



Justice-Centered STEM Education to Address Pressing Societal Challenges

Okhee Lee
New York University
June 27, 2023

Topic 1: Science and language
integration with
multilingual learners

Topic 2: Justice-centered STEM
education

Topic 3: Advocacy and activism

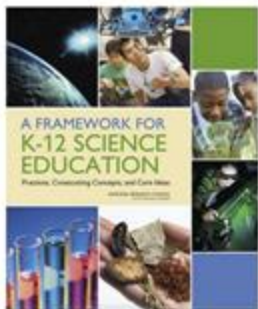


Topic 1:

Science and Language Integration with Multilingual Learners

Science Education

2012

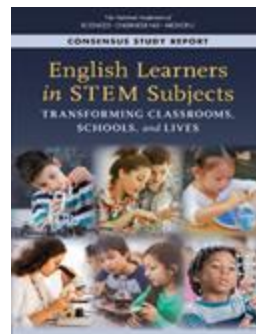


2013



Language Education

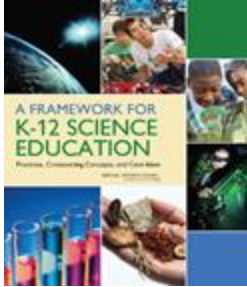
2018



2020



Science Standards: All Standards, All Students

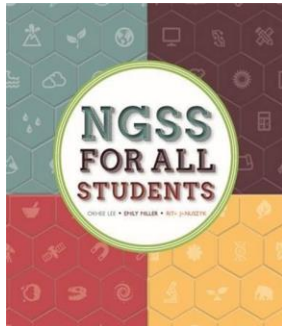


A Framework for K-12 Science Education (2012)



Next Generation Science Standards (2013)

Member of the NGSS writing team



APPENDIX D

**“ALL STANDARDS, ALL STUDENTS”:
MAKING THE NEXT GENERATION SCIENCE
STANDARDS ACCESSIBLE TO ALL
STUDENTS**

Leader of the NGSS Diversity and Equity team

Contemporary Approaches in Science Instruction

NYU SAIL RESEARCH LAB

Doing Science, Using Language

Yearlong Fifth-Grade Curriculum



Unit 1: Physical Science
What happens to our garbage?



Unit 2: Life Science
Why did the tiger salamanders disappear?



Unit 3: Earth Science
Why does it matter if I drink tap or bottled water?



Unit 4: Space Science
Why do falling stars fall?

<http://www.nyusail.org>



DRL-1503330

Contemporary Approaches in Science Instruction

Reviewed By:

Achieve **KEY COMPETENCY SCIENCE** FOR GRADE 5-8

EQuIP Examples

CONTENT AREA **SCIENCE** GRADE **5**



SAIL : The Garbage Unit

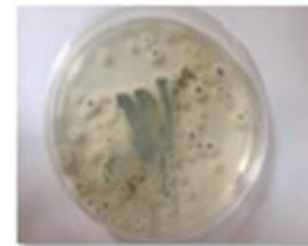
- **Phenomenon:** Our school, home, and community make large amounts of garbage every day.
- **Question:** What happens to our garbage?

Phenomena and problems –

Local (and universal) from

- Equity perspective
- Discipline perspective

Contemporary Approaches in Science Instruction



Cluster 1

What do we want to know about our garbage?

Phenomenon and driving question of the unit

Cluster 2

What happens to garbage materials?

5-PS1-3
Properties of matter

Cluster 3

How do we smell garbage materials?

5-PS1-1
Particle nature of matter

Cluster 4

What causes changes in garbage materials?

5-PS1-4
Chemical reactions
5-PS1-2
Conservation of matter
5-LS2-1
Decomposers

New York State Education Department Integrating Science and Language



Integrating Science and language for All Students with a Focus on English Language Learners Topic Briefs



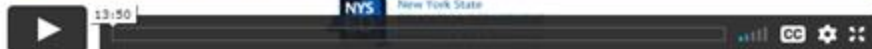
Introduction Webinar - Integrating Science and Language for All Students with a Focus on English Language Learners



**INTEGRATING SCIENCE AND LANGUAGE FOR ALL STUDENTS
WITH A FOCUS ON ENGLISH LANGUAGE LEARNERS:
INTRODUCTION TO WEBINAR AND BRIEF SERIES**

OKHEE LEE | NEW YORK UNIVERSITY

IN COOPERATION WITH
NYS EDUCATION DEPARTMENT OFFICE OF BILINGUAL EDUCATION AND WORLD LANGUAGES
NYS EDUCATION DEPARTMENT OFFICE OF CURRICULUM AND INSTRUCTION



Topic Brief 7- Formative Assessment in the Science Classroom



Webinar 7 - Formative Assessment in the Science Classroom



**INTEGRATING SCIENCE AND LANGUAGE FOR ALL STUDENTS
WITH A FOCUS ON ENGLISH LANGUAGE LEARNERS:
FORMATIVE ASSESSMENT IN THE SCIENCE CLASSROOM (7 OF 7)**

LORENA LLOSA, SCOTT E. GRAPIN, & ALISON HAAS

| NEW YORK UNIVERSITY
IN COOPERATION WITH
NYS EDUCATION DEPARTMENT OFFICE OF BILINGUAL EDUCATION AND WORLD LANGUAGES
NYS EDUCATION DEPARTMENT OFFICE OF CURRICULUM AND INSTRUCTION



English Language Proficiency Standards: WIDA 2020 Edition

Before
2020 Edition

Lee, O., & Stephens, A. (2020). English learners in STEM subjects: Contemporary views on STEM subjects and language with English learners. *Educational Researcher*, 49(6), 426-432.

Lee, O. (2019). Aligning English language proficiency standards with content standards: Shared opportunity and responsibility across English learner education and content areas. *Educational Researcher*, 48(8), 534-542.

Note: See the [American Educational Research Association video](#) about this publication.

Note: See the [Education Week blog](#) on the topic.

Lee, O. (2018). English language proficiency standards aligned with content standards. *Educational Researcher*, 47(5), 317-327.

Lee, O. (2017). Common Core State Standards for ELA/literacy and Next Generation Science Standards: Convergences and discrepancies using argument as an example. *Educational Researcher*, 46(2), 90-102.

Note: See the [Education Week blog](#) on the topic.

Lee, O., Quinn, H., & Valdés, G. (2013). Science and language for English language learners in relation to Next Generation Science Standards and with implications for Common Core State Standards for English language arts and mathematics. *Educational Researcher*, 42(4), 223-233.

After
2020 Edition



[Assess](#) [Teach](#) [Grow](#) [About](#) [Memberships and Programs](#)

Conversations with Tim: Examining how the 2020 Edition impacts multilingual learner education

[About](#) [←](#) [News](#) [←](#) Conversations with Tim: Examining how the 2020 Edition impacts multilingual learner education



From left: Okhee Lee, Kate Strand, Tim Boals and Meredith Trahan

August 12, 2022

This edition of *Conversations with Tim* features a discussion between Tim Boals, WIDA founder and director, and [Okhee Lee](#). Okhee is a professor of orishhood education at New York University's Steinhart School of Culture, Education and Human Development. She is widely known for advancing research, policy and practice that simultaneously promote science and language learning for all students – particularly multilingual learners.



English Language Proficiency Standards: WIDA 2020 Edition

Multilingual learners

refers to all children and youth who are, or have been, consistently exposed to multiple languages.

Multimodality, the use of multiple means of communication, is an essential way for all students to access and engage in the content areas. In addition to the use of spoken and written language, students also communicate through gestures, facial expressions, images, equations, maps, symbols, diagrams, charts, videos, graphs, computer-mediated content, and other means.

English Language Proficiency Standards: WIDA 2020 Edition

Abbreviated forms of the Five English Language Development Standards Statements
ELD Standard 1: Language for Social and Instructional Purposes (ELD-SI)
ELD Standard 2: Language for Language Arts (ELD-LA)
ELD Standard 3: Language for Mathematics (ELD-MA)
ELD Standard 4: Language for Science (ELD-SC)
ELD Standard 5: Language for Social Studies (ELD-SS)

WIDA 2012 Edition

English Language Development Standard 4	English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science	The language of Science
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Science and Language Integration

Science

- **Traditional views:** Individual learners master academic content (*the knowledge of; what knowledge is*)
- **Contemporary views:** Students make sense of phenomena and design solutions to problems as scientists and engineers do in their work (*knowledge for; what knowledge does; knowledge-in-use*)

Language

- **Traditional views:** Individual learners internalize vocabulary and grammar (*the language of; what language is*)
- **Contemporary views:** Students use language for a particular purpose (*language for; what language does; language-in-use*)

Topic 2:

Justice-Centered STEM Education

NYU SAIL RESEARCH LAB

Doing Science, Using Language



Earth Science:

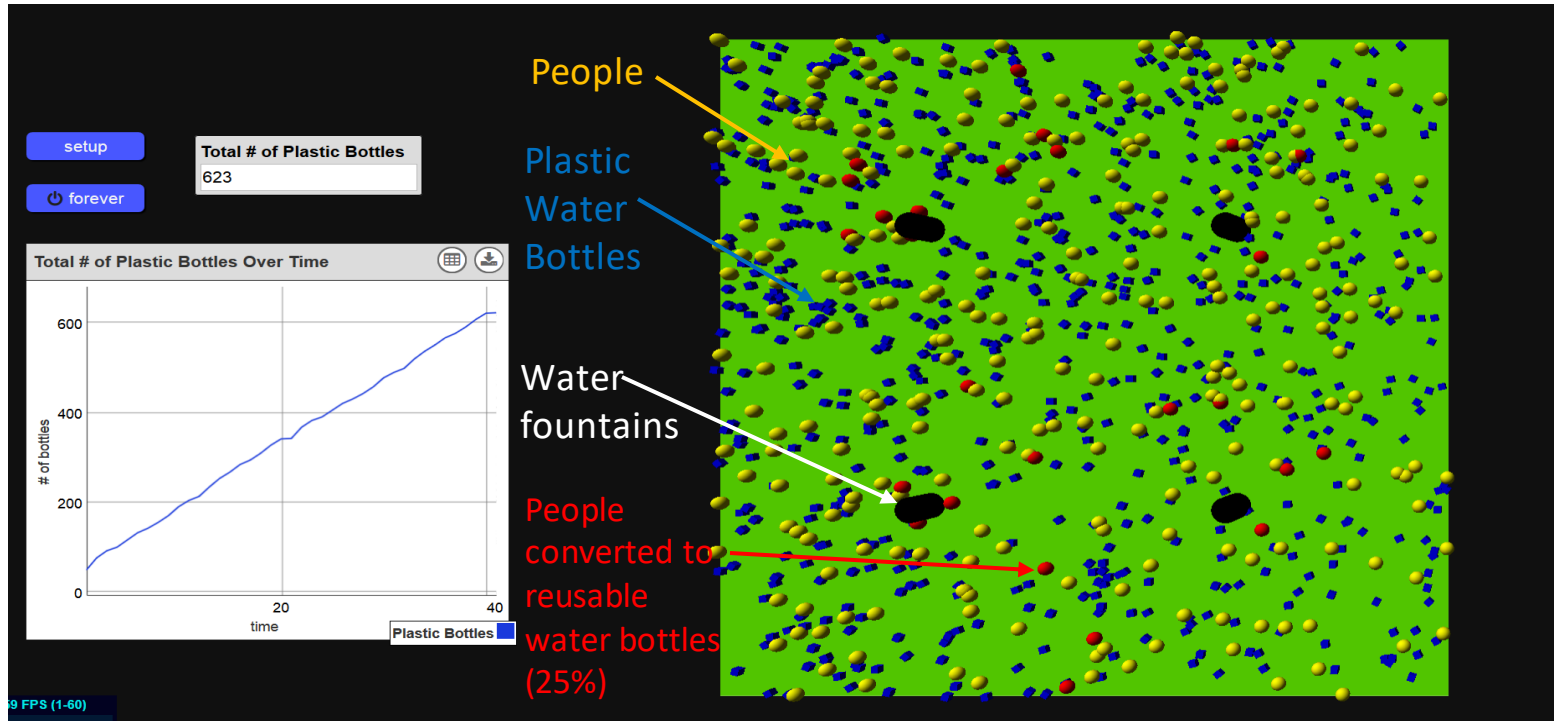
Why does it matter if I drink tap water or bottled water?

Engineering Design:

How can we help solve the problem that plastic pollution from bottled water harms ocean animals?

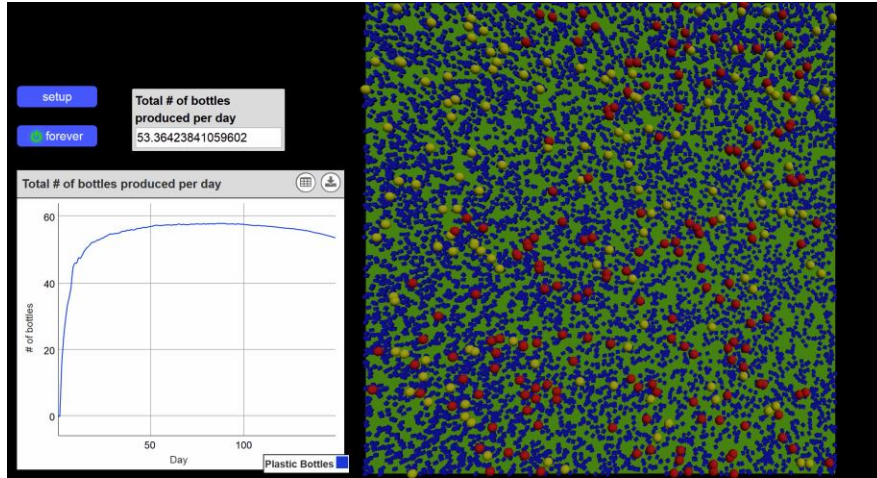
Computational Thinking Integrated with Science & Language

Example: Social media campaign to get more students at their school to use water fountains, instead of plastic water bottles

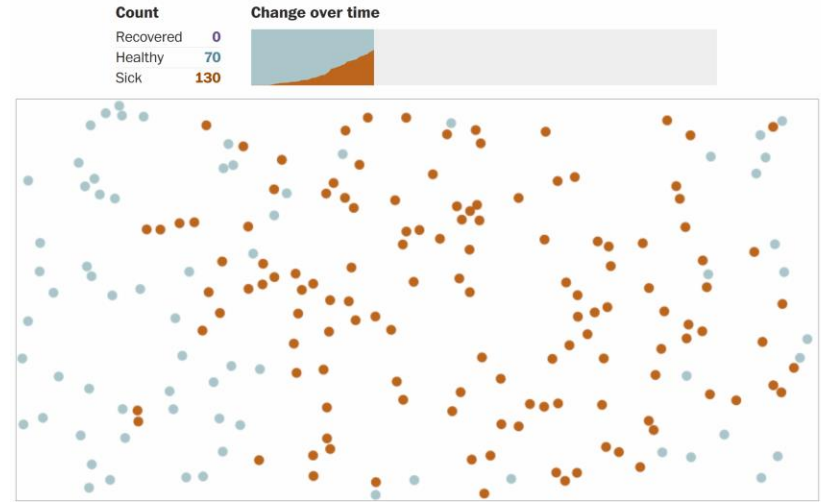


COVID-19 Pandemic

In March 2020, U.S. schools transitioned to remote learning



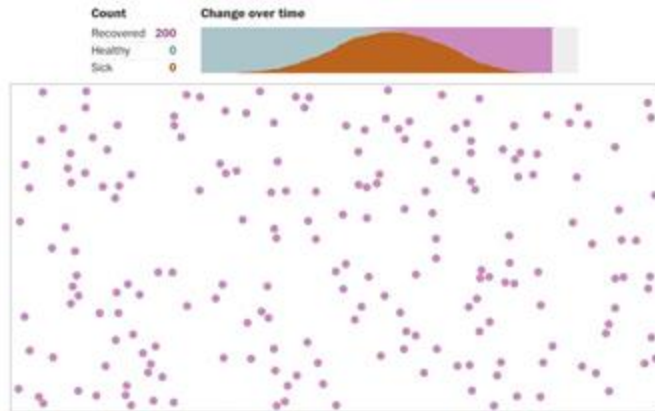
Plastic Pollution with 5th Grade Students



Coronavirus in *The Washington Post*

Computer Science about COVID-19

Computer Simulations Using COVID-19 Data, March 14, 2020



December 29, 2020

"In the early days of the pandemic, we created a simple simulation demonstrating how social distancing can help slow the spread of the virus. It was translated into 13 languages and became the most-viewed story in the history of The Post."

The Washington Post

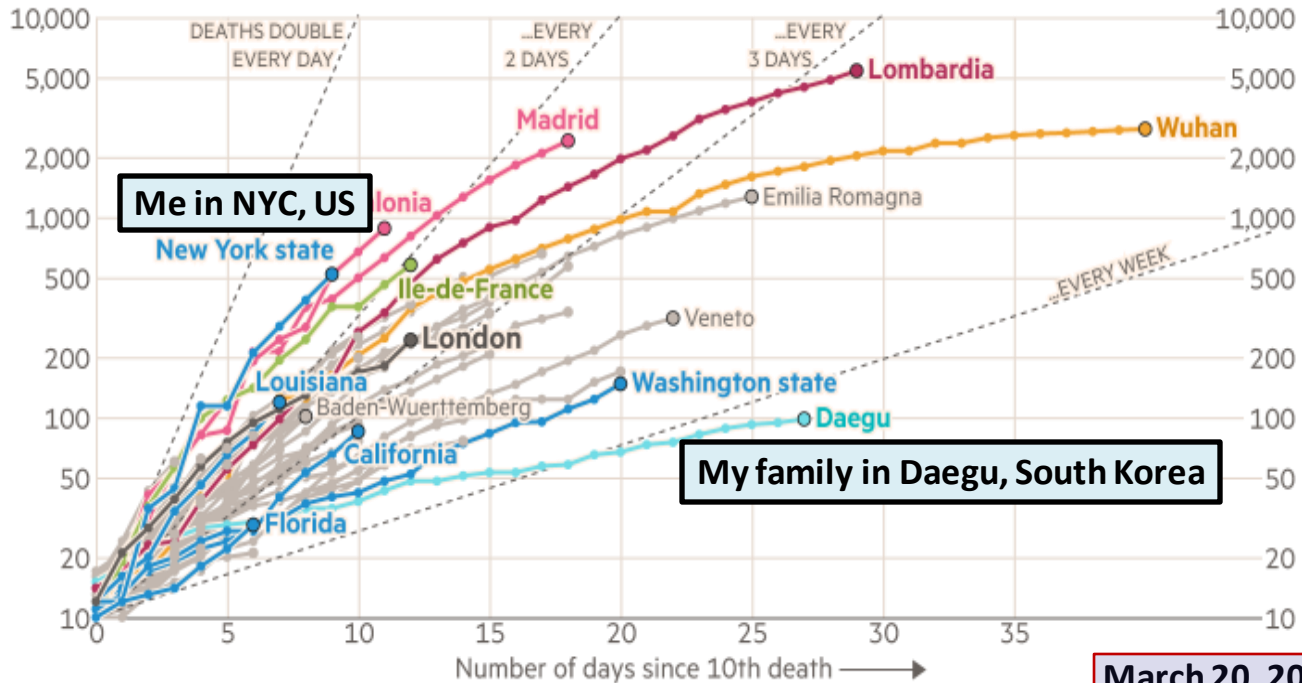
"Why Outbreaks Like Coronavirus Spread Exponentially, and How to 'Flatten the Curve'"

<https://www.washingtonpost.com/graphics/2020/world/corona-simulator/>

Data Science about COVID-19

Graph Comparing COVID-19 Deaths Between Cities Across the Globe

Total Number of Deaths



Lock down in
New York City in
Summer 2020



Lock down in
New York City in
December 2020



Contemporary Approaches in Science Education

Physical Science in Fifth Grade:
What happens to our garbage?

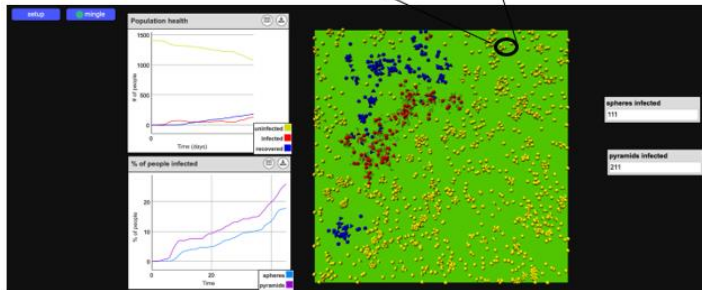
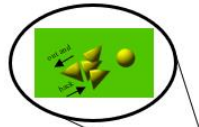
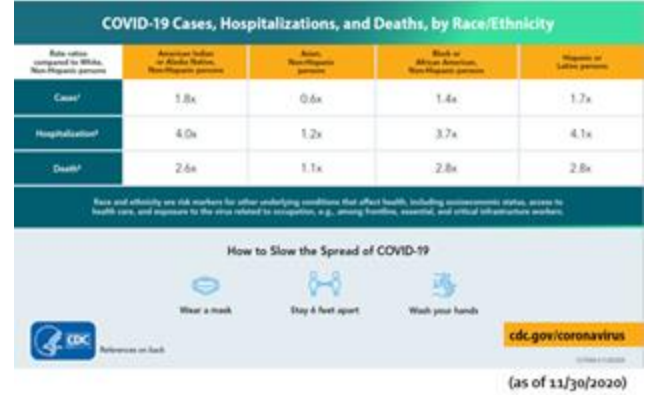
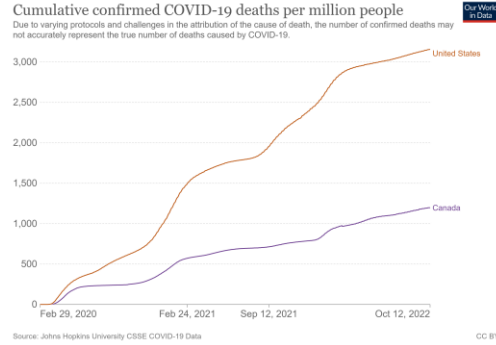
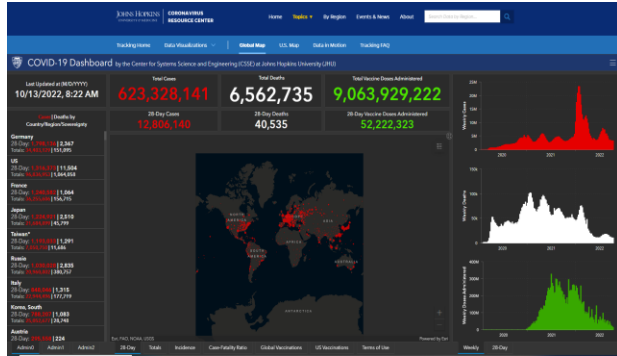


Societal
Challenge



“Sanitized”
Phenomenon

Justice-Centered Data Science and Computer Science



```

The World | Everyone | Droplet | Person | + Add Breed

Show Traits

while mingie toggled
  set my heading to random 0 to 359
  if my frontline worker? = yes
    call: go out and back
    distance 10
  else
    call: go out and back
    distance 1

on collision with Droplet
  do
    if my color = color: yellow
      with 50 % chance
        call: become infected
      delete agent collee
  
```

Justice-Centered STEM Education

Traditional

Scientists
and Teachers

**Student
Interest**

Master
Knowledge of
Science
Disciplines

Science

Some Students

Contemporary

Students as Scientists
and Engineers

**Student
Agency**

Make Sense of
Phenomena and
Design Solutions to
Problems

Equity

All Students

Future

Students as Informed
and Responsible Citizens

**Student
Advocacy**

Design Justice-
Centered Solutions

Justice

All Students

Topic 3: Advocacy and Activism

Asian American and Pacific Islander Hate Crime in the U.S. New York City, March 21, 2021



The National Academies of
SCIENCES • ENGINEERING • MEDICINE

CONSENSUS STUDY REPORT

Call to Action for Science Education

BUILDING OPPORTUNITY FOR THE FUTURE



ACTION AREA 1: ELEVATE THE STATUS OF SCIENCE EDUCATION

RECOMMENDATION 1: The White House, with leadership from the Office of Science and Technology Policy (OSTP), should act to raise the profile of science education and elevate the importance of access to high-quality science learning opportunities for all students across K-16. Specifically, OSTP should encourage

RECOMMENDATION 2: Congress should include science as an indicator of academic achievement when it next reauthorizes the Elementary and Secondary Education Act.

RECOMMENDATION 3: State Departments of Education should act now to include science in their accountability systems for K-12 education. A state accountability

RECOMMENDATION 4: National stakeholders in science, technology, engineering, and mathematics (STEM) education should undertake coordinated advocacy to improve science education K-16 with particular attention to addressing disparities in opportunity. These stakeholders (including professional organizations, advocacy groups,

On Wed, Jun 16, 2021 at 11:13 AM [REDACTED] wrote:

Hi Dr. Lee, I hope you are well. It's nice to e-meet you.

My name is [REDACTED] and I'm the deputy White House Liaison at ED. I received your package from one of my colleagues, and I wanted to reach out to learn more about your experiences and your interests at ED. If you could let me know what days and times work well for you this and next week, I will follow up with a calendar invite. Thanks so much.

Best,

[REDACTED]
Deputy White House Liaison
Office of the Secretary
US Dept of Education
[REDACTED]



Alondra Nelson ✓ @AlondraNelson46 · Apr 24



Looking forward to joining @AERA_EdResearch leadership and @NSF Director Panchanathan for this important discussion of #STEMequity and how to educate and inspire all who aspire to participate in science and technology, from skilled technical work to basic research and more.



Okhee Lee @OkheeLee_ · Apr 24

Tomorrow is an exciting day! Two top #science leaders, Dr. Alondra Nelson and Dr. Sethuraman Panchanathan, will join the first #AERA Fireside Conversation moderated by @fjlevine and @OkheeLee_. Hot topic: "Reframing STEM Education for Equity and the Role of Education Research."

Office of Science and Technology
Policy




CULTIVATING EQUITABLE EDUCATION SYSTEMS FOR THE 21ST CENTURY

2022 AERA ANNUAL MEETING
SAN DIEGO, CALIFORNIA AND VIRTUAL
APRIL 25-26, 2022 | #AERA22

Fireside Conversation with OSTP and NSF Leadership

Monday, April 25, 2022, 9:30 to 9:50 am
San Diego Convention Center, Upper Level - Ballroom 818
This session will be live both in San Diego and hybrid

			
Alondra Nelson Director of the Office of Science and Technology Policy	Sethuraman Panchanathan Director of the National Science Foundation	Okhee Lee AERA President and Vice President	Patricia J. Levine AERA Executive Director



**Please Join AAAS Section Q
(Education)!**