MATHEMATICAL AND STATISTICAL MODELING EDUCATION ACT

JUNE 14, 2022.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

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Ms. JOHNSON of Texas, from the Committee on Science, Space, and Technology, submitted the following

R E P O R T

[To accompany H.R. 3588]

[Including cost estimate of the Congressional Budget Office]

The Committee on Science, Space, and Technology, to whom was referred the bill (H.R. 3588) 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, having considered the same, reports favorably thereon without amendment and recommends that the bill do pass.

CONTENTS

II. PURPOSE OF THE BILL

The purpose of the bill is 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.

III. BACKGROUND AND NEED FOR THE LEGISLATION

Many STEM occupations require computational and data-driven discovery, decision making, and predictions using models that often must quantify uncertainty, as in weather predictions, spread of disease, or financial forecasting.

The mathematics education provided in PreK–12 schools, including statistical problem solving and data science, is not keeping pace with the rapidly evolving needs of the public and private sector. The resulting STEM skills shortage has forced employers to expend resources to train and upskill employees.

H.R. 3588, the *Mathematical and Statistical Modeling Education Act*, directs the National Science Foundation to support research to improve STEM education at the K–12 level, including innovations to incorporate mathematical and statistical modeling with a real-world context. The legislation also provides for a National Academies of Sciences, Engineering, and Medicine study to assess best practices for and barriers to successful implementation of such innovations.

H.R. 3588 has been endorsed by the American Statistical Association (ASA), the Institute for Operations Research and the Management Sciences (INFORMS), the Consortium for Mathematics and its Applications (COMAP), the American Mathematical Association of Two-Year Colleges (AMATYC), the National Council of Teachers of Mathematics (NCTM), the Center for Innovation in Education (C!E), and the Business Software Alliance (BSA).

IV. COMMITTEE HEARINGS

Pursuant to House rule XIII, clause 3(c)(6), the Committee designates the following hearings as having been used to develop or consider the legislation:

On April 28, 2021, and May 6, 2021, the Subcommittee on Research and Technology held a two-part hearing to discuss opportunities and challenges for leveraging and expanding the National Science Foundation mission to continue to advance excellent research; improve STEM education and research training; increase research accessibility, and accountability; and accelerate research to address major societal challenges.

WITNESSES:

April 28, 2021
- Dr. Sethuraman Panchanathan, Director, National Science Foundation
- Dr. Ellen Ochoa, Chair, National Science Board

May 6, 2021
- Dr. Roger M. Wakimoto, Vice Chancellor for Research and Creative Activities, University of California, Los Angeles
- Ms. Gabriela Cruz Thompson, Director, University Research and Collaboration, Intel Labs, Intel Corporation
- Dr. Mahmud Farooque, Associate Director, Consortium for Science, Policy and Outcomes, DC and Clinical Associate Professor, School for the Future of Innovation in Society, Arizona State University
- Dr. Gerald Blazey, Vice President for Research and Innovation Partnerships, Northern Illinois University
- Dr. P. Barry Butler, President, Embry-Riddle Aeronautical University

V. COMMITTEE CONSIDERATION AND VOTES

On May 28, 2021, Representatives Chrissy Houlahan and James R. Baird introduced H.R. 3588, the *Mathematical and Statistical Modeling Education Act*. The bill was co-sponsored by Representatives Jerry McNerney, Deborah K. Ross, Jake Ellzey, and Mikie Sherrill. This bill was referred to the House Committee on Science, Space, and Technology.

On April 5, 2022, the Committee on Science, Space, and Technology met to consider H.R. 3588. No amendments to the bill text were offered. Representatives James R. Baird, Jerry McNerney, and Deborah Ross delivered remarks in support of the bill. Acting Chairwoman Zoe Lofgren moved that the Committee favorably report the bill, H.R. 3588, to the House with the recommendation that the bill be approved. *The motion was agreed to by a voice vote*.

VI. SUMMARY OF MAJOR PROVISIONS OF THE BILL

H.R. 3588 directs the National Science Foundation to support research to improve STEM education at the K–12 level, including innovations to incorporate mathematical and statistical modeling with a real-world context.

The bill also provides for a National Academies of Sciences, Engineering, and Medicine study to assess best practices for and barriers to successful implementation of such innovations.

VII. SECTION-BY-SECTION ANALYSIS (BY TITLE AND SECTION)

Section 1. Short title

Section 2. Mathematical and statistical modeling education

Directs the National Science Foundation to provide grants for research and development related to mathematical modeling education. Authorizes $10 million for each of fiscal years 2022 through 2026 to carry out this section.

Section 3. NASEM report on mathematical and statistical modeling education in prekindergarten through 12th grade

Directs the National Science Foundation to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine to carry out a study to assess opportunities and challenges related to implementing innovations in mathematical mod-

eling education. Authorizes $1 million for fiscal year 2022 to carry out this section.

VIII. COMMITTEE VIEWS

The Committee intends for the Director to encourage applications that include partnerships with a nonprofit organization or an institution of higher education that has extensive experience and expertise in increasing and diversifying the participation of prekindergarten through grade 12 students in STEM education activities, including mathematics more generally, not necessarily specific to mathematical modeling and statistical modeling.

IX. COST ESTIMATE

Pursuant to clause 3(c)(2) of rule XIII of the Rules of the House of Representatives, the Committee adopts as its own the estimate of new budget authority, entitlement authority, or tax expenditures or revenues contained in the cost estimate prepared by the Director of the Congressional Budget Office pursuant to section 402 of the Congressional Budget Act of 1974.

X. CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, May 27, 2022.

Hon. EDDIE BERNICE JOHNSON,
Chairwoman, Committee on Science, Space, and Technology,
House of Representatives, Washington, DC.

DEAR MADAM CHAIRWOMAN: The Congressional Budget Office has prepared the enclosed cost estimate for H.R. 3588, the Mathematical and Statistical Modeling Education Act.

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.

H.R. 3588, Mathematical and Statistical Modeling Education Act
As ordered reported by the House Committee on Science, Space, and Technology on April 5, 2022

By Fiscal Year, Millions of Dollars	2022	2022-2027	2022-2032
Direct Spending (Outlays)	0	0	0
Revenues	0	0	0
Increase or Decrease (-) in the Deficit	0	0	0
Spending Subject to Appropriation (Outlays)	0	46	51

		Mandate Effects	
Statutory pay-as-you-go procedures apply?	No		
Increases on-budget deficits in any of the four consecutive 10-year periods beginning in 2033?	No	Contains intergovernmental mandate?	No
		Contains private-sector mandate?	No

H.R. 3588 would authorize the appropriation of $10 million annually over the 2022–2026 period for the National Science Foundation (NSF) to award grants to nonprofit organizations and institutions of higher education to develop approaches for teaching mathematical modeling in schools, and to report to the Congress on those grants. The bill also would authorize the appropriation of $1 million in 2022 for the NSF to enter into an agreement with the National Academies to study opportunities for and barriers to teaching mathematical modeling in schools.

For this estimate, CBO assumes that the legislation will be enacted late in fiscal year 2022 and that the authorized amounts will be appropriated each year. As a result of the late enactment date, CBO expects that spending would begin in 2023.

The NSF has awarded grants similar to those authorized under the bill in past years; however, using information from the agency, CBO estimates that no amounts were allocated for that purpose in 2022. Based on historical spending patterns for similar programs, CBO estimates that implementing H.R. 3588 would cost $46 million over the 2022–2027 period and $5 million after 2027.

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

TABLE 1.—INCREASES IN SPENDING SUBJECT TO APPROPRIATION UNDER H.R. 3588

	By fiscal year, millions of dollars—												
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2022–2027	2022–2032
Authorization	11	10	10	10	10	0	0	0	0	0	0	51	51
Estimated Outlays	0	6	10	12	10	8	4	1	0	0	0	46	51

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

XI. FEDERAL MANDATES STATEMENT

H.R. 3588 contains no unfunded mandates.

XII. COMMITTEE OVERSIGHT FINDINGS AND RECOMMENDATIONS

The Committee's oversight findings and recommendations are reflected in the body of this report.

XIII. STATEMENT ON GENERAL PERFORMANCE GOALS AND OBJECTIVES

The goal of H.R. 3588 is to support research and development to improve mathematics education outcomes by increasing PreK–12 student engagement with mathematical modeling and statistical modeling using problem-based learning with contextualized data and computational tools.

XIV. FEDERAL ADVISORY COMMITTEE STATEMENT

H.R. 3588 does not create any advisory committees.

XV. DUPLICATION OF FEDERAL PROGRAMS

Pursuant to clause 3(c)(5) of rule XIII of the Rules of the House of Representatives, the Committee finds that no provision of H.R. 3588 establishes or reauthorizes a program of the federal govern-

ment known to be duplicative of another federal program, including any program that was included in a report to Congress pursuant to section 21 of Public Law 111–139 or the most recent Catalog of Federal Domestic Assistance.

XVI. EARMARK IDENTIFICATION

Pursuant to clause 9(e), 9(f), and 9(g) of rule XXI, the Committee finds that H.R. 3588 contains no earmarks, limited tax benefits, or limited tariff benefits.

XVII. APPLICABILITY TO THE LEGISLATIVE BRANCH

The Committee finds that H.R. 3588 does not relate to the terms and conditions of employment or access to public services or accommodations within the meaning of section 102(b)(3) of the Congressional Accountability Act (Public Law 104–1).

XVIII. STATEMENT ON PREEMPTION OF STATE, LOCAL, OR TRIBAL LAW

This bill is not intended to preempt any state, local, or tribal law.

XIX. CHANGES IN EXISTING LAW MADE BY THE BILL, AS REPORTED

This legislation does not amend any existing Federal statute.

XX. PROCEEDINGS OF THE FULL COMMITTEE MARKUP

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MARKUPS: H.R. 3588, MATHEMATICAL AND STATISTICAL MODELING EDUCATION ACT; H.R. 3952, NOAA CHIEF SCIENTIST ACT; H.R. 6845, COMMERCIAL REMOTE SENSING AMENDMENT ACT OF 2022; H.R. 6933, COST-SHARE ACCOUNTABILITY ACT OF 2022; H.R. 7077, EMPOWERING THE U.S. FIRE ADMINISTRATION ACT

MARKUP

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

OF THE

HOUSE OF REPRESENTATIVES

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

APRIL 5, 2022

Serial No. CP: 117–11

Printed for the use of the Committee on Science, Space, and Technology

H.R. 6845, COMMERCIAL REMOTE SENSING AMENDMENT ACT OF 2022

H.R. 3952, NOAA CHIEF SCIENTIST ACT

H.R. 7077, EMPOWERING THE U.S. FIRE ADMINISTRATION ACT

H.R. 3588, MATHEMATICAL AND STATISTICAL MODELING EDUCATIONACT

H.R. 6933, COST-SHARE ACCOUNTABILITY ACT OF 2022

TUESDAY, APRIL 5, 2022

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Committee met, pursuant to notice, at 10:04 a.m., in room 2318 of the Rayburn House Office Building, Hon. Eddie Bernice Johnson [Chairwoman of the Committee] presiding.

Chairwoman JOHNSON. Thank you very much, and good morning to everyone. The Committee will come to order. And without objection, the Chair is authorized to declare a recess at any time.

Pursuant to Committee rule, the House rule XI, the Chair announces that she may postpone roll call votes.

Today, the Committee is meeting both in person and virtually. I want to announce a couple reminders to the Members about the conduct of the hearing. First, the Members and staff who are attending in person may choose to be masked, but it is not a requirement. However, any individuals with symptoms or a positive test or exposure to someone with COVID–19 should wear a mask while present.

Members who are attending virtually should keep their video feed on as long as they are present in the hearing. Members are responsible for their own microphones. And please also keep your microphones muted until you are speaking.

(1)

Finally, if Members have documents they wish to submit to the record, please email them to the Committee Clerk, whose email address was circulated prior to the meeting.

Pursuant to notice, the Committee meets to consider the following measures: H.R. 6845, the *Commercial Remote Sensing Amendment Act of 2022;* H.R. 3952, the *NOAA Chief Scientist Act;* H.R. 7077, *Empowering the U.S. Fire Administration Act;* H.R. 3588, the *Mathematical and Statistical Modeling and Education Act;* and finally, H.R. 6933, the *Cost-Share Accountability Act of 2022.* Thank you very much.

Welcome to today's markup of five bipartisan bills. The first bill we consider is H.R. 6845, the *Commercial Remote Sensing Amendment Act of 2022,* which was introduced by Ranking Member Lucas and Mr. Perlmutter. This bill would amend current statute to provide for more transparency in the U.S. commercial space remote sensing licensing process. H.R. 6845 helps provide this Committee and the Congress with the necessary information to carry out its oversight function and to monitor the implementation of regulations of the U.S. commercial remote sensing industry, including any impacts on the industry's competitiveness. H.R. 6845 is a good-government bill and helps to ensure transparency in the licensing of commercial remote sensing systems.

Next, we will consider H.R. 3952, the *NOAA Chief Scientist Act.* I want to thank our Environment Subcommittee Chairwoman Mikie Sherrill for introducing this bipartisan legislation along with Research Subcommittee Ranking Member Randy Feenstra. This legislation sets strong scientific qualifications for the Chief Scientist position. The bill outlines additional responsibilities of the Chief Scientist in NOAA (National Oceanic and Atmospheric Administration). It is—it also elevates the importance of the Chief Scientist and his or her role in upholding scientific integrity and advancing science and technology at the agency. And finally, the bill establishes an Office of the Chief Scientist, as well as the position of Deputy Chief Scientist. I support the passage of this *NOAA Chief Scientist Act* and urge my colleagues to do the same.

The next bill we have to mark up is H.R. 7077, *Empowering the U.S. Fire Administration Act,* sponsored by Representative Ritchie Torres and cosponsored by several Members of the Committee. This bipartisan bill authorizes the U.S. Fire Administration (USFA) to conduct onsite investigations of major fires. Despite advances in fire codes, loss of life from building fires still occurs far too frequently. A tragic fire in Representative Torres' New York district in January claimed seventeen victims, including eight children. This bill would help bring to bear the expertise of the U.S. Fire Administration following major fires to contribute to what we can learn from these fires and how we can prevent them from occurring in the future. I urge my colleagues to support this important bill.

I want to thank Representatives Houlahan and Baird for sponsoring our next bill, H.R. 3588, the *Mathematical and Statistical Modeling Education Act.* Improving access to high-quality STEM (science, technology, engineering, and mathematics) education remains a top priority for this Committee. Every two years the National Assessment of Education Progress reminds us that we're—what we're doing now is not working for the majority of our Na-

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tion's students. This bill will advance innovations to incorporate mathematical modeling across K through twelve curricula and ground those lessons in a real-world context. This will empower students to see mathematics as a tool they can use to solve the problems they see in their communities. We know this both increases learning and inspires more students to pursue STEM careers. I urge my colleagues to support this important bill.

Finally, we will consider H.R. 6933, the *Cost-Share Accountability Act of 2022*, which was introduced by Investigations and Oversight Subcommittee Ranking Member Mr. Obernolte and Chairman Foster. This is a commonsense bill to ensure that Congress is kept informed about instances where cost-share requirements at the Department of Energy (DOE) are reduced or eliminated. This is a straightforward, good-government bill, and I support its passage.

I look forward to a productive markup today, and I hope to be back in the hearing room very soon. I must tell you that my surgery and rehabilitation is going very well, but now I am going to pass the gavel to Ms. Lofgren, our distinguished Vice Chair—excuse me, to chair the remainder of this markup. Thank you, Chairwoman.

[The prepared statement of Chairwoman Johnson follows:]

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The first bill we will consider is H.R. 6845, the *Commercial Remote Sensing Amendment Act of 2022*, which was introduced by Ranking Member Lucas and Mr. Perlmutter. This bill would amend current statute to provide for more transparency in the U.S. commercial space remote sensing licensing process. H.R. 6845 helps provide this Committee and Congress with the necessary information to carry out its oversight function and to monitor the implementation of regulations on the U.S. commercial remote sensing industry, including any impacts on the industry's competitiveness.

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power students to see mathematics as a tool they can use to solve the problems they
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room very soon. But now I am going to pass the gavel over to Ms. Lofgren to chair
the remainder of this markup.

Ms. LOFGREN [presiding]. Thank you, Chairwoman Johnson. And
it's—I'm glad that your recovery is going so well, and I want to
thank you for your opening statement.

I will simply say that I support all of these bipartisan bills today,
and I look forward to a productive markup. And I will place a full
statement in the record. I now recognize the Ranking Member for
any opening remarks he would like to make.

Mr. LUCAS. Thank you, and thank you, Chairwoman Johnson, for
holding today's markup. And I look forward to my colleague being
back at this dais with us in very short time to continue to work
on the Nation's business.

This morning, we will consider five bipartisan bills. These are
what I call workhorse bills instead of show-horse bills, the great ex-
amples of consensus work we can do across the aisle to improve
American science and research.

Our first bill is the *Commercial Remote Sensing* bill amendment,
which I sponsored, and I'll go into more detail when we consider
the bill. But for now, I'd like to thank Representative Perlmutter
for working with me to support this growing industry.

Next on the docket is a bill to codify the role of Chief Scientist
at NOAA. The Chief Scientist plays an important role at NOAA,
advising the Administrator, providing scientific advice, and leading
scientific integrity efforts. The Chief Scientist has long been a crit-
ical position at NOAA, and this bill simply recognizes the value of
that role by making its current duties and responsibilities law. It
also places a process in place for naming an acting Chief Scientist
when the role is empty. In short, it ensures NOAA and its leader-
ship will continue to receive the best scientific advice as they con-
duct all of NOAA's important missions around environmental and
weather research, monitoring, prediction, and restoration. I'd like
to thank Representative Sherrill for sponsoring this bill and Rep-
resentative Feenstra for leading the Republican side.

Next up is a bill to empower the U.S. Fire Administration. The
Fire Administration is housed within FEMA (Federal Emergency
Management Agency), and it helps to strengthen our ability to pre-
vent and respond to fires through research and education. This bill
will make it easier for the U.S. Fire Administration to provide their
expertise to local authorities by granting it the authority to spend
specialists, researchers, investigators, fire protection engineers to
assist with investigations of major fires. The U.S. Fire Administra-
tion has valuable resources in preventing, responding to, and inves-
tigating fires, and this bill ensures that State and local govern-
ments can access their knowledge and hopefully prevent major fires

in the future. I want to thank Representative Torres for his work on this, as well as the original cosponsors from our Committee, Representative Stevens, Meijer, and Gonzalez.

Following that bill, we'll consider the *Mathematical and Statistical Modeling Education Act,* which will help improve STEM education for U.S. students. Mathematics and statistical modeling is a skill set with broad applications across all STEM fields and even the social sciences. Statistical modeling can help us describe past events, understand current developments, and predict future outcomes. Teaching advanced modeling will prepare students to work with complex data sets. That in turn sets us up for more competitive, flexible work force. I'd like to express my appreciation to Representative Houlahan and Representative Baird for bringing this before the Committee.

Finally, we'll consider the *Cost-Share Accountability Act.* This is a good-government bill meant to improve accountability and transparency. It requires the Department of Energy to submit reports to Congress detailing when it has decided to modify or eliminate cost-sharing requirements for its research, development, demonstration, and commercial application activities. It doesn't hinder DOE's ability to modify cost-sharing requirements when necessary. Instead, it just makes those decisions transparent and publicly available. This in turn makes it easier for Congress to conduct oversight. It's a smart policy, and I thank Representative Obernolte for developing this bill following oversight hearings on this authority last year and Representative Foster for working across the aisle with him. I'm looking forward to a relatively quick markup today because of the bipartisan nature and thorough vetting of each bill under consideration.

With that, I'll end my remarks so we can get back to work. Thank you, Madam Chair.

[The prepared statement of Mr. Lucas follows:]

Thank you, Chairwoman Johnson, for holding today's markup. This morning we will consider five bipartisan bills. These are what I'd call workhorse bills instead of show horse bills. They're great examples of the consensus work we can do across the aisle to improve American science and research.

Our first bill is the Commercial Remote Sensing Amendment, which I sponsored. I'll go into more detail when we consider that bill, but for now I'd like to thank Rep. Perlmutter for working with me to support this growing industry.

Next on the docket is a bill to codify the role of Chief Scientist at NOAA. The Chief Scientist plays an important role at NOAA, advising the Administrator, providing scientific advice, and leading scientific integrity efforts. The Chief Scientist has long been a critical position at NOAA, and this bill simply recognizes the value of that role by making its current duties and responsibilities law. It also puts a process in place for naming an acting Chief Scientist when the role is empty. In short, it ensures NOAA and its leadership will continue to receive the best scientific advice as they conduct all of NOAA's important missions around environmental and weather research, monitoring, prediction, and restoration. I'd like to thank Representative Sherrill for sponsoring this bill and Representative Feenstra for leading the Republican side.

Next up is a bill to empower the U.S. Fire Administration. The Fire Administration is housed within FEMA and it helps strengthen our ability to prevent and respond to fires through research and education. This bill will make it easier for the U.S. Fire Administration to provide their expertise to local authorities by granting it the authority to send specialists, researchers, investigators, and fire protection engineers to assist with investigations of major fires. The U.S. Fire Administration has valuable resources in preventing, responding to, and investigating fires and this bill ensures that state and local governments can access their knowledge and - hopefully - prevent major fires in the future. I'd like to thank Representative Torres for his

work on this, as well as the original cosponsors from our Committee - Representatives Stevens, Meijer, and Gonzalez.

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I'm looking forward to a relatively quick markup today because of the bipartisan nature and thorough vetting of each bill under consideration. With that, I'll end my remarks so we can get to work.

Ms. LOFGREN. Thank you, Mr. Ranking Member.

Other Members are—may put their opening remarks into the record.

[The prepared statement of Ms. Lofgren follows:]

Good morning everyone, I'm glad to begin this markup of five bipartisan bills.Today we will consider H.R. 6845, the *Commercial Remote Sensing Amendment Act of 2022*; H.R. 3952, the *NOAA Chief Scientist Act*; H.R. 7077, the *Empowering the U.S. Fire Administration Act*; H.R. 3588, the *Mathematical and Statistical Modeling Education Act*; and H.R. 6933, the *Cost-Share Accountability Act of 2022*.

Ranking Member Lucas and Mr. Perlmutter's H.R. 6845, the *Commercial Remote Sensing Amendment Act of 2022*, will help to bring more transparency in our U.S. commercial space remote licensing process. This bill will allow for this Committee and Congress to carry out it's critical oversight function of the U.S. commercial remote sensing industry and will build transparency in the licensing of these systems.

Up next is H.R. 3952, the *NOAA Chief Scientist Act*. This legislation was introduced by Chairwoman Mikie Sherrill of the Subcommittee on Environment and Research and Technology Subcommittee Ranking Member Randy Feenstra. This bill will help shape a strong Chief Scientist position at NOAA, and emphasizes the importance of upholding scientific integrity. The bill also establishes both an Office of the Chief Scientist and the position of Deputy Chief Scientist. As a Members of this Committee, we understand how critically important it is to uphold scientific integrity, especially at our federal science facilities.

Third we will consider H.R. 7077, the *Empowering the U.S. Fire Administration Act*, which was sponsored by Representative Ritchie Torres of New York. This bipartisan bill will authorize the U.S. Fire Administration to conduct investigations of major fires on-site. We must be able to learn from tragic events like fires so we can work to make sure they don't happen again, and this bill will help to do just that.

Next will be H.R. 3588, the *Mathematical and Statistical Modeling Education Act*. This bill was brought forth by Representatives Houlahan and Baird to coordinate Federal research and development efforts to help scale up and modernize STEM education through mathematical and statistical modeling. In order to build a strong and diverse STEM workforce, we have to ensure students are well-equipped with the evolving needs of the future.

The last bill we will consider today is H.R. 6933, the *Cost-Share Accountability Act of 2022*. This bill, which was introduced by Investigations and Oversight Subcommittee Ranking Member Obernolte and Chairman Foster, will ensure Congress stays up to date on information regarding changes in cost-share requirements at the Department of Energy.

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I'm confident we have a productive markup in front of us. From upholding scientific integrity at NOAA, making sure we learn from major fires and work to prevent them, improving access to high-quality STEM education, and more, we have five great bills to consider. I'm looking forward to moving each of these bills through the Committee today.

Thank you.

117TH CONGRESS
1ST SESSION

H. R. 3588

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.

IN THE HOUSE OF REPRESENTATIVES

MAY 28, 2021

Ms. HOULAHAN (for herself and Mr. BAIRD) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

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A BILL

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,*

3 **SECTION 1. SHORT TITLE.**

4   This Act may be cited as the "Mathematical and Sta-

5 tistical Modeling Education Act".

SEC. 2. MATHEMATICAL AND STATISTICAL MODELING EDU-CATION.

(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 quantify uncertainty, as in weather predictions, spread of disease, or financial forecasting.

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

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

3   erations research, engineering, and medicine, require

4   data savvy, including the ability to select reliable

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

6   recognize and quantify uncertainty in data, visualize

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

8   standing or make predictions.

9   (7) Rapidly emerging fields, such as artificial

10 intelligence, machine learning, quantum computing

11 and quantum information, all rely on mathematical

12 and statistical concepts, which are critical to prove

13 under what circumstances an algorithm or experi-

14 ment will work and when it will fail.

15   (8) Military academies have a long tradition in

16 teaching mathematical modeling and would benefit

17 from the ability to recruit students with this exper-

18 tise from their other school experiences.

19   (9) Mathematical modeling has been a strong

20 educational priority globally, especially in China,

21 where participation in United States mathematical

22 modeling challenges in high school and higher edu-

23 cation is orders of magnitude higher than in the

24 United States, and Chinese teams are taking a ma-

25 jority of the prizes.

1   (10) Girls participate in mathematical modeling

2   challenges at all levels at similar levels as boys, while

3   in traditional mathematical competitions girls par-

4   ticipate less and drop out at every stage. Students

5   cite opportunity for teamwork, using mathematics

6   and statistics in meaningful contexts, ability to use

7   computation, and emphasis on communication as

8   reasons for continued participation in modeling chal-

9   lenges.

10   (b) DEFINITIONS.—In this section:

11   (1) DIRECTOR.—The term "Director" means

12   the Director of the National Science Foundation.

13   (2) FEDERAL LABORATORY.—The term "Fed-

14   eral laboratory" has the meaning given such term in

15   section 4 of the Stevenson-Wydler Technology Inno-

16   vation Act of 1980 (15 U.S.C. 3703).

17   (3) FOUNDATION.—The term "Foundation"

18   means the National Science Foundation.

19   (4) INSTITUTION OF HIGHER EDUCATION.—The

20   term "institution of higher education" has the

21   meaning given such term in section 101(a) of the

22   Higher Education Act of 1965 (20 U.S.C. 1001(a)).

23   (5) MATHEMATICAL MODELING.—The term

24   "mathematical modeling" has the meaning given the

25   term in the 2019 Guidelines to Assessment and In-

1 struction in Mathematical Modeling Education

2 (GAIMME) report, 2nd edition.

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

4 ations research" means the application of scientific

5 methods to the management and administration of

6 organized military, governmental, commercial, and

7 industrial processes to maximize operational effi-

8 ciency.

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

10 tistical modeling" has the meaning given the term in

11 the 2021 Guidelines to Assessment and Instruction

12 in Statistical Education (GAISE II) report.

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

14 demic and professional disciplines of science, tech-

15 nology, engineering, and mathematics.

16   (c) PREPARING EDUCATORS TO ENGAGE STUDENTS

17 IN MATHEMATICAL AND STATISTICAL MODELING.—The

18 Director shall provide grants on a merit-reviewed, com-

19 petitive basis to institutions of higher education, and non-

20 profit organizations (or a consortium thereof) for research

21 and development to advance innovative approaches to sup-

22 port and sustain high-quality mathematical modeling edu-

23 cation in schools operated by local education agencies, in-

24 cluding statistical modeling, data science, operations re-

25 search, and computational thinking. The Director shall en-

1 courage applicants to form partnerships to address critical

2 transitions, such as middle school to high school, high

3 school to college, and school to internships and jobs.

4   (d) APPLICATION.—An entity seeking a grant under

5 subsection (c) shall submit an application at such time,

6 in such manner, and containing such information as the

7 Director may require. The application shall include the fol-

8 lowing:

9   (1) A description of the target population to be

10   served by the research activity for which such grant

11   is sought, including student subgroups described in

12   section 1111(b)(2)(B)(xi) of the Elementary and

13   Secondary Education Act of 1965 (20 U.S.C.

14   6311(b)(2)(B)(xi)), and students experiencing home-

15   lessness and children and youth in foster care.

16   (2) A description of the process for·recruitment

17   and selection of students, educators, or local edu-

18   cational agencies to participate in such research ac-

19   tivity.

20   (3) A description of how such research activity

21   may inform efforts to promote the engagement and

22   achievement of students in prekindergarten through

23   grade 12 in mathematical modeling and statistical

24   modeling using problem-based learning with contex-

25   tualized data and computational tools.

1   (4) In the case of a proposal consisting of a
2 partnership or partnerships with 1 or more local
3 educational agencies and 1 or more researchers, a
4 plan for establishing a sustained partnership that is
5 jointly developed and managed, draws from the ca-
6 pacities of each partner, and is mutually beneficial.

7   (e) PARTNERSHIPS.—In awarding grants under sub-
8 section (c), the Director shall encourage applications that
9 include—

10   (1) partnership with a nonprofit organization or
11 an institution of higher education that has extensive
12 experience and expertise in increasing the participa-
13 tion of students in prekindergarten through grade
14 12 in mathematical modeling and statistical mod-
15 eling;

16   (2) partnership with a local educational agency,
17 a consortium of local educational agencies, or Tribal
18 educational agencies;

19   (3) an assurance from school leaders to making
20 reforms and activities proposed by the applicant a
21 priority;

22   (4) ways to address critical transitions, such as
23 middle school to high school, high school to college,
24 and school to internships and jobs;

1   (5) input from education researchers and cog-

2 nitive scientists, as well as practitioners in research

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

4 date in terms of content and pedagogy;

5   (6) a communications strategy for early con-

6 versations with parents, school leaders, school

7 boards, community members, employers, and other

8 stakeholders; and

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

10 boards, community members, and other stakeholders

11 to build skills in modeling and analytics.

12 (f) USE OF FUNDS.—An entity that receives a grant

13 under this section shall use the grant funds for research

14 and development activities to advance innovative ap-

15 proaches to support and sustain high-quality mathe-

16 matical modeling education in public schools, including

17 statistical modeling, data science, operations research, and

18 computational thinking, which may include—

19   (1) engaging prekindergarten through grade 12

20 educators in professional learning opportunities to

21 enhance mathematical modeling and statistical prob-

22 lem solving knowledge, and developing training and

23 best practices to provide more interdisciplinary

24 learning opportunities;

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

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

10   (A) missing or incorrect values;

11   (B) quantities of data that require choice
12   and use of appropriate technology;

13   (C) multiple data sets that require choices
14   about which data are relevant to the current
15   problem; and

16   (D) data of various types including quan-
17   tities, words, and images;

18   (4) taking a school or district-wide approach to
19 professional development in mathematical modeling
20 and statistical modeling;

21   (5) engaging rural local agencies;

22   (6) supporting research on effective mathe-
23 matical modeling and statistical modeling teaching
24 practices, including problem- and project-based
25 learning, universal design for accessibility, and ru-

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1 brics and mastery-based grading practices to assess

2 student performance;

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

4 service training resources to assist educators in

5 adopting transdisciplinary teaching practices within

6 mathematics and statistics courses;

7   (8) coordinating with local partners to adapt

8 mathematics and statistics teaching practices to le-

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

10 nity assets in order to support community-based

11 learning;

12   (9) providing hands-on training and research

13 opportunities for mathematics and statistics edu-

14 cators at Federal laboratories, institutions of higher

15 education, or in industry;

16   (10) developing mechanisms for partnerships

17 between educators and employers to help educators

18 and students make connections between their mathe-

19 matics and statistics projects and topics of relevance

20 in today's world;

21   (11) designing and implementing professional

22 development courses and experiences, including men-

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

24 online experiences;

1   (12) addressing critical transitions, such as
2   middle school to high school, high school to college,
3   and school to internships and jobs; and

4   (13) any other activity the Director determines
5   will accomplish the goals of this section.

6   (g) EVALUATIONS.—All proposals for grants under
7   this section shall include an evaluation plan that includes
8   the use of outcome oriented measures to assess the impact
9   and efficacy of the grant. Each recipient of a grant under
10 this section shall include results from these evaluative ac-
11 tivities in annual and final projects.

12 (h) ACCOUNTABILITY AND DISSEMINATION.—

13 (1) EVALUATION REQUIRED.—The Director
14 shall evaluate the portfolio of grants awarded under
15 this section. Such evaluation shall—

16 (A) use a common set of benchmarks and
17 tools to assess the results of research conducted
18 under such grants and identify best practices;
19 and

20 (B) to the extent practicable, integrate the
21 findings of research resulting from the activities
22 funded through such grants with the findings of
23 other research on student's pursuit of degrees
24 or careers in STEM.

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

2   180 days after the completion of the evaluation

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

4   Congress and make widely available to the public a

5   report that includes—

6   (A) the results of the evaluation; and

7   (B) any recommendations for administra-

8   tive and legislative action that could optimize

9   the effectiveness of the grants awarded under

10   this section.

11   (i) AUTHORIZATION OF APPROPRIATIONS.—For each

12 of fiscal years 2022 through 2026, there are authorized

13 out of funds appropriated to the National Science Founda-

14 tion, $10,000,000 to carry out the activities under this

15 section.

16 **SEC. 3. NASEM REPORT ON MATHEMATICAL AND STATIS-**

17   **TICAL MODELING EDUCATION IN PRE-**

18   **KINDERGARTEN THROUGH 12TH GRADE.**

19   (a) STUDY.—Not later than 60 days after the date

20 of enactment of this Act, the Director shall seek to enter

21 into an agreement with the National Academies of

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

23 ferred to as "NASEM") (or if NASEM declines to enter

24 into such an agreement, another appropriate entity) under

1 which NASEM, or such other appropriate entity, agrees

2 to conduct a study on the following:

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

4   plementation of mathematical modeling and statis-

5   tical modeling in elementary and secondary edu-

6   cation, including opportunities for and barriers to

7   use modeling to integrate mathematical and statis-

8   tical ideas across the curriculum, including the fol-

9   lowing:

10   (A) Pathways in mathematical modeling

11   and statistical problem solving from kinder-

12   garten to the workplace so that students are

13   able to identify opportunities to use their school

14   mathematics and statistics in a variety of jobs

15   and life situations and so that employers can

16   benefit from students' school learning of data

17   science, computational thinking, mathematics,

18   statistics, and related subjects.

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

20   lems, service-based learning. and internships for

21   connecting students with career preparatory ex-

22   periences.

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

24   performance-based learning and assessment.

1   (2) Characteristics of teacher education pro-

2   grams that successfully prepare teachers to engage

3   students in mathematical modeling and statistical

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

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

6   workforce.

7   (3) Mechanisms for communication with stake-

8   holders, including parents, administrators, and the

9   public, to promote understanding and knowledge of

10   the value of mathematical modeling and statistical

11   modeling in education.

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

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

14 NASEM or such other appropriate entity shall hold not

15 less than one public meeting to obtain stakeholder input

16 on the topics of such study.

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

18 shall require NASEM, or such other appropriate entity,

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

20 agreement, to submit to the Secretary of Education and

21 the appropriate committees of jurisdiction of Congress a

22 report containing—

23   (1) the results of the study conducted under

24   subsection (a);

1   (2) recommendations to modernize the proc-
2 esses described in subsection (a)(1); and

3   (3) recommendations for such legislative and
4 administrative action as NASEM, or such other ap-
5 propriate entity, determines appropriate.

6   (d) AUTHORIZATION OF APPROPRIATIONS.—For the
7 fiscal year 2022, there are authorized out of funds appro-
8 priated to the National Science Foundation, $1,000,000
9 to carry out the activities under this section.

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Ms. LOFGREN. Without objection, the bill is considered as read and open to amendment at any point.

I understand Mr. Baird would like to be recognized to strike the last word on behalf of the bill. Mr. Baird, you are recognized.

Mr. BAIRD. Thank you, Madam Chair. I want to thank the Committee for bringing up H.R. 3588 for consideration. This is an important piece of legislation, and I was proud to introduce with my friend from Pennsylvania, Congresswoman Chrissy Houlahan.

The *Mathematical and Statistical Modeling Education Act* provides a much-needed solution to improving the quality of STEM education in America. This legislation advances mathematical instruction by incorporating modern tools and contexts, including data, statistics, and computation. Mathematical modeling is currently taught on a limited basis, yet it is the foundation for the important work our Nation is addressing within research, development, and technological innovation.

In addition to being both a bipartisan and bicameral piece of legislation, this bill has the support of several organizations, including the American Mathematical Society and the Society for Industrial and Applied Mathematics. I am proud to lead this effort in providing for the security of America's global competitive edge, and I hope all Members will support this bill. Thank you again, Madam Chair, and I yield the balance of my time.

Ms. LOFGREN. The gentleman yields back. I'm pleased to recognize my colleague from California, I think the only Member of the House with a Ph.D. in mathematics, Dr. McNerney——

Mr. MCNERNEY. I want to thank the Chair.

Ms. LOFGREN [continuing]. To strike the last word.

Mr. MCNERNEY. I strike the last word. And somebody has to be a Ph.D. in math, Madam Chair, so I take that honor.

I speak in support of H.R. 3588, the *Mathematical and Statistical Modeling Education Act,* which will support research to innovate mathematical and statistical modeling education at the K through twelve level. I want to thank my colleagues Chrissy Houlahan, Jim Baird, Deborah Ross, and Jake Ellzey for also sponsoring this bill.

I've long been a champion for improving STEM education in the United States because I recognize that these skills have an increasing important role in the workplace. Mathematics and statistics underpin all of the STEM disciplines, especially as science and engineering are becoming increasingly computational and data-based. Advances in these fields will enable better understanding of complex systems and technology design, which will help solve societal health challenges in health, defense, energy, transportation, and others.

Many of the stimulated innovations of the previous decades have transformed the way we live and work, including the development of artificial intelligence, machine learning, and quantum computing, which rely on the mathematical and statistical concepts such as algorithms. It is for the same reasons that I've introduced a resolution making April as the Mathematical and Statistics Awareness Month, which with the goal of increasing public understanding of and appreciation for the mathematical and statistical sciences and transforming the STEM work force to become more inclusive and diverse.

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This bill, H.R. 3855, the *Mathematical and Statistical Modeling Education Act*, would direct the National Science Foundation to provide grants for research and development to advance innovation—innovative approaches in mathematical modeling, education in public schools. Funds may be used to train educators to develop curriculum and provide students with hands-on opportunities.

Education in mathematical statistical sciences is foundational and serves as a connective fabric for all the advances in science and engineering. These grant-based investments will be critical to engaging students early and keeping them interested in these fields throughout their lives. For this reasons—for these reasons, I urge my colleagues to support H.R. 3855—3588, excuse me, a little dyslexic there, but it's not an impediment to a math degree. And I yield back my time. Thank you.

Ms. LOFGREN. The gentleman yields back. I understand Ms. Ross would like to strike the last word. She is recognized for five minutes.

Ms. ROSS. Thank you very much, Madam Chair.

And I'm also proud to support H.R. 3588, the *Mathematics and Statistical Modeling Education Act*. Mathematical and statistical modeling are the underpinning of our livelihoods, contributing to everything from severe weather forecasting to predictions about the spread of COVID–19 and the health and prosperity of the oceans.

Despite the rapidly evolving pace of data science and modeling, there are troubling statistics about student attraction and retention in the STEM fields. Now more than ever we must do everything in our power to engage students from a young age in data science. Doing so will support new discoveries, match work force needs, and allow our industry to maintain leadership across sectors.

Recently, I had the opportunity to meet with Dr. Rachel Levy and discuss her contributions to the development of this legislation as an American Mathematical Society Congressional Fellow in Senator Hassan's office. This bill was informed by Dr. Levy's three decades of work in mathematical and statistical modeling with teachers and students spanning from kindergarten to industry. Now as the head of the North Carolina State University's Data Science Academy in my district, Dr. Levy continues to contribute to the principle that data science is for everyone.

We can further bolster our efforts like Dr. Levy's bypassing this bipartisan, bicameral bill to create a mathematical and statistical foundation for students of all backgrounds. I urge my colleagues to support the bill, and I yield back.

Ms. LOFGREN. The gentlelady yields back. Are there additional Members who wish to be heard on the underlying bill?

Hearing none, no amendments were noticed on the roster. Does anyone wish to offer an amendment at this time?

Hearing none, a reporting quorum being present, I move that the Committee on Science, Space, and Technology, report 35—H.R. 3588 to the House with the recommendation that the bill be approved.

Those who are in favor of this motion will signify by saying aye. Those opposed will say no.

In the opinion of the Chair, the ayes have it. The bill is favorably reported.

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Without objection, the motion to reconsider is laid upon the table. I ask unanimous consent that staff be authorized to make any necessary technical and conforming changes to the bill. And without objection, that is so ordered. Members will have two subsequent calendar days in which to submit supplemental minority or additional views on the measure.

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