STEM Education of the Future
A Visioning Report

Directorate for Education and Human Resources

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STEM Education in a rapidly changing scientific, social, virtual and physical landscapes

Nature of STEM

Nature of Work

Workforce Skills

National Demographics
EHR Advisory Committee: Subcommittee on STEM Education of the Future

Dr. Margaret Honey (Chair)  
President & CEO  
New York Hall of Science

Dr. Bruce Alberts  
Chancellor's Leadership Chair in Biochemistry and Biophysics for Science and Education  
University of California, San Francisco

Dr. Hyman Bass  
Samuel Eilenberg Distinguished University Professor, Mathematics; Professor, School of Education  
University of Michigan

Dr. Carlos Castillo-Chavez  
Emeritus and Founding Director of the Simon A. Levin Mathematical and Computational Modeling Sciences Center  
Arizona State University

Dr. Okhee Lee  
Professor of Childhood Education, Department of Teaching and Learning  
New York University-Steinhardt

Dr. Francisco Rodriguez (Ex-Officio Member)  
Chancellor  
Los Angeles Community College District

Dr. Marilyn M. Strutchens  
Emily R. & Gerald S. Leischuck Endowed Professor; Mildred Cheshire Fraley Distinguished Professor, Department of Curriculum and Teaching  
Auburn University

Dr. Laurel Vermillion  
President  
Sitting Bull College

EHR Liaisons: Alexandra Medina-Borja (Executive Secretary); Robin Wright (DUE)
Subcommittee Timeline

- Fall 2017 EHR AC Meeting Formed
- March 2018 Charge Delivered
- 2018-2019 Eight Meetings
- Fall 2019 EHR AC Meeting Draft Report
- Spring 2020 EHR AC Meeting Final report
Contributors and Thought Partners

Dr. Jim Spohrer
Director of Cognitive OpenTech at IBM
*The future of technology and impact on Education* (April 25, 2018)

EHR/NSF Program Officers
*INCLUDES, CYBERLEARNING, ATE, IGE, FW-HTF, IUSE, CS-FOR-ALL* (May 31, 2018)

Dr. Christine Ortiz
Graduate Dean at MIT; Founder of Station 1
*The Future of the Research University: Promise and Peril* (May 31, 2018)

STEM Education Innovators (September 10-11, 2019)
- Dr. Larry Rosenstock – Emeritus & Founding CEO, High-Tech High
- Dr. Mark Somerville – Dean of Faculty, Olin College
- Dr. Josh Fost - Vice Provost of Academic Innovation, Minerva Schools
- Dr. Arthur Heinrichler – Dean of Undergraduate Studies, Worcester Polytechnic Institute
- Dr. Ann Mckenna - Vice Dean of Strategic Advancement, Arizona State University

Panel: Designing Higher Education Systems Founded on Access and Equity (October 16, 2019)
- Dr. Maria Klawe – President, Harvey Mudd College
- Dr. Claude M. Steele – Professor, Stanford University
- Mr. Antonio Perez, Engineering Student, Olin College (see [https://www.youtube.com/watch?v=ywAliVKhbs](https://www.youtube.com/watch?v=ywAliVKhbs))
Vision for STEM Education of the Future

https://www.nsf.gov/news/mmg/media/images/PF7224_flate_h.jpg
Priority 1: Provide pathways into STEM careers for learners at all stages of their education.

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<th>Challenge</th>
<th>Actions</th>
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<td>Uneven access to high quality STEM education</td>
<td>Create opportunities for all students to receive high-quality STEM education</td>
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<td>Persistent, complex dynamics of bias in STEM</td>
<td>More research to determine interventions that promote access, equity, and inclusion</td>
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<td>Changing pathways into STEM jobs</td>
<td>Students acquire core 21st century competencies (adaptability, flexibility, collaboration, learning, etc.)</td>
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<td>STEM education needed across the lifespan</td>
<td>Educators need to understand how people learn from Pre-K through adulthood</td>
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<td>Lack of diversity of thought and human capital in U.S. STEM graduate programs</td>
<td>Graduate education should enable students to acquire core 21st century research; increased entry of domestic students into research careers</td>
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Priority 2: Build an Ethical STEM workforce with future-proof skills.

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<td>Advances in 21st century technologies present ethical issues and require new creative thinking.</td>
<td>STEM education must prepare our workforce to innovate and work with modern technologies, and also to consider their societal effects.</td>
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Priority 3a: Enhance the use of technological innovations in both in-person and virtual learning spaces.

Priority 3b: Prepare educators to provide rich learning experiences for all students.

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<td>Understand how virtual distance learning environments affect cognition and learning.</td>
<td>Research is needed to build a deeper understanding of the possibilities of virtual and hybrid distance learning environments, from how they affect the development of skills and abilities, to the pedagogies and curriculum that work best.</td>
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STEM Education Research Agenda

Diversity, equity, inclusion
Online/virtual learning
Lifelong learning

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Professional development for faculty and teachers

A Vision for STEM Education of the Future

Equitable and Inclusive

Powered by evidence-based instruction and technology

Across all life stages and key transitions

Personalized, project-based, and learner-centered

21st century skills oriented
FIGURE 2: MISSING MILLIONS: FASTER PROGRESS IN INCREASING DIVERSITY NEEDED TO REDUCE SIGNIFICANT TALENT GAP

While the number of people from under-represented groups in the S&E workforce has grown over the past decade, much faster increases will be needed for the S&E workforce to be representative of the U.S. population in 2030. To achieve that goal, the NSB estimates that the number of women must nearly double, Black or African Americans must more than double, and Hispanic or Latinos must triple the number that are in the 2020 U.S. S&E workforce. These estimates are based on projections from the U.S. Census and Bureau of Labor Statistics, together with data from the National Center for Science and Engineering Statistics, and assume that participation of these groups in the S&E workforce increases at current rates.

Legend

- Women

- Hispanic or Latino

- Black or African American

- × 100,000 people in 2020 S&E workforce

- × 100,000 additional people needed in 2030 for the S&E workforce to representative of the U.S. population
NASEM Forum on Postsecondary Response to COVID-19

How can researchers help the ... The National Academies

How can and are laboratories ... The National Academies

How can we crowd-source sci... The National Academies

How can we provide policy ad... The National Academies

https://vimeo.com/showcase/6986200
Help Shape the Vision and Priorities for STEM Education in the Future

What should our ambitions be for 2040?

What should we do to achieve them?

…we must consider the entire education ecosystem so that children of all backgrounds, race, ethnicity, gender, religion and income levels can learn the wonders and possibilities of STEM and maintain that interest and passion throughout their lives.”