CHALLENGES FOR TODAY'S SCIENCE EDUCATORS

STEM EDUCATION COALITION
POLICY • FORUM
Science Technology Engineering Mathematics

Thanks to Our Co-Sponsors:

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NCSSS National Consortium of Secondary STEM Schools
swe Society of Women Engineers
NSBE National Society of Black Engineers
ETS
AFTERSCHOOL STEM HUB
SASA Student Association for STEM Advocacy
nsta National Science Teaching Association
EDC Education Development Center
COMAP
LEGO education
ASTC Association of Science and Technology Centers
BATTELLE
STEMx™
bp


nsta
National Science Teaching Association
NCTM
NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS
ExxonMobil
swe
Society of Women Engineers
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NCSSS
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Dr. Heidi Schweingruber

Director, Board on Science Education, National Academies of Science, Engineering and Medicine

NATIONAL ACADEMIES
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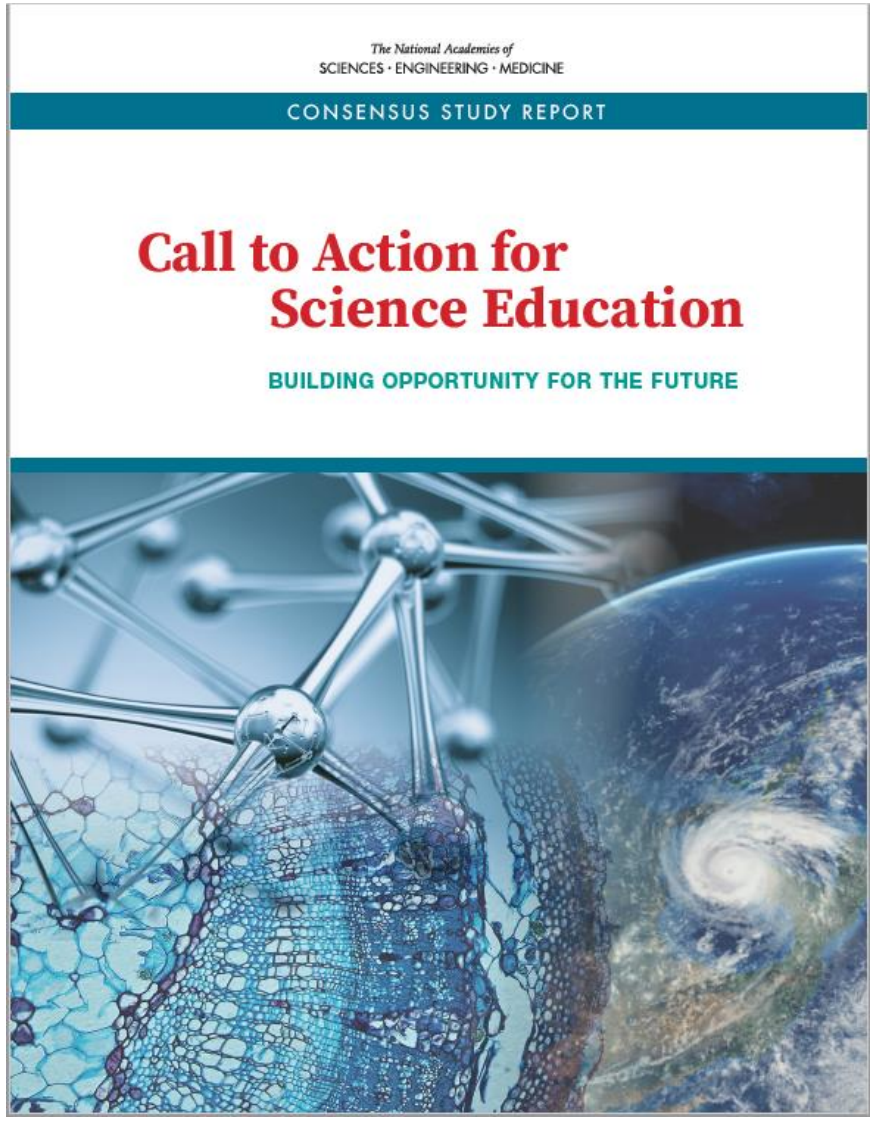
Challenges for Today's Science Educators

Heidi Schweingruber, Director

Board on Science Education



Scientific thinking and understanding are essential for all people navigating the world, not just for scientists and other science, technology, engineering, and mathematics (STEM) professionals.

Better, More Equitable Science Education – A National Priority

Supported by the Carnegie Corporation of New York

NATIONAL ACADEMIES Sciences Engineering Medicine

Key Issues in Science Education Broadly

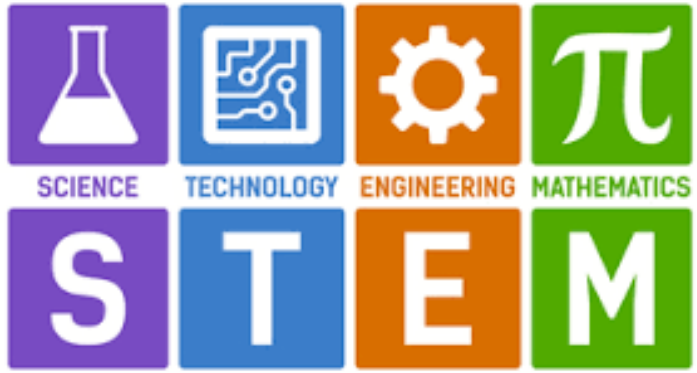
1. Elementary science – lack of time and seen as low priority
2. Inequitable access to high quality instruction (for both K-12 & in post-secondary)
3. Inequitable access to advanced coursework and supportive pathways from middle school into post-secondary
4. Shortage of science teachers (recruitment and retention)
5. Lack of diversity in teaching workforce
6. Lack of professional development opportunities in science

Action Areas

1: Elevate the Status of Science Education

2: Establish Local and Regional Alliances for STEM Opportunity

3: Document Progress Toward Better, More Equitable Science Education



Strengths to Build On

- Common direction and vision
  - 48 states have adopted standards based on the *Framework for K-12 Science Education*
  - New NAEP framework just released reflects this approach, so policy levers are moving in the same direction
- Emergence of aligned science curricula (some open source)
- Growing emphasis on effective approaches to professional development

NATIONAL ACADEMIES Sciences Engineering Medicine

On-going work of the Board on Science Education

Two congressionally mandated studies:

- Evidence-based PreK-12 STEM education innovations
- Prek-12 STEM Education and Workforce Development in Rural Areas

Other studies:

- Computing and datascience in K-12 education
- Equity in Prek-12 STEM education
- Equitable and effective teaching in undergraduate STEM education

Peter McLaren

Executive Director, Next Gen Education, LLC

Challenges for Today's Science Educators – A Perspective from the Field

Peter McLaren – Executive Director

Next Gen Education LLC

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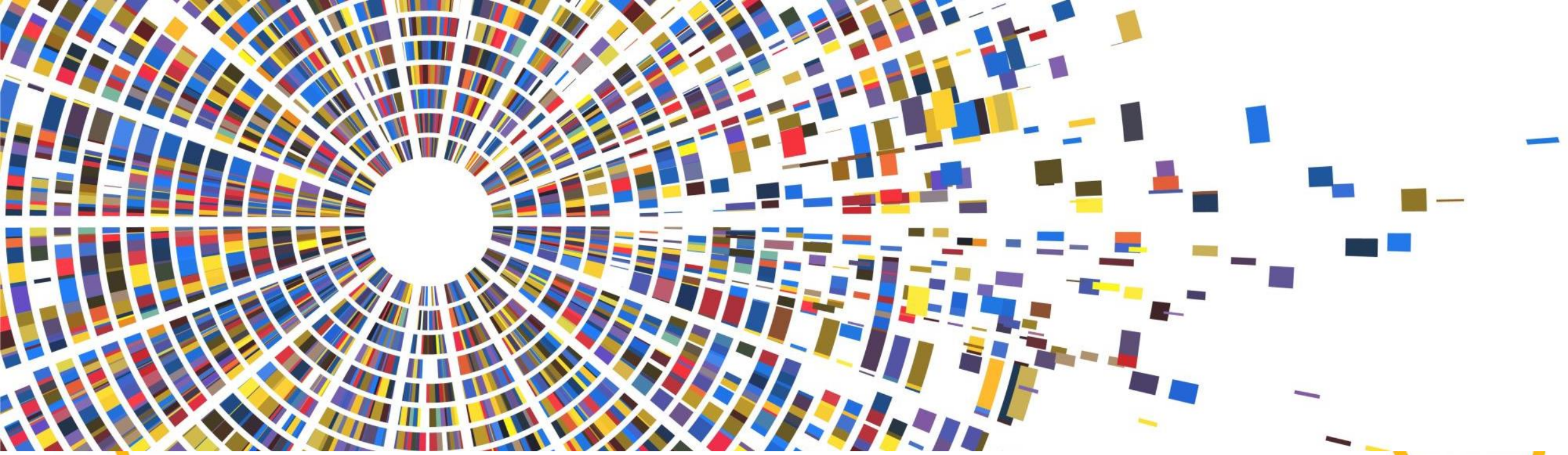
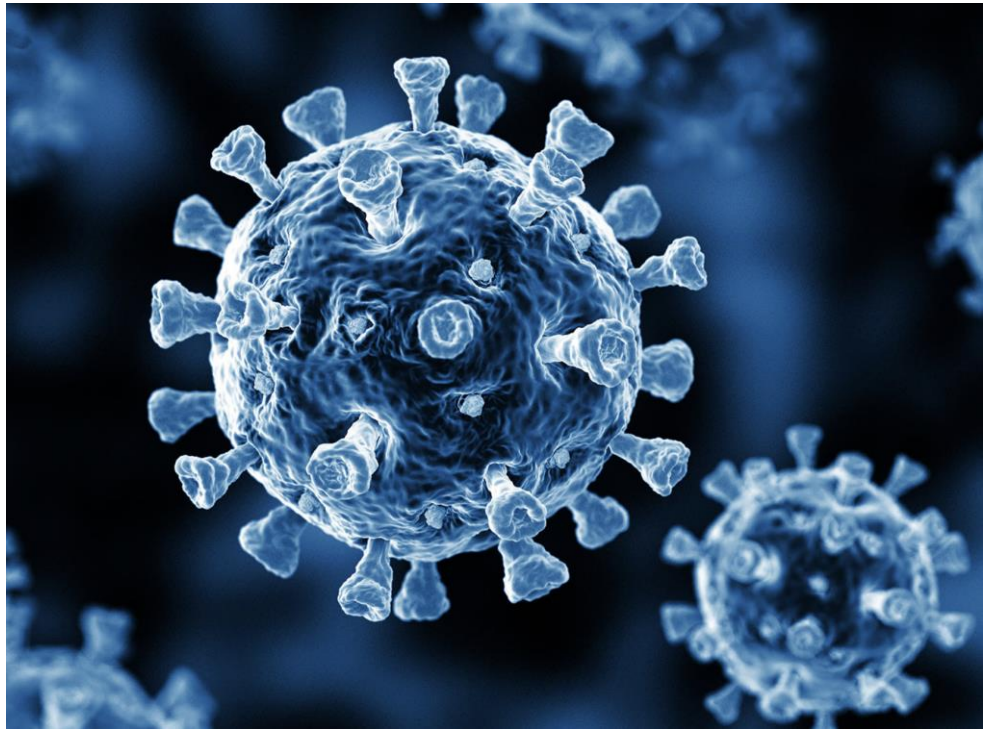
Who Am I?

Peter McLaren is the executive director of Next Gen Education, LLC and works as a consultant with states and districts in support of the implementation of the Next Generation Science Standards and other three-dimensional state science standards based on the *Framework for K-12 Science Education* (NRC, 2012). In his previous work, Peter served in several roles in science education policy including Director of the State and District Support for Science at Achieve, Science and Technology Specialist at the Rhode Island Department of Education, and President of the Council of State Science Supervisors (CSSS), serving as President from July 2010 until April 2013. McLaren was also a member of the NGSS Writing Team concentrating in the area of middle school physical science.



Let’s Not Forget What We Learned

Science Teaching in the Post Covid World



Starting Over – Implementing three-dimensional teaching and learning

Engaging students using phenomena and problem solving

Student collaboration and discourse along with teacher questioning and prompting.

Time and Resources – Its All About Equity

- *Equity refers to all students having equitable time spent:
  - with science learning both inside and outside of the classroom;
  - equitable access to learning resources and materials;
  - and equitable exposure to instructors trained in relevant science subject areas as well as culturally and linguistically responsive pedagogy.
- *Equity is also about helping all students develop the skills they need for a successful future and the opportunity to pursue and succeed in jobs.
- Whereas new three-dimensional science standards do not require a higher budget than traditional science it DOES require more teacher professional development.

* Cited from Call to Action for Science Education – Building Opportunity for the Future

Inclusion of Science in State Accountability Systems

- Prioritization of ELA and Math in accountability affects:
  - Instructional minutes for science and other subjects
  - Budgeting for instructional materials, professional development, and high-quality and equitable learning opportunities for students in science
- Only 24 states include science as part of their accountability system
  - AR, CO, CT, FL, GA, IL, KY, LA, MD, MA, MS, MO, NE, NM, NY, NC, OH, RI, TN, TX, UT, VT

Recommendations

- With the next ESSA Reauthorization Include science as an indicator of academic achievement within the legislation.
  - All states need to include science in their accountability systems for K-12 education.
    - Build a system of assessments for science as well as key indicators to be able to provide information on school, district, and state progress.
    - Serve aa a driver for professional learning, instructional practice, classroom and state assessment, and high-quality instructional materials
    - Used in concert with ELA and Math Science accountability signals the importance of STEM for our students' future learning pathways as well as their careers.
    - Science understanding metrics is not purely based upon regurgitating facts but using science and engineering practices and crosscutting concepts so that students gain conceptual understanding.
    - Provide equitable science education K-12

Challenges for Today's Science Educators – A Perspective from the Field

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Leslie Brooks

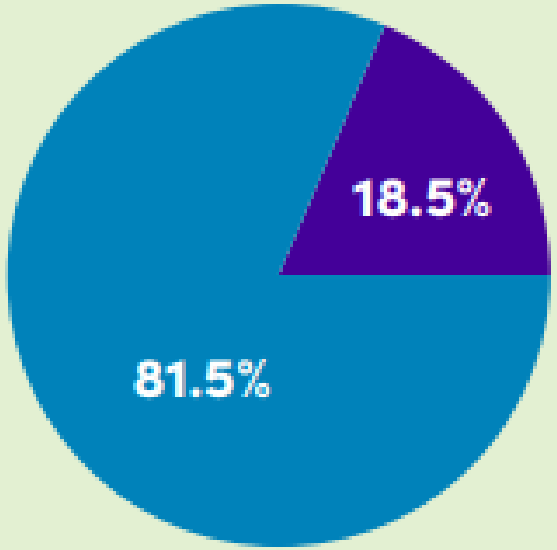
STEM Hub Manager, Afterschool Alliance

AFTERSCHOOL STEM HUB

Afterschool STEM Educators

And Their Role in the STEM Learning Ecosystem, Impact, & Needs

LEARNING DOESN'T JUST HAPPEN IN SCHOOL



The LIFE Center Lifelong and Lifewide Learning Diagram

Afterschool serves **7.8 million** youth

73% include STEM learning

Unique Benefits of High-Quality Afterschool STEM:

- Extra time to explore
- Freedom to fail
- Chance to follow spark

SPARKING INTEREST, INSPIRING CAREERS

An analysis of 160 afterschool STEM programs across 11 states found that among the nearly 1,600 participating students:[10]

80% made positive gains in science career knowledge

78% increased interest in STEM

73% increased their "science identity"—a personal belief that one can succeed at science

Allen, P., Noam, G., Little, T., Fukuda, E., Chang, R., Gorrall, B., Waggenspack, L. (2016). Afterschool & STEM: System-building evaluation. The PEAR Institute

Recruiting and/or retaining staff remains difficult for programs

A majority of program providers continue to report hiring staff, retaining staff, or both is very or somewhat difficult:

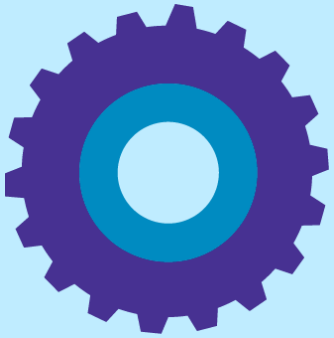
Fall 2023	57%
Spring 2023	57%
Fall 2022	67%
Spring 2022	68%
Fall 2021	74%

Top 3 reasons for difficulties:

1. Difficult to compete with salaries/wages offered by other companies (71%)
2. Staff burnout (57%)
3. Inability to offer more hours to staff (52%)

Steps taken to attract/retain staff:

Increased hourly wages and/or salaries	60%
Provided additional PD opportunities	43%
Provided free childcare for staff	21%
Provided sign-on bonuses	18%
Created more full-time positions	17%
Provided additional paid time off	14%
Provided additional/new health and/or dental benefits	11%

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Alaska
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Policy Recommendations: STEM-Specific

- Fund research that quantifies cost of quality comprehensive afterschool STEM learning programs, including the cost of quality professional development.
- Ensure adequate funding is made available through set-asides and PD/TA-specific funding streams.
- Establish policies that support and promote content area experts to work part-time in afterschool programs.
- Support non-regulatory guidance that enables different staff hiring mechanisms and make-up.

Being able to explore my interests in extracurriculars has been essential to my understanding of the school curriculum and my personal development as a person. I've met so many people and have been a part of so many experiences that have molded my dreams of pursuing a STEM career.

Alyssa B, 11th grade, Delaware

MILLION GIRLS MOONSHOT
A STEM NEXT INITIATIVE

Afterschool STEM Hub website

LinkedIn

THANK YOU!

Dr. Kimberly Hughes

Director, UTeach Institute, University of Texas at Austin

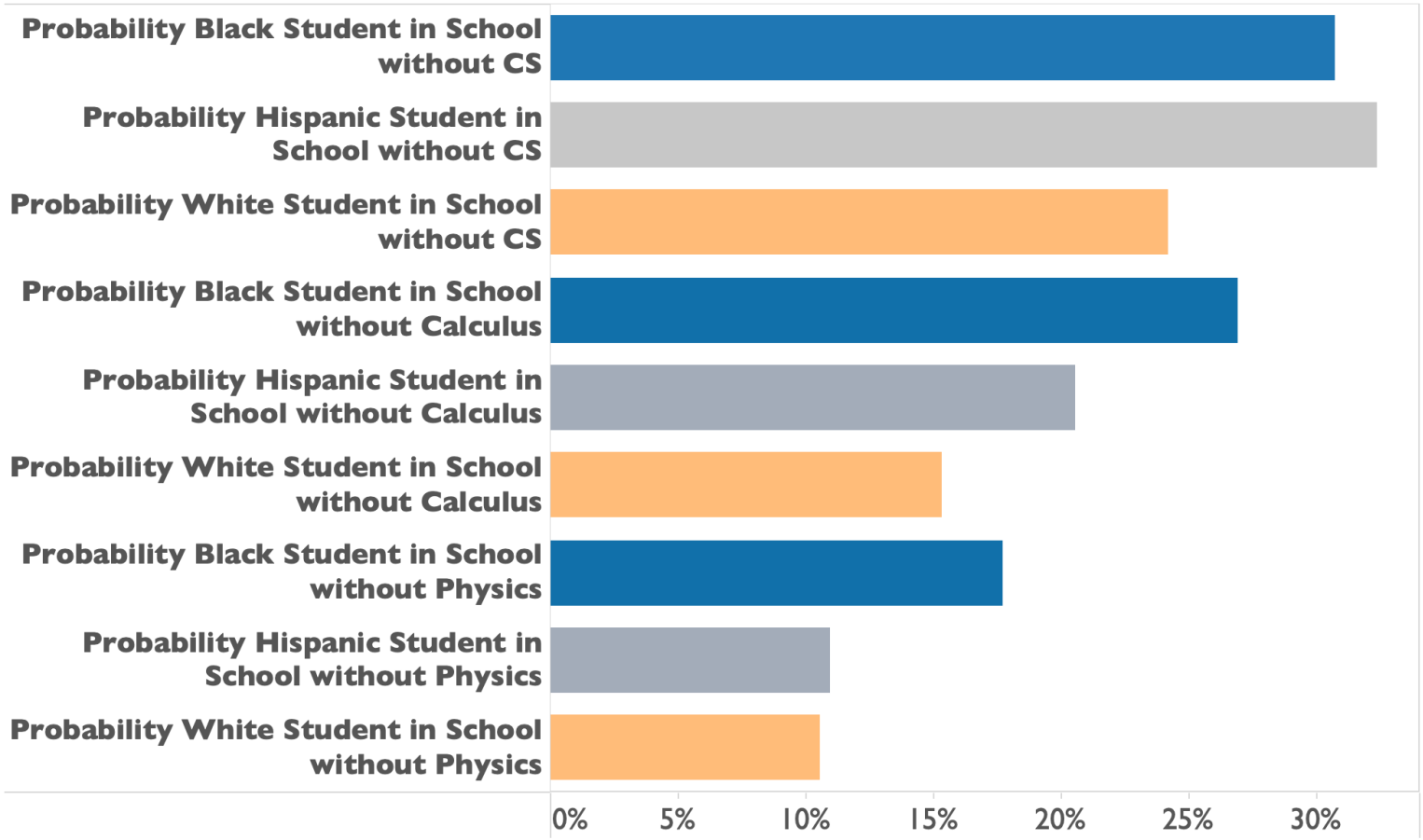
U.S. Science Teacher Preparation: Quality Matters

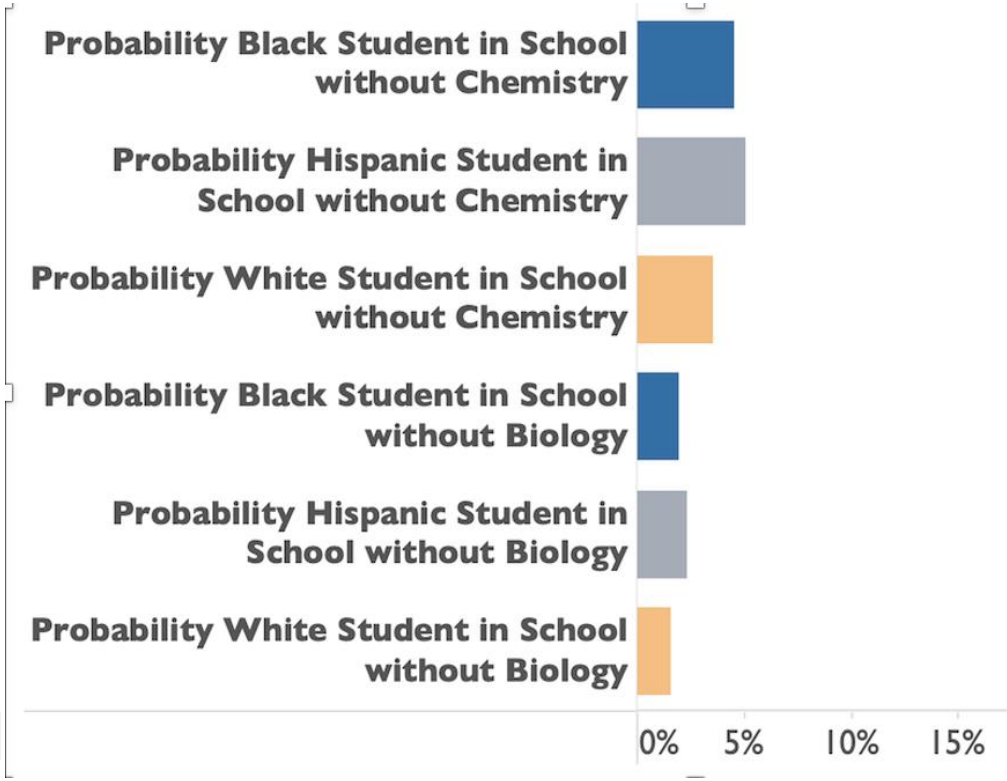
The University of Texas at Austin
WHAT STARTS HERE CHANGES THE WORLD

KIMBERLY HUGHES
DIRECTOR, UTEACH INSTITUTE
THE UNIVERSITY OF TEXAS AT AUSTIN

Jnee 2023

PROBABILITY OF BEING IN SCHOOL WITHOUT ACCESS TO STEM COURSES





CRDC 19-21

Michael Marder, UTeach Executive Director

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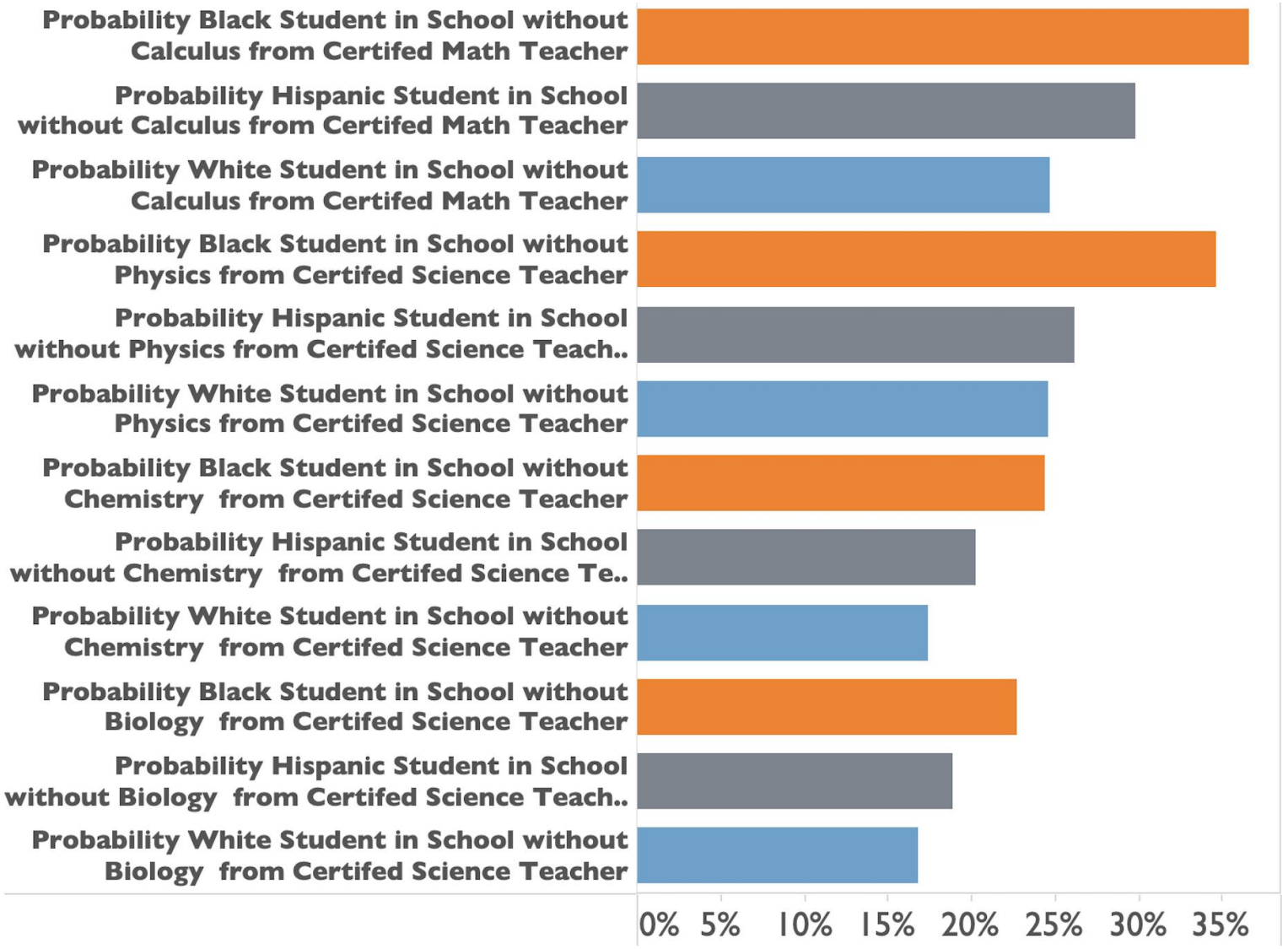
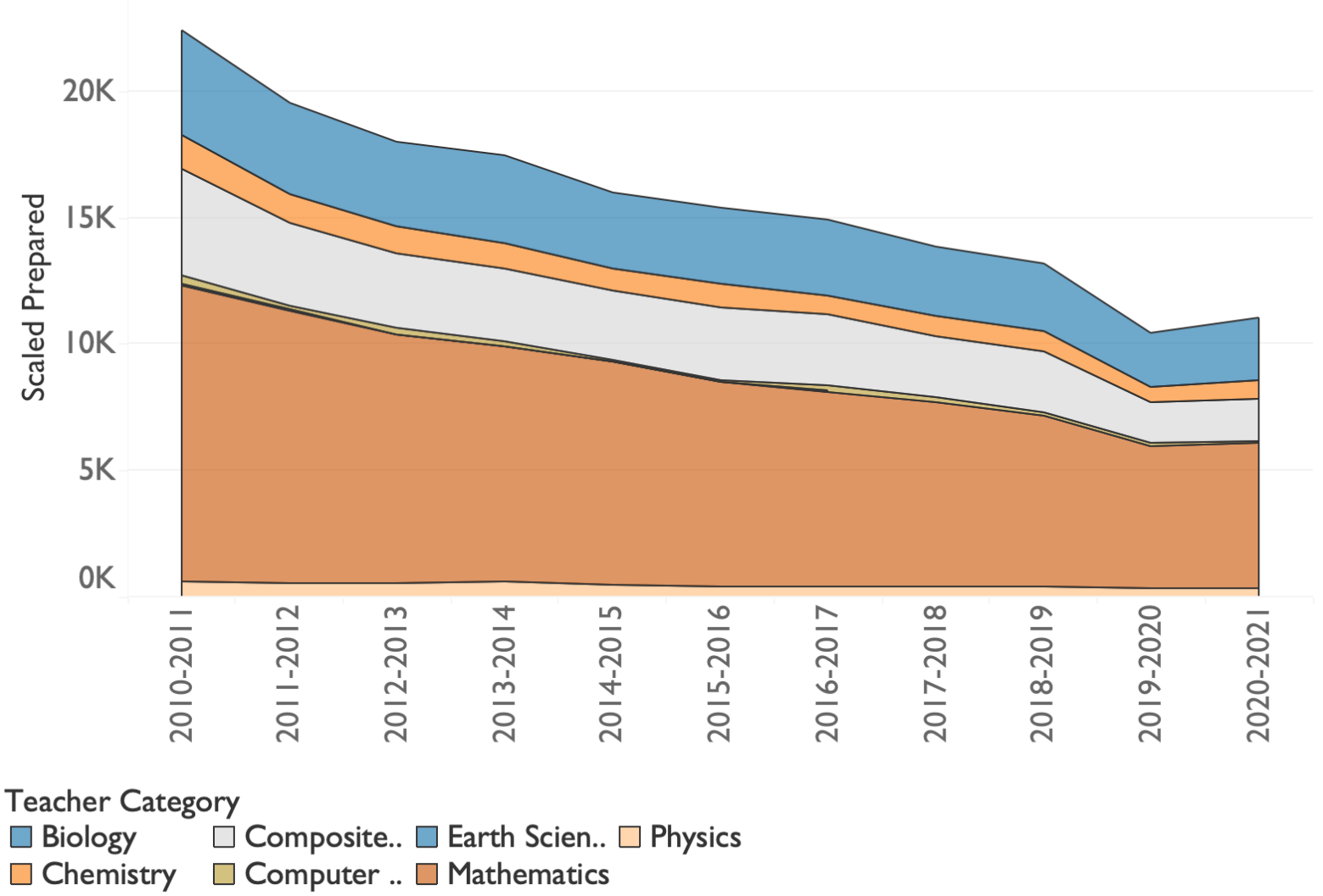


CRDC 19-21

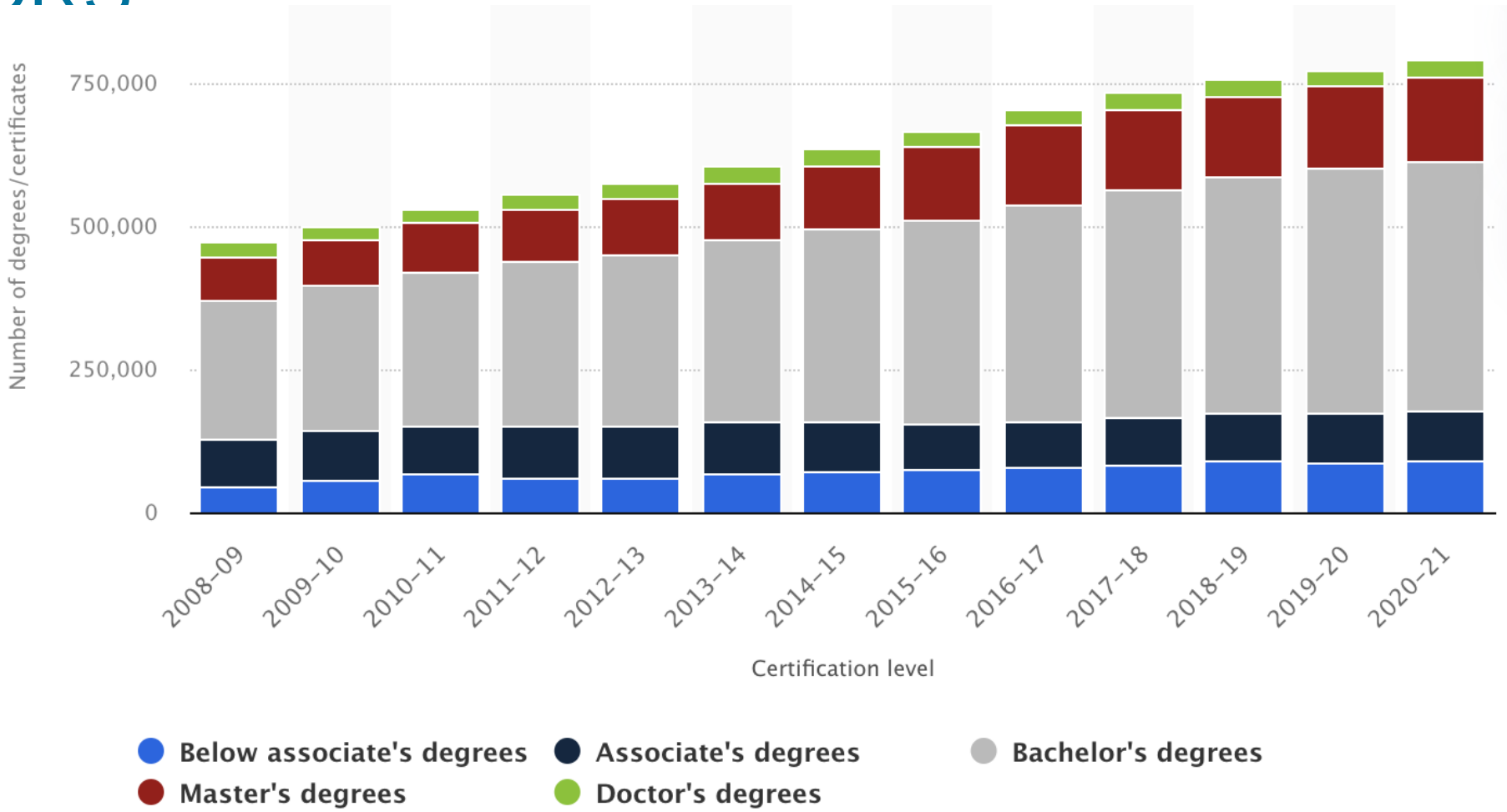
Michael Marder, UTeach Executive Director

STEM TEACHER PREPARATION HAS DECLINED BY 50%

US STEM teacher production, 2011-2021

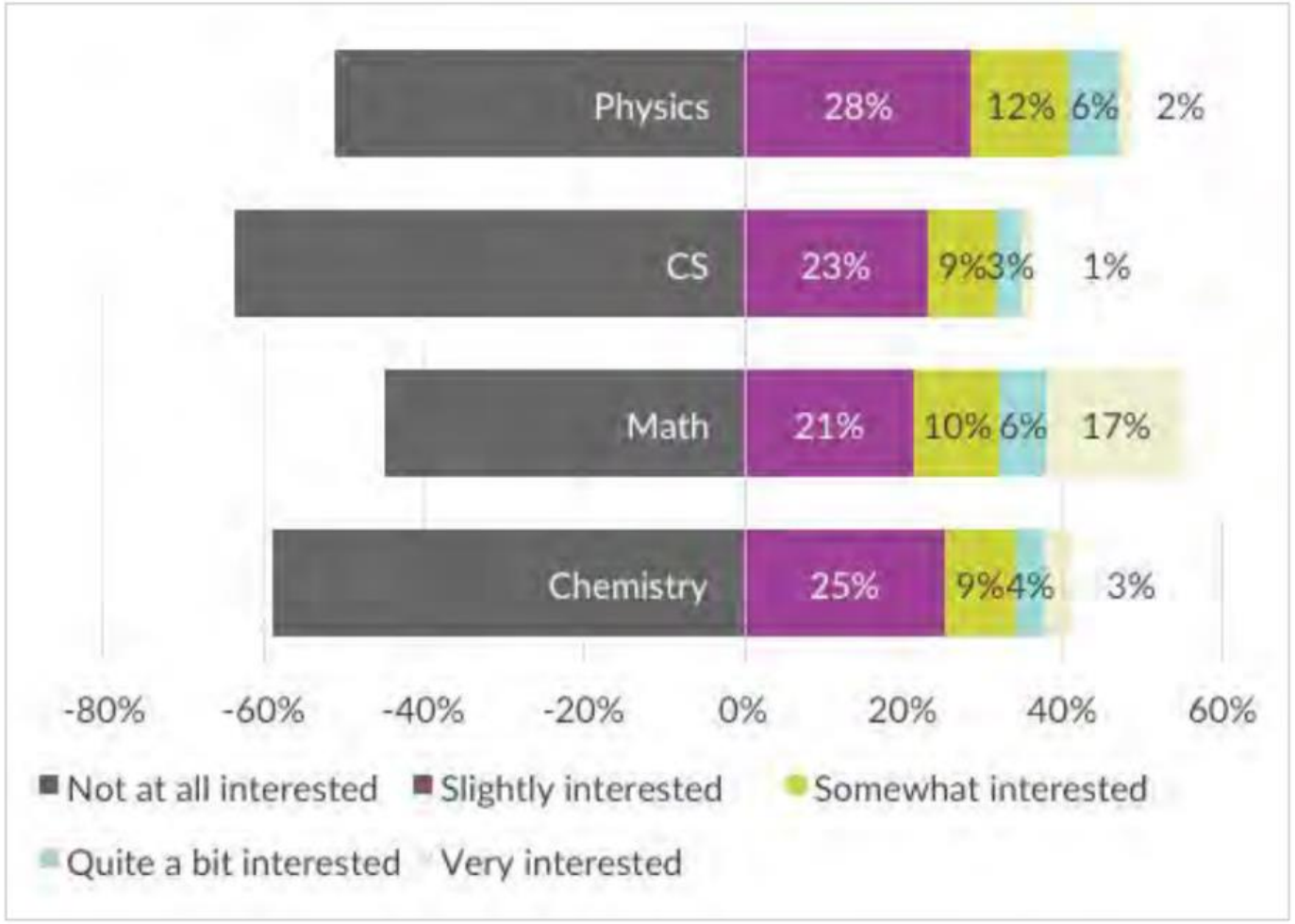


UNTAPPED CAPACITY: UNDERGRADUATE STEM MAJORS



Digest of Education Statistics, 2022

STEM MAJORS ARE INTERESTED IN TEACHING



Undergraduates respond to the question "How interested are you in being a middle or high school teacher [POPA, Marder, Brown and Plisch, 2017]

Dr. Florentia Spires

STEM Instructional Leader, Prince George's County, Maryland

Diversity and STEM 2011 and 2021

Data provided by: NSF and NCSES 1/30/2023

Figure 2-2

STEM workforce ages 18–74, by sex, ethnicity, race, and disability status: 2011 and 2021

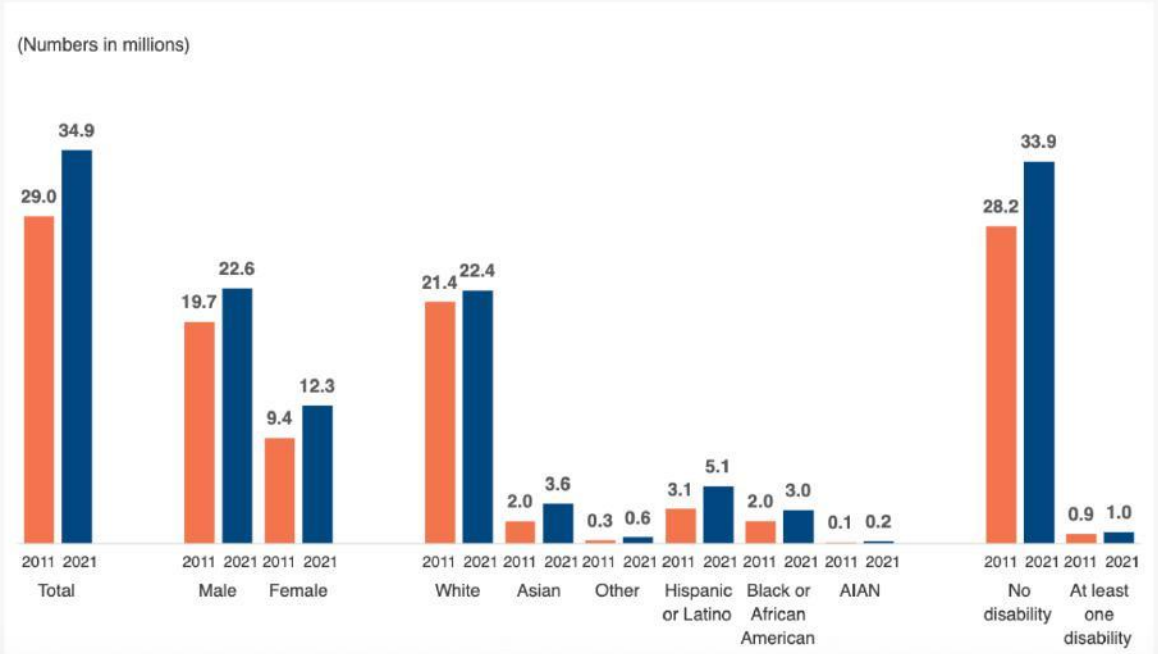
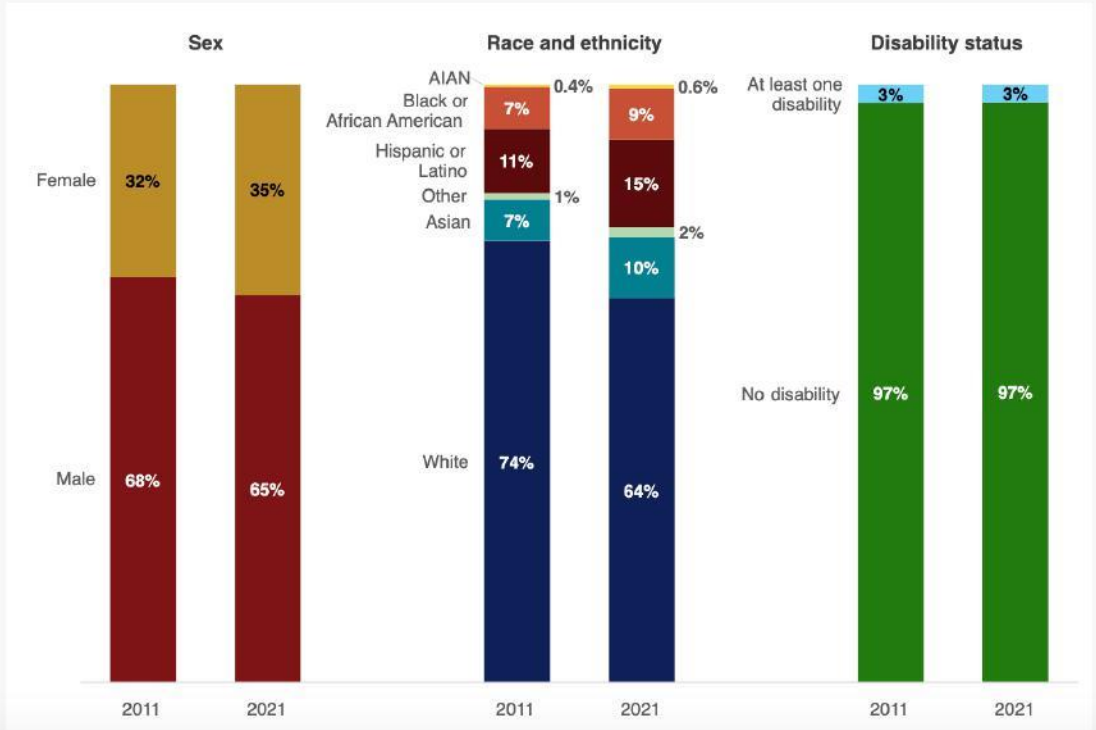


Figure 2-3

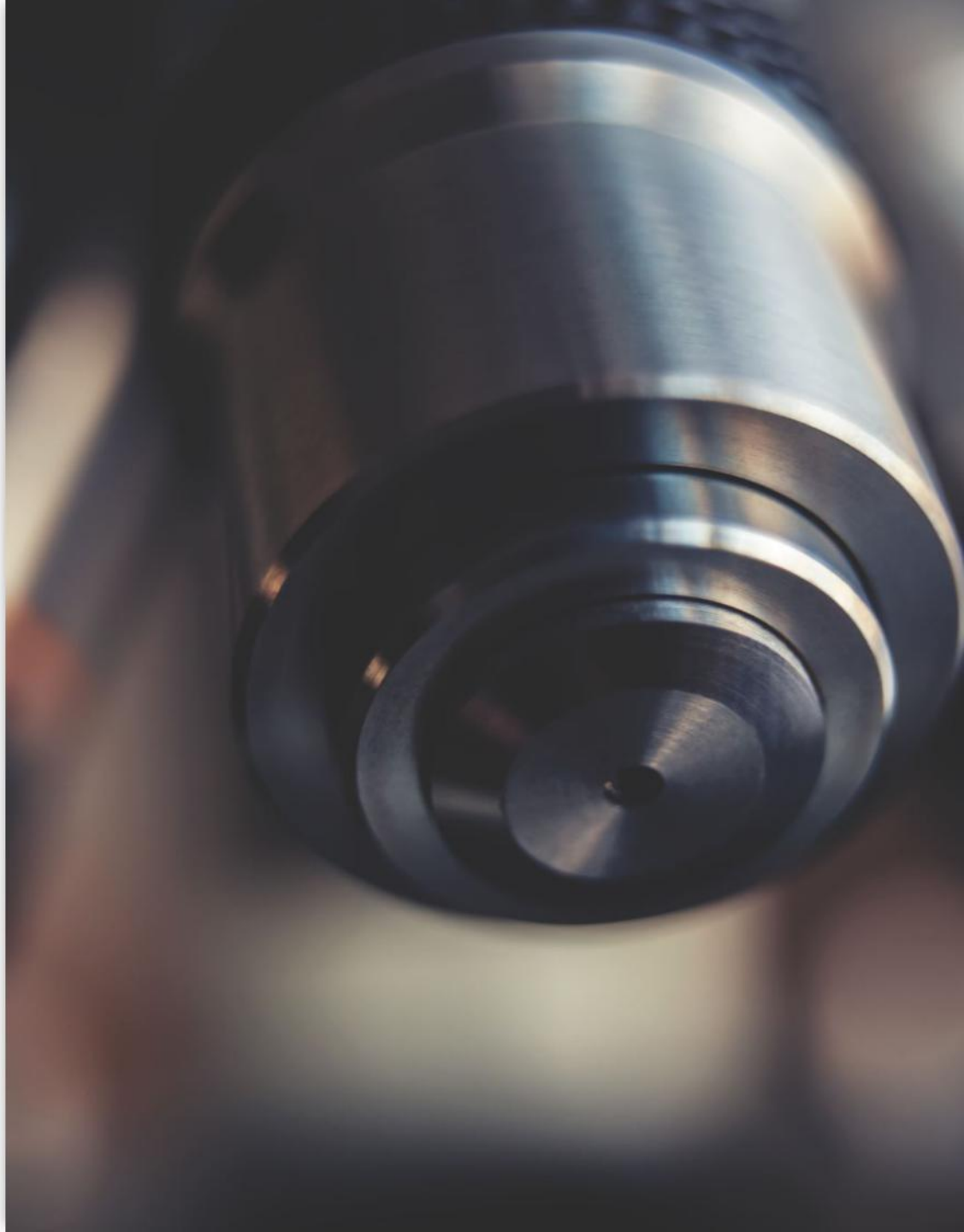
Characteristics of the STEM workforce ages 18–74: 2011 and 2021



Prince George's County Public Schools Student population: 2.7% Asian, 3.9% White, 36.5% Latino, and 55.2% African American

Science/STEM in the Classroom

- Bilateral perspectives: Science today as an educator, as a student
- STEM Career Paths, non-STEM career paths (Where and when does this show up?)
- Purpose: application, global citizens, contributions to society
- Do students connect science/STEM to their lives?
- How do students relate science to their personal lives, the real world?



Metrics to consider:

- Population of learners, vertical articulation
- Materials for execution of curriculum
- Application of material usage is varied
- Training for the curriculum is excellent, SEL
- Internal programming vs. executional timeline
- Are teachers keeping up with the changing trends in STEM?
- Equity, application of education, career fields, STEM pipeline
- Access to expertise
- Mainstream or periphery

- Questions?

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