

BOARD ON SCIENCE EDUCATION

Science and Engineering in Preschool through Elementary Grades: The Brilliance of Children and the Strengths of Educators

 *#BrillianceAndStrengths*

Sponsors:

Carnegie Corporation of New York
Robin Hood Learning + Technology Fund

The Committee's Commitments

- Acknowledge that science and engineering are not neutral
 - Situated within complex historicized system
 - Antiracism and justice central elements of educational system that works to redress social inequities and oppressions.
- Recognize strengths of children, communities, families and educators
 - Use asset-based language in describing these actors & settings.
 - Attend to how learning environments could draw on, build, and attend to these strengths and needs.
- Hold vision for science and engineering learning as intentionally bringing together science and engineering practices, disciplinary core ideas, crosscutting concepts, identities, and interests.



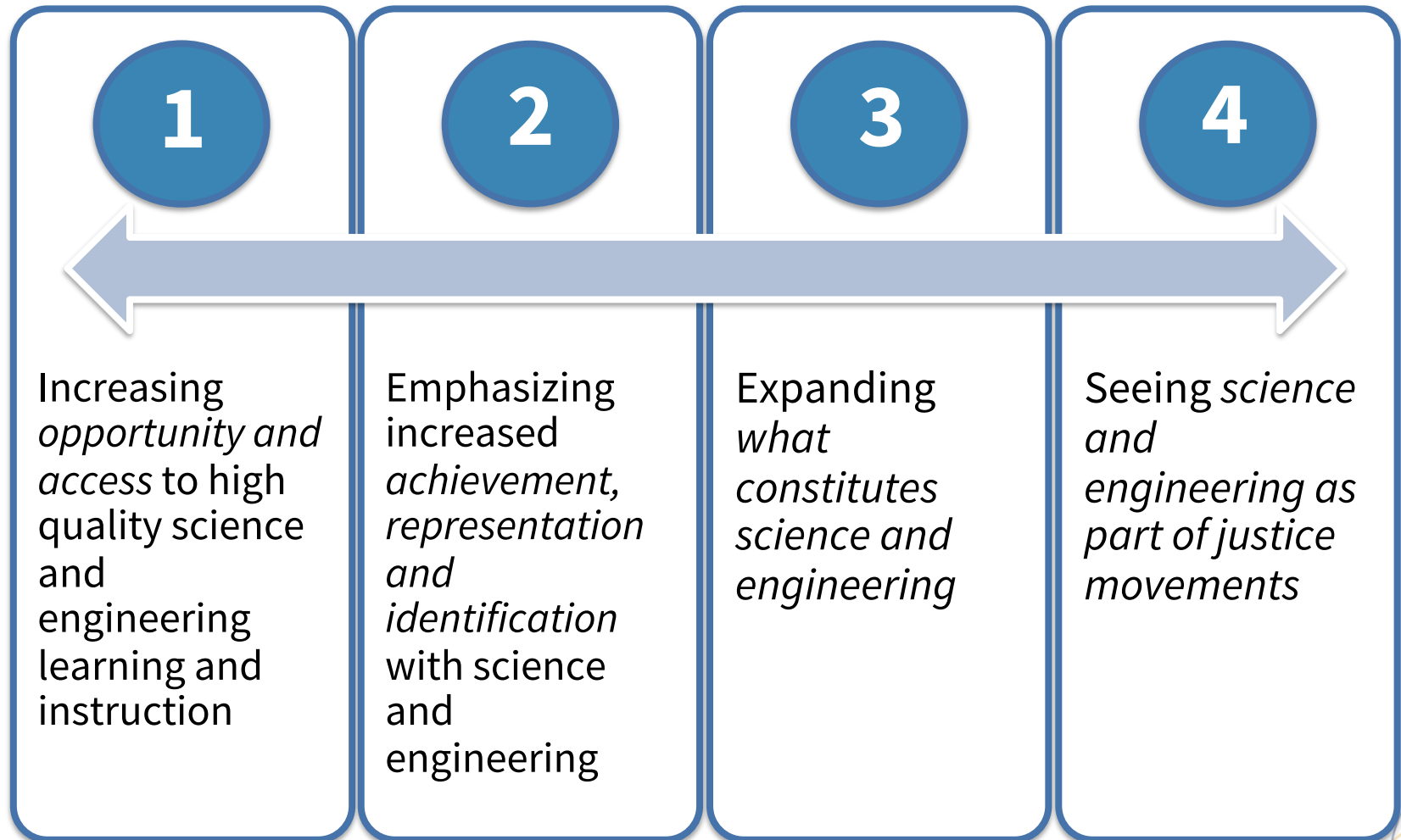
Foundational commitment to equity and justice

Equity: ways to change policies and practices to remove barriers to participation in science and engineering and increase achievement, representation, and identification.

Justice: addressing systemic oppressions that cause those barriers, seeking fair treatment of all people & supporting opportunities for self-determination & thriving



Four Approaches for Equity and Justice



Approach 1: Increasing opportunity and access to high quality science & engineering learning & instruction

<i>Description</i>	<i>Example</i>	<i>Potential pitfalls</i>
Shift in what happens in the classroom to improve learning: from focusing on engaged learning, to high-quality curricular materials, to supplemental experiences for underserved students. Recognizing the need to increase presence of well-prepared teachers, especially for underserved students.	• Teachers recognize “opportunity gaps” (instead of achievement gaps). • Curricular materials use phenomena to engage children in science and engineering practices, and/or are translated into multiple languages.	The dominant (Eurocentric) forms of science and engineering, which can be alienating and oppressing, are not examined and continue to shape learning and instruction.



Approach 2: Emphasizing increased achievement, representation, and identification with science & engineering

<i>Description</i>	<i>Example</i>	<i>Potential pitfalls</i>
The goal is to improve academic achievement through generating interest and connecting subject areas to students' lives. Strong focus on promoting personal relevance and invite students' identities into the learning environment.	• Children see themselves as engineers, choosing what problems to solve and applying engineering concepts to their lives. • Teachers and Curricular Materials increase representations of who is a scientist, especially those from historically marginalized groups.	Same as approach #1 AND Can lead to static notions of "culture". Leaves the door open for fixing perceived deficits of students and/or their communities. May privilege achievement or identity, not both.



Approach 3: Expanding what constitutes science and engineering

<i>Description</i>	<i>Example</i>	<i>Potential pitfalls</i>
Improving learning opportunities through reflecting on and reframing what counts as science and engineering, under what contexts, and who gets to be a scientist and/or engineer. Curriculum and instruction allow for, invite, and build on learners' and families' diverse sense-making repertoires (conceptual, cultural, linguistic)	● Science investigations and Engineering designs connect to and build on the knowledge and goals of families and communities. ● Teachers see and respond to children's sense-making, especially when they differ from Eurocentric norms. ● Curriculum is designed flexibly so that educators can adapt it to respond to local contexts.	May not necessarily connect to social movements to upend systemic oppression. If not adopted as part of a larger structural change, can allow a mismatch with how students are evaluated and assessed, which may leave minoritized students at a disadvantage



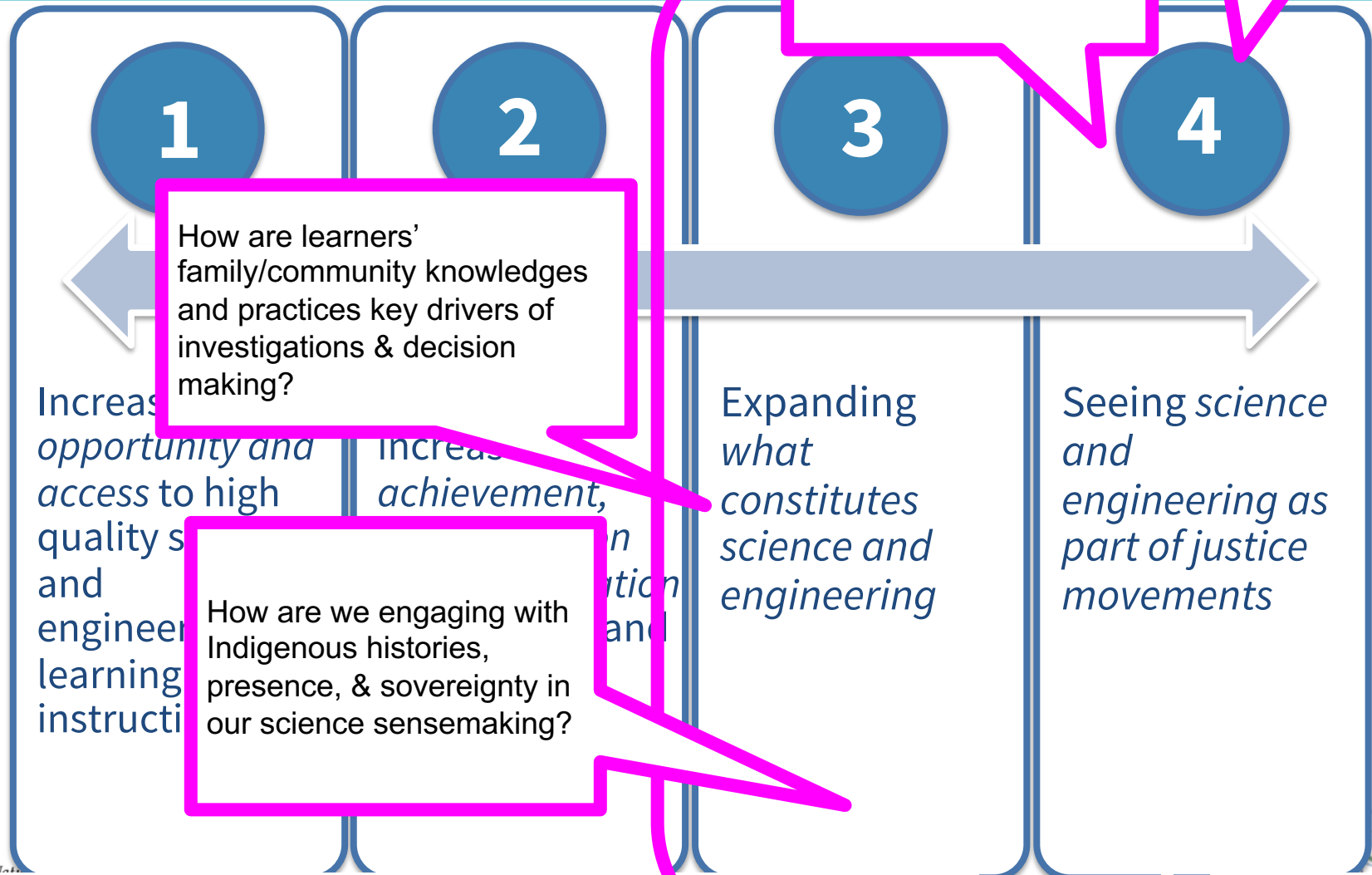
Approach 4: Connecting science and engineering as part of justice movements

<i>Description</i>	<i>Example</i>	<i>Potential pitfalls</i>
Science and engineering must be in the service of achieving justice. Starts with identifying and prioritizing movements that address the communities' goals and needs. Answer the question: How can science and engineering support the progress toward those projects?	• Children investigate how Black, Indigenous, and other communities of color are affected by diseases and climate change, and reflect on the interconnectedness between humans and the natural world. • Curricula invite children to address their own questions about community-relevant issues and make decisions for ethical futures.	May deprioritize the learning goals outlined in approaches 1-3. Justice movements may not (want to) intersect with PK-5 classroom activities. Requires re-thinking how children are assessed.

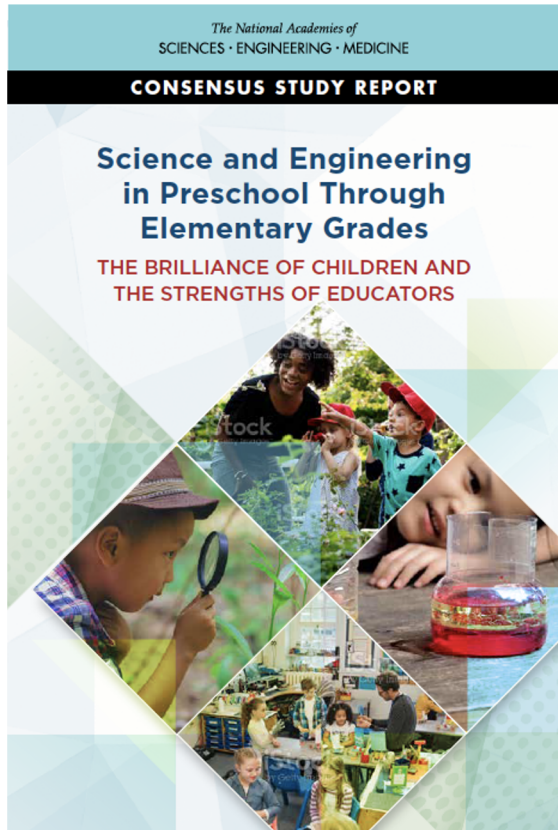


Four Approaches for E

From *Brilliance of Children* report (NASEM, 2021)



Questions and Discussion



You can obtain a PDF (for free!) or order the book at nap.edu — search for Brilliance and Strengths

Practitioner companion volume coming in later in 2022!

