
13 to cover a period of four years.

14 (2) FIRST 2-YEAR PERIOD.—

15 (A) GRANT ACTIVITIES.—The first two
16 years of funding provided under a grant shall
17 be used for the selection, development, or both
18 of research-based and evidenced-based—

19 (i) engineering instructional materials
20 that respond to local needs; and

21 (ii) professional training and meth-
22 odologies guidelines for teachers associated
23 with engineering concepts and approaches.

1 (B) NATURE OF MATERIALS.—Instruc-
2 tional materials developed pursuant to subpara-
3 graph (A)(i) shall—

4 (i) emphasize—

5 (I) engineering fundamentals and
6 concepts;

7 (II) engineering design, manufac-
8 turing, and testing; and

9 (III) essential skills such as sys-
10 tems thinking, creativity, teamwork,
11 communication, and ethical consider-
12 ations;

13 (ii) be designed to introduce students
14 to modern engineering tools such as com-
15 puter-aided design, computer-aided manu-
16 facturing, statistical analysis, codes and
17 standards, human factors, and reliability
18 analysis;

19 (iii) provide information for teachers
20 on science inquiry activities related to engi-
21 neering; and

22 (iv) be aligned with and integrated
23 into relevant science, engineering, and
24 mathematics standards that may exist in
25 the State or may be developed.

1 (3) SECOND 2-YEAR PERIOD.—

2 (A) PILOT INSTRUCTIONAL PROGRAM.—

3 The third year of funding provided under a
4 grant shall be used for the implementation in
5 one elementary or secondary school of an engi-
6 neering education program—

7 (i) based on the instructional mate-
8 rials selected or developed under paragraph
9 (2); and

10 (ii) using engineering students and
11 pre-service teachers from the institution or
12 institutions described in subsection (b) as
13 mentors for the elementary or secondary
14 school students.

15 (B) EXPANDED INSTRUCTIONAL PRO-
16 GRAM.—The fourth year of funding provided
17 under a grant shall be used for the implementa-
18 tion of the engineering instructional education
19 program in the remaining elementary or sec-
20 ondary schools described in subsection (c)(2), as
21 revised based on evaluation of the third year ex-
22 perience.

23 (e) APPLICATIONS.—

24 (1) REQUIRED COMMITMENTS.—An application
25 for a grant under this section shall demonstrate

1 strong long-term commitment for the proposed pro-
2 gram from—

3 (A) the institution or institutions described
4 in subsection (b), through—

5 (i) providing laboratory and instruc-
6 tional space;

7 (ii) establishing ongoing professional
8 training programs for pre-service and in-
9 service teachers and teachers in-residence;
10 and

11 (iii) collaboration with the local edu-
12 cational agency or agencies described in
13 subsection (c)(2), private sector or govern-
14 ment organizations described in subsection
15 (c)(3), and nonprofit educational enter-
16 prises, as appropriate;

17 (B) the local educational agency described
18 in subsection (c)(2) and the State, including
19 commitments—

20 (i) to provide total funding to the in-
21 stitution or institutions of higher education
22 described in subsection (b) or the elemen-
23 tary or secondary schools described in sub-
24 section (c)(2), or both, collectively with or-
25 ganizations described in subparagraph

1 (C)(i), at least as great as that provided by
2 the grant awarded under this section;

3 (ii) to support continuance or expan-
4 sion of the engineering education program
5 after the expiration of grant funding under
6 this section, with the goal of offering engi-
7 neering education in all elementary and
8 secondary schools under the jurisdiction of
9 the local educational agency or agencies;
10 and

11 (iii) for continuing collaboration with
12 the institution or institutions described in
13 subsection (b) and private sector or gov-
14 ernment organizations described in sub-
15 section (c)(3); and

16 (C) private sector or government organiza-
17 tions through—

18 (i) financial support to the institution
19 or institutions of higher education de-
20 scribed in subsection (b) or the elementary
21 or secondary schools described in sub-
22 section (c)(2);

23 (ii) participation of personnel in the
24 development and implementation of the
25 program;

1 (iii) provision of expertise, equipment,
2 and materials;

3 (iv) provisions of guidance on instruc-
4 tional materials and needed supplies and
5 equipment; or

6 (v) other support.

7 (2) SELECTION.—A sufficient number of new
8 grants shall be made in each fiscal year, subject to
9 the availability of appropriations to achieve a meas-
10 urable impact.

11 (f) AUTHORIZATION OF APPROPRIATIONS.—No addi-
12 tional funds are authorized to be appropriated to carry
13 out this Act. This Act shall be carried out using amounts
14 otherwise made available for such purposes.

15 **SEC. 5. STUDY.**

16 Not later than 5 years after the date of enactment
17 of this Act, the Director shall enter into an arrangement
18 with the National Academy of Engineering for a study
19 to—

20 (1) conduct a formal review of the activities
21 under this Act and analyze the extent to which such
22 activities will change the quality, scale, equity, and
23 impact of pre-college engineering education, specifi-
24 cally taking into account how the development of

1 teaching guidelines and instructional materials
2 under this Act could contribute to such change;

3 (2) benchmark the results with relevant recent
4 studies conducted by cognizant organizations and
5 the National Academy of Engineering; and

6 (3) recommend if revisions to the program es-
7 tablished under this Act are needed to establish en-
8 gineering education in all secondary schools across
9 the United States.

10 **SEC. 6. ANNUAL REPORT TO CONGRESS.**

11 Not later than 5 years after the date of enactment
12 of this Act, and annually thereafter, the Director shall
13 provide a report to Congress on activities and results
14 under this Act. Such reports shall describe—

15 (1) the total number of grant applications re-
16 ceived in each year;

17 (2) the number and geographic distribution of
18 the grants each year and in total;

19 (3) participation of minority-serving institutions
20 of higher education such as historically black col-
21 leges and universities and Hispanic-serving institu-
22 tions;

23 (4) participation of underrepresented student
24 groups;

25 (5) plans for collaboration among grantees;

- 1 (6) overall program outcomes and issues of con-
- 2 cern; and
- 3 (7) recommendations for program revisions to
- 4 achieve the desired program outcome.

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