118TH CONGRESS
2D SESSION

H. R. 1735

IN THE SENATE OF THE UNITED STATES

SEPTEMBER 24, 2024

Received; read twice and referred to the Committee on Health, Education, Labor, and Pensions

AN ACT

To coordinate Federal research and development efforts focused on modernizing mathematics in STEM education through mathematical and statistical modeling, including data-driven and computational thinking, problem, project, and performance-based learning and assessment, interdisciplinary exploration, and career connections, and for other purposes.

1   *Be it enacted by the Senate and House of Representa-*

2 *tives of the United States of America in Congress assembled,*

SECTION 1. SHORT TITLE.

This Act may be cited as the "Mathematical and Statistical Modeling Education Act".

SEC. 2. MATHEMATICAL AND STATISTICAL MODELING EDUCATION.

(a) FINDINGS.—Congress finds the following:

(1) The mathematics taught in schools, including statistical problem solving and data science, is not keeping pace with the rapidly evolving needs of the public and private sector, resulting in a STEM skills shortage and employers needing to expend resources to train and upskill employees.

(2) According to the Bureau of Labor Statistics, the United States will need 1,000,000 additional STEM professionals than it is on track to produce in the coming decade.

(3) The field of data science, which is relevant in almost every workplace, relies on the ability to work in teams and use computational tools to do mathematical and statistical problem solving.

(4) Many STEM occupations offer higher wages, more opportunities for advancement, and a higher degree of job security than non-STEM jobs.

(5) The STEM workforce relies on computational and data-driven discovery, decision making, and predictions, from models that often must quan-

1 tify uncertainty, as in weather predictions, spread of

2 disease, or financial forecasting.

3   (6) Most fields, including analytics, science, eco-

4 nomics, publishing, marketing, actuarial science, op-

5 erations research, engineering, and medicine, require

6 data savvy, including the ability to select reliable

7 sources of data, identify and remove errors in data,

8 recognize and quantify uncertainty in data, visualize

9 and analyze data, and use data to develop under-

10 standing or make predictions.

11   (7) Rapidly emerging fields, such as artificial

12 intelligence, machine learning, quantum computing

13 and quantum information, all rely on mathematical

14 and statistical concepts, which are critical to prove

15 under what circumstances an algorithm or experi-

16 ment will work and when it will fail.

17   (8) Military academies have a long tradition in

18 teaching mathematical modeling and would benefit

19 from the ability to recruit students with this exper-

20 tise from their other school experiences.

21   (9) Mathematical modeling has been a strong

22 educational priority globally, especially in China,

23 where participation in United States mathematical

24 modeling challenges in high school and higher edu-

25 cation is orders of magnitude higher than in the

1 United States, and Chinese teams are taking a ma-
2 jority of the prizes.

3 (10) Girls participate in mathematical modeling
4 challenges at all levels at similar levels as boys, while
5 in traditional mathematical competitions girls par-
6 ticipate less and drop out at every stage. Students
7 cite opportunity for teamwork, using mathematics
8 and statistics in meaningful contexts, ability to use
9 computation, and emphasis on communication as
10 reasons for continued participation in modeling chal-
11 lenges.

12 (b) DEFINITIONS.—In this section:

13 (1) DIRECTOR.—The term "Director" means
14 the Director of the National Science Foundation.

15 (2) FEDERAL LABORATORY.—The term "Fed-
16 eral laboratory" has the meaning given such term in
17 section 4 of the Stevenson-Wydler Technology Inno-
18 vation Act of 1980 (15 U.S.C. 3703).

19 (3) FOUNDATION.—The term "Foundation"
20 means the National Science Foundation.

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

1   (5) MATHEMATICAL MODELING.—The term

2 "mathematical modeling" has the meaning given the

3 term in the 2019 Guidelines to Assessment and In-

4 struction in Mathematical Modeling Education

5 (GAIMME) report, 2nd edition.

6   (6) OPERATIONS RESEARCH.—The term "oper-

7 ations research" means the application of scientific

8 methods to the management and administration of

9 organized military, governmental, commercial, and

10 industrial processes to maximize operational effi-

11 ciency.

12   (7) STATISTICAL MODELING.—The term "sta-

13 tistical modeling" has the meaning given the term in

14 the 2021 Guidelines to Assessment and Instruction

15 in Statistical Education (GAISE II) report.

16   (8) STEM.—The term "STEM" means the aca-

17 demic and professional disciplines of science, tech-

18 nology, engineering, and mathematics, including

19 computer science.

20   (c) PREPARING EDUCATORS TO ENGAGE STUDENTS

21 IN MATHEMATICAL AND STATISTICAL MODELING.—The

22 Director shall make awards on a merit-reviewed, competi-

23 tive basis to institutions of higher education, and nonprofit

24 organizations (or a consortium thereof) for research and

25 development to advance innovative approaches to support

1 and sustain high-quality mathematical modeling education
2 in schools that are private, faith-based, or homeschools,
3 or operated by local educational agencies, including statis-
4 tical modeling, data science, operations research, and com-
5 putational thinking. The Director shall encourage appli-
6 cants to form partnerships to address critical transitions,
7 such as middle school to high school, high school to col-
8 lege, and school to internships and jobs.

9 (d) APPLICATION.—An entity seeking an award
10 under subsection (c) shall submit an application at such
11 time, in such manner, and containing such information as
12 the Director may require. The application shall include the
13 following:

14 (1) A description of the target population to be
15 served by the research activity for which such an
16 award is sought, including student subgroups de-
17 scribed in section 1111(b)(2)(B)(xi) of the Elemen-
18 tary and Secondary Education Act of 1965 (20
19 U.S.C. 6311(b)(2)(B)(xi)), and students experi-
20 encing homelessness and children and youth in fos-
21 ter care.

22 (2) A description of the process for recruitment
23 and selection of students, educators, or local edu-
24 cational agencies to participate in such research ac-
25 tivity.

1   (3) A description of how such research activity

2   may inform efforts to promote the engagement and

3   achievement of students, including students from

4   groups historically underrepresented in STEM, in

5   prekindergarten through grade 12 in mathematical

6   modeling and statistical modeling using problem-

7   based learning with contextualized data and com-

8   putational tools.

9   (4) In the case of a proposal consisting of a

10   partnership or partnerships with 1 or more local

11   educational agencies and 1 or more researchers, a

12   plan for establishing a sustained partnership that is

13   jointly developed and managed, draws from the ca-

14   pacities of each partner, and is mutually beneficial.

15   (e) PARTNERSHIPS.—In making awards under sub-

16 section (c), the Director shall encourage applications that

17 include—

18   (1) partnership with a nonprofit organization or

19   an institution of higher education that has extensive

20   experience and expertise in increasing the participa-

21   tion of students in prekindergarten through grade

22   12 in mathematical modeling and statistical mod-

23   eling;

1   (2) partnership with a local educational agency,

2 a consortium of local educational agencies, or Tribal

3 educational agencies;

4   (3) an assurance from school leaders to making

5 reforms and activities proposed by the applicant a

6 priority;

7   (4) ways to address critical transitions, such as

8 middle school to high school, high school to college,

9 and school to internships and jobs;

10   (5) input from education researchers and cog-

11 nitive scientists, as well as practitioners in research

12 and industry, so that what is being taught is up-to-

13 date in terms of content and pedagogy;

14   (6) a communications strategy for early con-

15 versations with parents, school leaders, school

16 boards, community members, employers, and other

17 stakeholders; and

18   (7) resources for parents, school leaders, school

19 boards, community members, and other stakeholders

20 to build skills in modeling and analytics.

21 (f) USE OF FUNDS.—An entity that receives an

22 award under this section shall use the award for research

23 and development activities to advance innovative ap-

24 proaches to support and sustain high-quality mathe-

25 matical modeling education in public schools, private

1 schools (including faith-based schools), or homeschools, in-
2 cluding statistical modeling, data science, operations re-
3 search, and computational thinking, which may include—

4   (1) engaging prekindergarten through grade 12
5   educators in professional learning opportunities to
6   enhance mathematical modeling and statistical prob-
7   lem solving knowledge, and developing training and
8   best practices to provide more interdisciplinary
9   learning opportunities;

10   (2) conducting research on curricula and teach-
11   ing practices that empower students to choose the
12   mathematical, statistical, computational, and techno-
13   logical tools that they will apply to a problem, as is
14   required in life and the workplace, rather than pre-
15   scribing a particular approach or method;

16   (3) providing students with opportunities to ex-
17   plore and analyze real data sets from contexts that
18   are meaningful to the students, which may include—

19   (A) missing or incorrect values;

20   (B) quantities of data that require choice
21   and use of appropriate technology;

22   (C) multiple data sets that require choices
23   about which data are relevant to the current
24   problem; and

1   (D) data of various types including quan-

2   tities, words, and images;

3   (4) taking a school or district-wide approach to

4 professional development in mathematical modeling

5 and statistical modeling;

6   (5) engaging rural local agencies;

7   (6) supporting research on effective mathe-

8 matical modeling and statistical modeling teaching

9 practices, including problem- and project-based

10 learning, universal design for accessibility, and ru-

11 brics and mastery-based grading practices to assess

12 student performance;

13   (7) designing and developing pre-service and in-

14 service training resources to assist educators in

15 adopting transdisciplinary teaching practices within

16 mathematics and statistics courses;

17   (8) coordinating with local partners to adapt

18 mathematics and statistics teaching practices to le-

19 verage local natural, business, industry, and commu-

20 nity assets in order to support community-based

21 learning;

22   (9) providing hands-on training and research

23 opportunities for mathematics and statistics edu-

24 cators at Federal laboratories, institutions of higher

25 education, or in industry;

1 (10) developing mechanisms for partnerships

2 between educators and employers to help educators

3 and students make connections between their mathe-

4 matics and statistics projects and topics of relevance

5 in today's world;

6 (11) designing and implementing professional

7 development courses and experiences, including men-

8 toring for educators, that combine face-to-face and

9 online experiences;

10 (12) reduce gaps in access to learning opportu-

11 nities for students from groups historically under-

12 represented in STEM;

13 (13) provide support and resources for students

14 from groups historically underrepresented in STEM;

15 (14) addressing critical transitions, such as

16 middle school to high school, high school to college,

17 and school to internships and jobs;

18 (15) researching effective approaches for engag-

19 ing students from groups historically underrep-

20 resented in STEM; and

21 (16) any other activity the Director determines

22 will accomplish the goals of this section.

23 (g) EVALUATIONS.—All proposals for awards under

24 this section shall include an evaluation plan that includes

25 the use of outcome oriented measures to assess the impact

1 and efficacy of the award. Each recipient of an award

2 under this section shall include results from these evalua-

3 tive activities in annual and final project reports.

4 (h) ACCOUNTABILITY AND DISSEMINATION.—

5 (1) EVALUATION REQUIRED.—The Director

6 shall evaluate the portfolio of awards made under

7 this section. Such evaluation shall—

8 (A) use a common set of benchmarks and

9 tools to assess the results of research conducted

10 under such awards and identify best practices;

11 and

12 (B) to the extent practicable, integrate the

13 findings of research resulting from the activities

14 funded through such awards with the findings

15 of other research on student's pursuit of de-

16 grees or careers in STEM.

17 (2) REPORT ON EVALUATIONS.—Not later than

18 180 days after the completion of the evaluation

19 under paragraph (1), the Director shall submit to

20 Congress and make widely available to the public a

21 report that includes—

22 (A) the results of the evaluation; and

23 (B) any recommendations for administra-

24 tive and legislative action that could optimize

1 the effectiveness of the awards made under this

2 section.

3 (i) FUNDING.—$10,000,000 for each of the fiscal

4 years 2025 through 2029 is authorized to be used by the

5 Directorate for STEM Education of the National Science

6 Foundation to carry out this section.

SEC. 3. NASEM REPORT ON MATHEMATICAL AND STATIS-

TICAL MODELING EDUCATION IN PRE-

KINDERGARTEN THROUGH 12TH GRADE.

10 (a) STUDY.—Not later than 180 days after the date

11 of the enactment of this Act, the Director shall seek to

12 enter into an agreement with the National Academies of

13 Sciences, Engineering and Medicine (in this section re-

14 ferred to as ''NASEM'') (or if NASEM declines to enter

15 into such an agreement, another appropriate entity) under

16 which NASEM, or such other appropriate entity, agrees

17 to conduct a study on the following:

18 (1) Factors that enhance or barriers to the im-

19 plementation of mathematical modeling and statis-

20 tical modeling in elementary and secondary edu-

21 cation, including opportunities for and barriers to

22 use modeling to integrate mathematical and statis-

23 tical ideas across the curriculum, including the fol-

24 lowing:

1   (A) Pathways in mathematical modeling

2   and statistical problem solving from kinder-

3   garten to the workplace so that students are

4   able to identify opportunities to use their school

5   mathematics and statistics in a variety of jobs

6   and life situations and so that employers can

7   benefit from students' school learning of data

8   science, computational thinking, mathematics,

9   statistics, and related subjects.

10   (B) The role of community-based prob-

11   lems, service-based learning. and internships for

12   connecting students with career preparatory ex-

13   periences.

14   (C) Best practices in problem-, project-,

15   performance-based learning and assessment.

16   (2) Characteristics of teacher education pro-

17   grams that successfully prepare teachers to engage

18   students in mathematical modeling and statistical

19   modeling, as well as gaps and suggestions for build-

20   ing capacity in the pre-service and in-service teacher

21   workforce.

22   (3) Mechanisms for communication with stake-

23   holders, including parents, administrators, and the

24   public, to promote understanding and knowledge of

1 the value of mathematical modeling and statistical

2 modeling in education.

3 (b) PUBLIC STAKEHOLDER MEETING.—In the course

4 of completing the study described in subsection (a),

5 NASEM or such other appropriate entity shall hold not

6 less than one public meeting to obtain stakeholder input

7 on the topics of such study.

8 (c) REPORT.—The agreement under subsection (a)

9 shall require NASEM, or such other appropriate entity,

10 not later than 24 months after the effective date of such

11 agreement, to submit to the Secretary of Education and

12 the appropriate committees of jurisdiction of Congress a

13 report containing—

14 (1) the results of the study conducted under

15 subsection (a);

16 (2) recommendations to modernize the proc-

17 esses described in subsection (a)(1); and

18 (3) recommendations for such legislative and

19 administrative action as NASEM, or such other ap-

20 propriate entity, determines appropriate.

21 (d) FUNDING.—From amounts appropriated or oth-

22 erwise made available for the Directorate for STEM Edu-

23 cation of the National Science Foundation, the Director

24 shall allocate up to $1,000,000 for fiscal year 2024 to

25 carry out this section.

1 **SEC. 4. LIMITATIONS.**

2 (a) LIMITATION ON FUNDING.—Amounts made avail-

3 able to carry out sections 2 and 3 shall be derived from

4 amounts appropriated or otherwise made available to the

5 National Science Foundation.

6 (b) SUNSET.—The authority to provide awards under

7 this Act shall expire on September 30, 2028.

Passed the House of Representatives September 23, 2024.

Attest: KEVIN F. MCCUMBER,

Clerk.