ACCELERATING K–5 SCIENCE EDUCATION THROUGH NETWORKS AND DESIGN

ASCEND K-5 October 2024 Advisory Board Meeting: Summary, Takeaways, and Next Steps

Introduction

Building on the momentum of recent reports including NASEM's Science and Engineering in Preschool Through Elementary Grades: The Brilliance of Children and the Strengths of Educators and the Call to Action for Science Education, the Lawrence Hall of Science's Center for K–12 Science is launching an initiative to design sustainable systems to prioritize science in elementary settings. As an early step in this effort, we assembled an Advisory Board consisting of experts in elementary science education representing a range of roles. The first Advisory Board meeting was held at the University of California International House in Berkeley, CA on October 28–29. 2024. This document shares the activities and outcomes of that meeting.

Participants

Nine Advisors attended in person (Kimberley Astle, Greg Borman, Jenn Brown-Whale, Terrance Burgess, Kristoffer Carroll, Tina Cheuk, Taunya Nesin, Carrie Tzou and Paola Valdivia), two Advisors attended virtually (K. Renae Pullen and Betsy Davis), four Advisors were unable to attend (Alicia Conerly, Maya Garcia, Meg Richard and Enrique Suárez), and six Center for K–12 Science project staff facilitated and attended (Rebecca Abbott, Vanessa Lujan, Daniel Alcazar Roman, Leslie Stenger, Meredith Moran, and Suzanna Loper).

Meeting Activities

- *For reference: Slides and Agenda from the meeting*

Introducing the Center for K–12 Science and ASCEND K–5

The meeting began with an introduction to the Lawrence Hall of Science's Center for K–12 Science and an overview of the goals of the ASCEND K–5 project. The Lawrence Hall of Science is the public science center for the University of California, Berkeley. Within the

Lawrence, the Center for K–12 Science is a group of researchers, designers, and educators focused on K–12 science education in formal school settings. The Center's work includes research, instructional materials development, professional learning design and implementation, and systems change work at the district and state level. While some of the Center work has had national impact, the Center is seeking to increase that impact in order to have a greater effect on science education in the U.S.

Elementary science education was identified as a target for this effort based on the urgency of need and the experience and expertise available within the Center. The ASCEND K–5 project is a multi-year strategic effort, deploying existing Center resources as well as seeking new resources, to build a program with significant impact on equitable and effective elementary science education.

Introducing the Advisory Board Members

Each participant introduced themselves briefly with their name, organization, participation and connection to science education. Then participants engaged in three rounds of small-group conversation, addressing a different prompt in each round:

- How does your past or current work relate to elementary science?
- What brings you here? What piqued your interest in joining this group?
- What are your greatest concerns and greatest hopes for elementary science?

This segment concluded with a shareout of connections made, which were documented on a Connections & Exploration Poster.

Brainstorming Top Challenges and Areas of Need

Participants were assigned to four groups of 3 (3 in person, 1 online). Within the in-person group, assignments were random. Advisors spent about 15 minutes brainstorming and recording on sticky notes responses to the prompt: What are the most important problems the field should be addressing? Advisors considered questions like: What are the biggest barriers to effective elementary science instruction? What should we be talking about to create lasting change? At this point, the hybrid component of the day ended and the virtual members were excused.

After the initial brainstorm, the groups' efforts were organized using an affinity mapping process. Each group took turns sharing one idea and placing the corresponding sticky note onto a sheet of chart paper. If other groups had recorded similar ideas, they added that to create clusters around the initial idea. This continued until all ideas had been shared. While the participants took a break, the Lawrence staff refined and reorganized the clusters to consolidate them further, ultimately identifying 13 distinct topics:

- Need to support identity, relevance and community connections
- Need for HQIM that is usable
- Need for support for administrators' knowledge and leadership
- Competition with other subjects
- Staffing models
- Need for accountability systems
- Inequitable access
- Lack of resources
- Schedules / instructional minutes
- Overburdening of elementary teachers
- Need for better pre-service teacher preparation
- Supporting teacher learning
- Mindset about the value of elementary science

With the goal of identifying four topics to focus on in Day 2, Advisors were asked to use "dot voting" to identify priorities. Advisors were provided with 6 sticky dots and could place one or more dots on topics they identified as important. This resulted in the narrowing of the list to seven topics:

1. Need to support identity, relevance and community connections
2. Need for support for administrators' knowledge and leadership
3. Competition with other subjects
4. Need for accountability systems
5. Schedules / instructional minutes
6. Supporting teacher learning
7. Mindset about the value of elementary science

Advisors were asked to identify, using a Google form, a first, second, and third choice for group work on Day 2.

The day concluded with a dinner in Berkeley.

Identifying Root Causes

Based on participants' selection, it was decided to collapse categories 3, 5, and 7 into a single group, resulting in the identification of the following four topics and assignments for Day 2. Assignments were made taking into account participants' preferences and also with an effort to represent a variety of roles within each group wherever possible.

- Need for support for administrators' knowledge and leadership
    - Greg, Tina, Jenn
- Need to support identity, relevance and community connections
    - Taunya, Kris, Carrie
- Schedules/instructional minutes+competition+mindset/value
    - Terrence, Kimberley, Paola
- Teacher learning (virtual group)
    - Betsy, K. Renae. with Meredith

Each group then engaged in a root-cause analysis protocol. They created a poster using a 'fishbone diagram' to further clarify and then analyze their problem:

Directions for the root-cause analysis:

1. Write a clear and concise statement of the problem your group is analyzing. Add this to the head of the diagram.
2. Brainstorm potential root causes for this issue, and write each on its own sticky note.
3. Cluster stickies along "rib bones"
4. Name each rib bone with a category label
5. Continue to add stickies and/or name categories

Groups also listed ideas they had for efforts that were already underway related to this problem. At the end of their work time, each group presented a brief overview of the result of their root cause analysis, and then participants engaged in a gallery walk where they viewed the posters more closely, added any reactions or ideas, or added stars for causes or categories they thought were important (see linked photos in Appendix A).

Brainstorming Ideas for Actions

The goals of the ASCEND K–5 project were reviewed, with a reminder of the types of work the Center currently engages in: research, instructional materials design, professional learning design and delivery, systems change work, policy work, and supporting communities of practice and networks. Advisors were asked to keep these categories in mind when brainstorming actions, but not to limit themselves.

Each group spent time brainstorming ideas for actions related to their topic. The original plan was to then have those actions sorted among posters for each of the areas of Center work, but it was determined that the actions fit better in the context of the original poster. Advisors participated in another gallery walk where they viewed the ideas for actions. See Appendix A for a list of all actions.

This activity culminated with a debrief in which each group talked through their ideas for actions while Lawrence staff recorded notes and attempted to consolidate and identify initial connections.

The session concluded with an invitation to identify categories or specific people who should be invited to contribute to this effort (see Appendix B).

Analysis and Takeaways

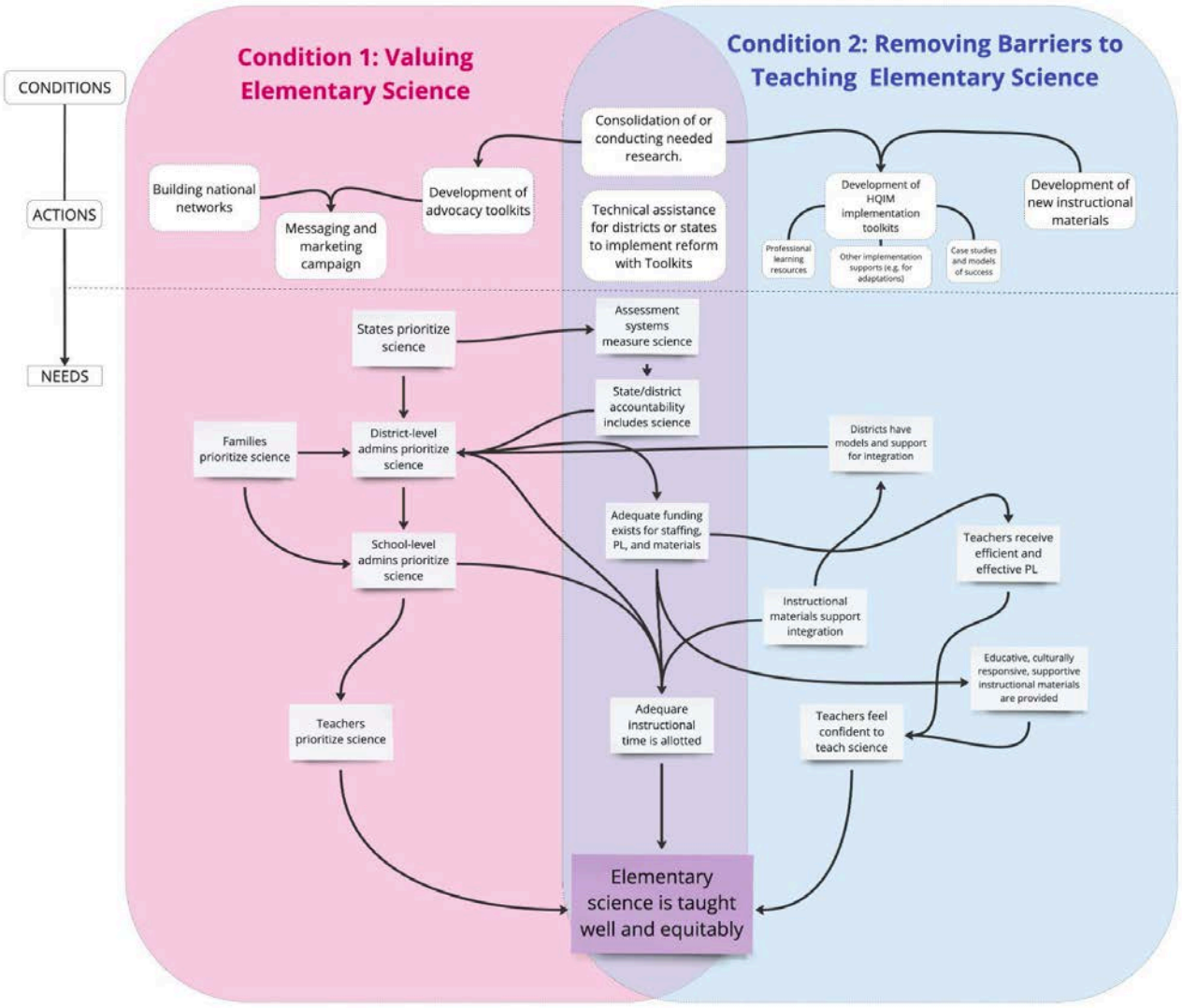
Needs

This section represents a post-session analysis of our key takeaways from the Advisory Board meeting.

The Lawrence staff synthesized the root cause analyses, resulting in the identification of two conditions that need to be met:

- The valuing of elementary science
- The removal of barriers to teaching elementary science

The model below represents these two categories. Within Condition 1, different stakeholders are identified: States, districts, families, schools, and teachers. All these groups must prioritize science and arrows are used to illustrate the key relationships between these levels. Within Condition 2, specific needs are identified: Models of and support for integration; instructional materials that support integration; instructional materials that are educative, culturally responsive, and supportive of teachers; and efficient and effective PL; these together lead to teachers that are confident about and prepared to teach science. In the center of the model, in the overlap between the two conditions, are conditions that are the instantiation of elementary science being valued, and that support the removal of barriers from teaching elementary science, including: assessment systems that measure science; accountability systems that include science; adequate funding for science; and adequate instructional time for science.



Synthesis of the root cause analyses:
Conditions, actions and needs to be able to teach elementary science well and equitably

Actions

The Lawrence staff next considered what ideas for actions could address the needs in this model. With respect to Condition 1, valuing elementary science, a major takeaway from the Advisory Board discussion was the need for a clear, simple, and compelling message (or a set of such messages for different audiences) to promote the value of science and the need for action. A comparison was made to the recent swell of support for the Science of Reading. We learned from this discussion that marketing and messaging is an important part of the work for ASCEND K–5.

Related to this focus, the Advisors identified the importance of building national networks, across levels of different stakeholders, and including our colleagues in math and ELA education.

Finally, the development of advocacy toolkits for stakeholders in different parts of the systems was identified as a potential action.

Similarly, the concept of implementation toolkits was identified as a potential action to address Condition 2, the need for removing barriers to teaching elementary science. These could include: PL resources; instructional materials resources; and case studies and models of success.

To support the development of both advocacy toolkits and implementation toolkits a multifaceted approach is essential. This potential action could include the consolidation of existing research, identifying gaps, and conducting new research to address those needs. Additionally, the Center could host action-oriented summits or provide technical assistance to guide districts and/or states in utilizing the toolkits and their proposed reform models to support implementation efforts.

Next Steps for ASCEND K–5

The model above identifies a broad set of possible actions. Next, the Lawrence Hall of Science's Center for K–12 Science plans to:

- Schedule a virtual meeting with the Advisory Board to review the Takeaways in this summary
- Receive broader feedback on the ideas represented in this model
- Further refine areas of action
- Identify the actions where the Center can begin work with existing resources
- Identify areas where the Center can:
    - Build networks and partnerships to begin work
    - Pursue funding to begin work

To receive broader feedback and further refine our areas of action we plan to present interactive sessions at CSSS, NSELA, and NSTA to engage additional stakeholders:

- We have a short presentation accepted for the CSSS meeting in Philadelphia on March 25. This presentation will focus on gathering perspectives and reactions from state-level science leaders. We have submitted sessions for the NSELA Leadership Summit and for NSTA in Philadelphia in March 2025. These 60-90 minute sessions will be designed to be a condensed version of the sessions we completed with the

Advisory Board in October, to gain broader feedback from teachers and instructional leaders.

After these sessions, we plan to further refine the areas of action, propose an Action Plan for the Center, and share and get feedback on this plan with the Advisory Board in additional virtual meetings.

Appendices

Appendix A: Actions

Area 1: Culturally relevant science learning

Problem statement

Facilitating culturally relevant science learning is complex. It requires time, resources, teacher prep, admin buy-in, trust building with families.

Root cause categories

- Admin buy-in and ongoing support
- Trustbuilding with families
- Resources including time
- Assessment models
- Curriculum Design
- Teacher prep and ongoing PL

Actions

0. Priming
    a. Literature basis
    b. State advocacy
    c. Equity
    d. Pathways
    e. CCSSO Policy Work
1. Increase science accountability
    a. Increase # of state science assessments
    b. Δ school / foundation work to increase accountability for science
2. Funding increase in science accountability

    a. HQIM
    b. Curriculum-based PL
    c. Admin PL/cohorts
    d. Increase family engagement legislation
3. Implementation of funding
    a. Monitoring
    b. Sustainable grants
    c. Network support

- Curriculum Adaptation Support
    - Toolkit
    - Guidance for Admins and Teachers
    - PST
- Provide different models of family engagement and how they were accomplished
    - Clone model

Area 2: Administrators

Problem Statement

Elementary science teaching and learning is deprioritized among the competing demands for school and district administrators

Root cause categories

- Limited pressure / demand from history (3 stars)
- Limited pressure / demand from state leadership
- Limited pressure / demand from district leadership (1 star)
- Limited pressure / demand from unions
- Limited pressure / demand from families
- Limited pressure / demand from researchers
- Limited (inconsistent / not coherent) access to building and district leaders (2 stars)

Actions

SOLUTION/ACTION - Organize and lead a nationwide marketing campaign for elementary science teaching and learning

1. Step 1: organize to determine public friendly, compelling message of value of Elementary Science teaching and learning.
    - Ally with literacy and math
2. Step 2: Create communication plan for getting message out
    - Develop talking points, erc and send to news outlets

Part of Step 2 (Creation of a communication plan)

- Develop talking points
- Get commitments
- Collaborate with professional organizations
- Leverage digital platforms
- Create toolkits 'concise documents' for multiple layers of stakeholders
    i. Families
    ii. School admin
    iii. District leaders (non science
    iv. State leaders
- Ensure toolkits are customized for audience but with a consistent message

SOLUTION/ACTION

- Mobilize a nationwide network of families advocating for elementary science ed
    - Ally with literacy and math
    -

SOLUTION/ACTION

- Facilitate relationship building among K–12 education committees at legislative level
    - Ally with literacy and math

SOLUTION/ACTION

- Organize, plan, and facilitate nationwide, coordinated efforts related to school and district admin professional learning

Area 3: Schedules/Instructional Minutes

Problem Statement: Students aren't receiving sufficient instructional time to learn state science standards.

Root Causes:

- Unclear value for science education
- Limits on funding
- Less accountability --> lower prioritization
- HQIM needs (competition w/ELA and Math)
- Teacher education/training
- Talent/staffing models for elementary science
- Instructional schedules/minutes

Actions

- A ready-to-use suite of messaging and advocacy tools with the compelling whys, fundamental rights to access, benefits, etc.
- Accountability in prioritization: Developing accountability tool (e.g. rubric, list, etc.) that raises awareness for families so that they understand what science their children are getting. Creating a parent-led movement.
- Research on # of minutes and times/week K–5 students should receive science instruction and why. What is the floor?
- Research/case studies of schools successfully implementing K–5 science across contexts, demographics (schedules, staff models, change management, curricular implementation)
- Create/pilot measure progress: PL sessions for elementary science teachers that build content knowledge, confidence, and investment. Measuring efficacy of teacher (attitudes?), # of science minutes taught
- Developing resources to demonstrate how to integrate other disciplines into science. Tool districts can use to work through making their ELA/math, science curriculum work together.
- Teacher ed & training research: 1. How does professional learning impact teacher confidence in teaching science? Research showing impact of science teaching on ELA/math/science/identity/engagement, etc.

Area 4: Teacher Learning (Pre-Service and In-Service)

The problem: Not all teachers have opportunities to learn in the ways we know are best practices for teaching learning.

Root cause categories

- support for learning to engage in equitable teaching and teaching each child as a whole child
- curriculum materials
- mindset & identities (of teachers, of others)
- opportunities for professional learning for teachers across the continuum (pre-service and in-service)
- district & infrastructure (not prioritizing resources for science)

Actions

Potential Idea for Action (across Equitable Teaching and Curriculum Materials):

- When designing instructional materials, build in educative supports for teachers about if/how phenomena, content, learning activities, etc., could be adapted for a variety of contexts and experiences. Provide examples and resources that teachers can look to (while also acknowledging that every learning context is unique and will still require additional personalization/adaptation).

Potential Idea for Action (across Opportunities for PL and District and Infrastructure):

- Explore and connect with districts and systems who are taking concrete steps toward prioritizing elementary science Professional Learning. Showcase (e.g., with case studies) their process (including both successes and challenges) as a possible model that other districts and systems can draw upon while simultaneously adapting for their own contexts.

Appendix B: Efforts underway

- Great First 8 (all integrated curriculum)
- Call to Action
- Open Sci Ed Elementary/other integrated science curricula (OER, HQIM)
- Research on importance of background knowledge for reading comprehension
- STEM Equity report
- The Brilliance Report & Rise and Thrive
- Betsy Davis research on scheduling
- LHS partnership grant: Centering Traditional Indigenous Knowledge in K-12 instructional materials
- Equity in STEM report
- AMNH Urban Advantage supporting (NYC) teachers
- Chicago Academy of Science supporting CPS
- Learning in Places
- LHS Localizing Conference K-12
- LHS Instructional Leaders Localizing Working Group (25-26)
- Islandwood Localizing Curriculum Group, WA
- NASEM BOSE CASTL K-12
- Leadership in Science - Stacy Vanderveen
- Kate McNeil's admin NGSS practices project
- Expansive Science Education (ESE)
- efforts from within the ASCEND K-5 advisory board (there are lots - e.g. Learning in Places - Tzou, ASSETS project - Davis, etc.)
- companies are making curriculum materials
- various research projects focused on teacher ed and professional learning
- EdReports and other similar groups

- NASEM CASTL K-12
- Rise & Thrive (practitioner volume from Brilliance & Strengths) -- being used in lots of TE courses
- NSTA - Online resources & conferences
- recommendations in the Brilliance & Strengths report
- Daryl Greenberg's IES center (need more info but this was focused on assessment)
- OpenSciEd and other OER curric development projects (e.g. Okhee's SAIL project; SOLID Start)
- Potential Allies:
    - Council of Chief school officers (CCSSO)
    - National Education Association (NEA)
    - National Association of Elementary School Principals (NAESP)
    - Association for Supervision and Curriculum Dev. (ASCD)
    - Learning Forward
    - WestEd
    - PIRs
    - NSTA
    - NSELA
    - NARST AGRA
    - CSSS