BHEF BUSINESS-HIGHER EDUCATION FORUM®

Creating Solutions. Inspiring Action.®

Confronting the STEM Challenge:
A New Modeling Tool for
U.S. Education Policymakers

Questions and Answers About the BHEF U.S. STEM Education Model

Q: Why Should People Care About STEM?

A: Science, technology, engineering, and mathematics (STEM) are vital to American innovation and competitiveness, yet relatively few U.S. students obtain STEM bachelor's degrees. While the number of degrees awarded in the STEM fields has increased modestly over the last decade, only 15.6 percent of bachelor's degrees were awarded in these fields in 2007, and the overall share of degrees awarded in STEM fields actually decreased during the past five years.

Meanwhile, our major competitors are ramping up their education systems, and focusing on STEM education as a means to bolster their economic competitiveness. This relative dearth of U.S. STEM graduates led BHEF in 2005 to launch its Securing America's Leadership in Science, Technology, Engineering, and Mathematics Initiative, with the goal of doubling the number of U.S. STEM graduates.

Q: What is the BHEF U.S. STEM Education Model?

A: The BHEF U.S. STEM Education Model, developed by Raytheon Company and gifted to BHEF in 2009, is the centerpiece of BHEF's STEM Education & Modeling Project, which is designed to help increase the number of students who pursue majors and careers in STEM fields. The Model is a simulation model that incorporates census data and standardized test scores to track the flow of students through the K-16 education system and into careers in STEM teaching or STEM industries. The Model is free and available in open source for use by the public through **www.stemnetwork.org**, and is managed by a partnership among BHEF, Raytheon and The Ohio State University's (OSU) Battelle Center for Mathematics and Science Education Policy. **BHEF has released a new report on the Model called**, *"Increasing the Number of STEM Graduates: Insights from the U.S. STEM Education & Modeling Project."* To read the report, go to **www.bhef.com/publications**.

Q: What is Significant About the Model?

A: The BHEF U.S. STEM Education Model is the first simulation model to examine the U.S. education system using system dynamics principles and tools. Specifically, the Model allows users to test various scenarios to determine whether they have the potential to increase the number of students choosing to major and graduate in STEM disciplines.

As the report *"Increasing the Number STEM Graduates: Insights from the U.S. STEM Education & Modeling Project"* suggests, the Model has provided a number of powerful insights, several of which are captured on the following page. Both the Model and the overall approach aim to foster the development of a knowledge base that allows the diverse community of stakeholders, including policymakers, funders and educators, to examine a range of issues and potential solutions that focus on increasing interest and proficiency among students in STEM majors and careers, as well as meet the dynamic needs of the STEM workforce.

Q: What Are the Next Steps?

A: As a result of the development and testing of the Model, BHEF plans to adapt it and extend the approach to examine other contexts and related issues. For example, BHEF and its partners, including Raytheon and Ohio State, are launching a State STEM Education Modeling Project that will adapt the existing national Model for use by states. In addition, BHEF is applying the modeling approach to examine issues related to changing STEM industry and workforce demands, the role of community colleges, and challenges related to STEM graduate education.

Q: How Can I Access the Model and Join the Effort?

A: Visit **www.STEMnetwork.org** to download the Model or access the Web–based interface on the Forio platform. You also may log onto this site to join the STEM Research and Modeling Network, receive updates about the modeling work, and participate in Webinars.

Solutions to the STEM Challenge:
# Insights from the BHEF U.S. STEM Education Model

Increasing the number of STEM college graduates will require:

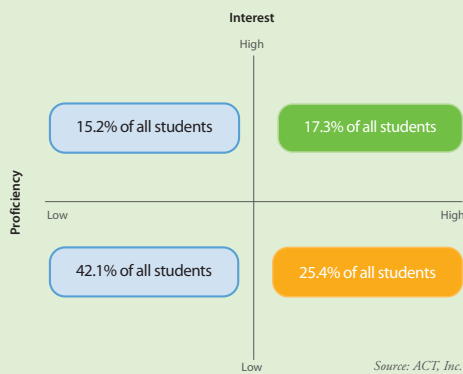### 1 | Improving STEM Undergraduate Education
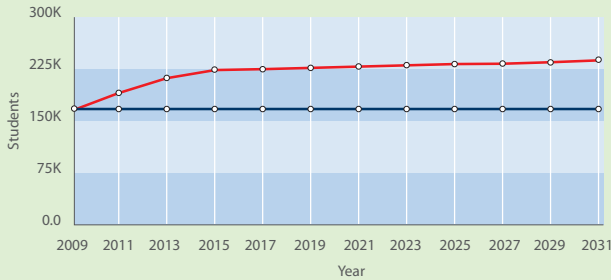
The Model highlights the importance of strengthening STEM undergraduate education as the highest leverage strategy to meet employers' immediate STEM workforce needs. This simulation result points to the potential increase in STEM college graduates from scaling up cohort programs, which build strong social networks among students by grouping them through courses and other activities.

### 2 | Increasing the Number of STEM Capable Teachers
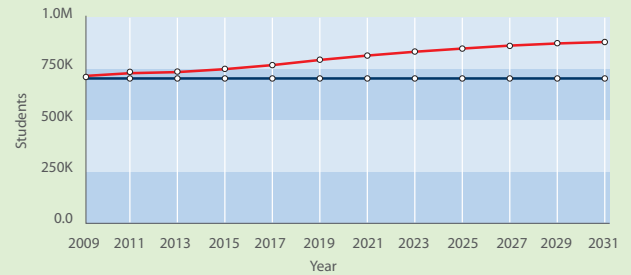
The Model shows that increasing the number of teachers who are "STEM-capable" can result in increased numbers of high school students prepared to go into STEM fields. Nevertheless, the gains take many years to realize.

3 | Increasing Student Interest in STEM

Interest
High

15.2% of all students	17.3% of all students

Proficiency
Low — High

42.1% of all students	25.4% of all students

Low

Source: ACT, Inc.

Data from ACT indicate that fewer than one in five students are both interested and proficient (17.3%) in STEM subjects. A focus on increasing the pool of students who demonstrate high proficiency in math but low interest in STEM (25.4%) provides fertile opportunity to enlarge the pool of students who may choose and succeed in STEM majors.

4 | A Strategy That Integrates These Approaches into a Mutually Reinforcing P-16 STEM Education Improvement Agenda
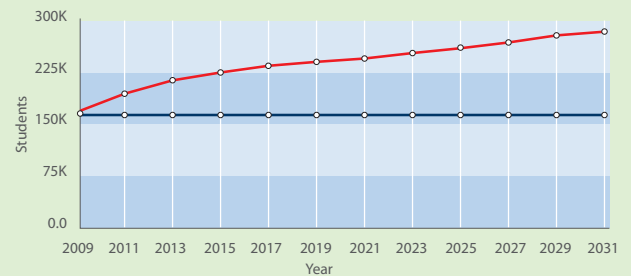
This result shows how simultaneously combining the first two approaches above results in greater numbers of college graduates than when either strategy is pursued in isolation. This is due to the additive effects of the increased number of K-12 students who are proficient in STEM when entering college.

The Business-Higher Education Forum

BHEF is an organization of Fortune 500 CEOs, prominent college and university presidents, and foundation leaders working to advance innovative solutions to our nation's education challenges in order to enhance U.S. competitiveness. BHEF addresses education issues fundamental to our nation's ability to compete globally with two major initiatives:

» **The Securing America's Leadership in Science, Technology, Engineering, and Mathematics (STEM) Initiative**, promoting America's leadership in STEM.

» **The College Readiness, Access, and Success Initiative (CRI)**, addressing college/work readiness and success.

BHEF and its members work to influence public policy and inspire other corporate, academic, and foundation leaders to act. BHEF also conducts research to create solutions and to identify strategies and policy reforms that the organization and its members advance directly and with partner organizations.

For information on:

» The Model, see: *Increasing the Number of STEM Graduates: Insights from the U.S. STEM Education & Modeling Project* at **www.bhef.com/publications**

» The STEM and CRI Initiatives, go to **www.bhef.com/solutions**

» To run the model go to **www.forio.com/simulate/bhef/u-s-stem-education-model/overview**

» Research and BHEF publications, including, *"An American Imperative: Transforming the Recruitment, Renewal, and Retention of our Nation's Mathematics and Science Teaching Workforce,"* go to **www.bhef.com/publications**

» How to make a positive impact on, and invest wisely in, the pre-school through graduate school pipeline, go to **www.StrategicEdSolutions.org**®

BHEF BUSINESS-
HIGHER EDUCATION
FORUM®

Creating Solutions. Inspiring Action.®

Business-Higher Education Forum | 2025 M Street NW, Suite 800 | Washington, DC 20036
Tel: 202-367-2269 | Fax: 202-367-2269 | www.bhef.com