Proceedings of the *Unpacking the STEM Imagination* Convening

Museum of Science, Boston

September 8-17, 2021

About the Unpacking the STEM Imagination Convening

The Museum of Science, Boston received funding from the National Science Foundation to carry out a conference grant exploring connections between research and practice at the intersections of imagination, STEM (science, technology, engineering, and mathematics), and ISE (informal STEM education). A series of virtual convening events were held from September 8-17, 2021. The proceedings of these events are documented in this report to summarize the content of the convening activities as they were implemented, provide references and citations for the content delivered, and acknowledge the contributions and participation of the convening attendees and collaborators.

This document only reports the content and structure of the convening events. Results of the team's research and a description of findings emergent from participant discussion and convening artifacts will be reported in 2022 and shared on informalscience.org.

Suggested Citation (APA 7th Edition)

Museum of Science. (2021, September 8-17). *Proceedings of the Unpacking the STEM Imagination Convening*. Museum of Science, Boston, MA, United States.

Note: Suggested citations for individual panel presentations and workshops are included in their respective descriptions within these proceedings.

Workshop Participants

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Unpacking the STEM Imagination: *Agenda Overview*

Wednesday, September 8, 2021

12:30 – 1:45pm ET: Panel 1: Raising the Imagination

3:00 – 5:00pm ET: Workshop 1: Unearthing the STEM Imagination

Thursday, September 9, 2021

5:30 – 6:45pm ET: Panel 2: Imagination and STEM Futures

Friday, September 10, 2021

1:00 – 3:00pm ET: Workshop 2: Positioning Imagination in STEM Practice and STEM Education

Monday, September 13, 2021

3:30 – 4:45pm ET: Panel 3: Cultivating Contexts for Imaginative Thinking in STEM

Wednesday, September 15, 2021

2:00 – 4:00pm ET: Workshop 3: Creating Conditions for Imaginative Engagement with STEM

Friday, September 17, 2021

1:00 – 3:00pm ET: Workshop 4: Framing a More Imaginative Future for ISE Research and Practice

Unpacking the STEM Imagination: *Panel Event Details*

Raising the Imagination

Wednesday, September 8th 12:30-1:45pm ET (9:30-10:45am PT)

Imagination is a resource. How we tap or temper that resource at different points in life can have critical consequences for the ways we think about our world, each other, and ourselves. In this panel discussion, professionals with expertise in human development, museum exhibit design, and STEAM education shared perspectives on how imaginative ways of thinking can be elevated across the life span.

Featuring:
- Dr. Helen Hadani (Moderator), Fellow, Brookings Institution
- Ashanti Davis, Exhibition Manager, Fleet Science Center
- Dr. Brendan Gaesser, Assistant Professor of Psychology, University at Albany
- Dr. Gus Halwani, Vice President of STEAM & Innovation, The Possible Project

Suggested Citation (APA 7th Edition)

Davis, A., Gaesser, B., Hadani, H., & Halwani, G. (2021, September 8). Raising the imagination [Panel discussion]. *Unpacking the STEM Imagination Convening*, Museum of Science, Boston, MA, United States. https://youtu.be/l4nHM36QEmo

Imagination and STEM Futures

Thursday, September 9th 5:30-6:45pm ET (2:30-3:45pm PT)

STEM leaders and practitioners activate their imaginations in critical ways when solving problems and innovating towards new possibilities. In this panel, thought leaders who leverage STEM as part of their work shared perspectives on the role imaginative thinking can play in creating the future we want to realize.

Featuring:
- Dr. Christine Reich (Moderator), Chief Learning Officer, Museum of Science, Boston
- Dr. Christina Agapakis, Creative Director, Ginkgo Bioworks
- Dr. Jill Becker, Chief Executive Officer, Kebotix
- Rev. Mariama White-Hammond, Chief of Environment, Energy, and Open Spaces, City of Boston

Suggested Citation (APA 7th Edition)

Agapakis, C., Becker, J., Reich, C., & White-Hammond, M. (2021, September 9). Imagination and STEM futures [Panel discussion]. *Unpacking the STEM Imagination Convening*, Museum of Science, Boston, MA, United States.

Note: A recording for this session is unavailable.

Cultivating Contexts for Imaginative Thinking in STEM

Monday, September 13th 3:30-4:45pm ET (12:30-1:45pm PT)

What conditions best support imaginative ways of thinking to take root? In this panel, experts on educational leadership, inclusion and access in STEM, and community-centered STEM education discussed how we can craft learning environments to enrich the imaginative potential for all learners.

Featuring:
- Aysha Upchurch (Moderator), Dancing Diplomat and Lecturer on Education, Harvard Graduate School of Education
- Dr. Gillian Judson, Assistant Professor in the Faculty of Education, Simon Fraser University
- Sonya Pryor-Jones, Chief Implementation Officer, Fab Foundation and Founder, Fab House
- Dr. Cary Supalo, Research Developer, Educational Testing Service

Suggested Citation (APA 7th Edition)

Judson, G., Pryor-Jones, S., Supalo, C. & Upchurch, A. (2021, September 13). Cultivating contexts for imaginative thinking in STEM [Panel discussion]. *Unpacking the STEM Imagination Convening*, Museum of Science, Boston, MA, United States. https://youtu.be/2q37QX_pnw0

Unpacking the STEM Imagination: *Workshop Event Details*

Unearthing the STEM Imagination (Workshop 1)

Wednesday, September 8, 3:00-5:00pm ET

This workshop addressed definitions of imagination and imaginative ways of thinking, seeking to connect these ideas to both the practice of STEM itself and to the achievement of informal STEM education (ISE) goals. Participants considered the role imagination plays in STEM practice, and the intersecting relationships between imaginative ways of thinking, the design of learning experiences, and ISE outcomes.

Agenda

Warm-up: Participants introduced themselves in the chat, and then responded to the prompt, "What are the first words that come to mind for you when you hear the word 'imagination'?" in a Google Form. Responses were used to generate a word cloud.

Literature Review Deep Dive: Sarah May presented a brief overview of the literature review process, and described preliminary results focusing on definitions of imagination and imaginative ways of thinking.

STEM, STEAM, and ISE Skills, Ways of Thinking, and Outcomes Deep Dive: Becki Kipling presented an overview of established STEM and STEAM skills and ways of thinking, drawing from Next Generation Science Standards - Science and Engineering Practices, Common Core Math Practices, American Association for the Advancement of Science's Benchmarks for Science Literacy, and STEAM Habits of Mind (various sources). She then presented constructs, practices, goals, and outcomes established in informal science education resources, including Learning Science in Informal Environments, the Center for the Advancement of Informal Science Education, and NSF's Advancing Informal Science Learning (AISL) program goals.

Small-group Work: In small groups, facilitators led a mapping activity in Google Slides through which participants identified STEM and ISE skills, ways of thinking, and outcomes most relevant to their own work, and mapped them to imaginative ways of thinking preliminarily identified in the research team's literature review. Discussion focused on themes emergent among participant connections, and what these themes might say about the role of imagination in STEM, STEAM, and ISE.

Large-group Review and Share-out: In the large group, participants from each small group shared some of the themes discussed, and new insights and questions that emerged from these conversations.

Links to recordings associated with this workshop
- Methods Moment: Literature Review: https://youtu.be/qAVaIFriHGE
- Definitions and Imaginative Ways of Thinking: https://youtu.be/O_6TS-sk3q8

Suggested Citation (APA 7th Edition)
Kipling, R. & May, S. (2021, September 8). Unearthing the STEM imagination [Workshop]. *Unpacking the STEM Imagination Convening*, Museum of Science, Boston, MA, United States.

Positioning Imagination in STEM Practice and STEM Education (Workshop 2)

Friday, September 10, 1:00-3:00pm ET

This workshop built shared knowledge about the role of imagination in STEM practice and STEM education, considering interdisciplinary perspectives on the value of imagination in STEM endeavors. Participants explored case studies of imagination-infused projects from various informal STEM education contexts, considered how their own projects and perspectives are situated within this landscape, and explored with others how to push the boundaries of current work to address imagination in new ways.

Agenda

Warm-up: Attendees participated in a Zoom ice-breaker to learn more about "who's in the room." Starting with all cameras off, a facilitator prompted participants to turn their cameras on if certain roles or titles applied to them (e.g., researchers, educators, experience designers).

Re-cap: Sarah May briefly reviewed the definitions of imagination and imaginative ways of thinking presented in Workshop #1.

Literature Review and Professional Perspectives Deep Dive: Sarah May presented findings from the literature review describing how imagination is positioned in relation to STEM across literature reviewed. Participant videos and results from the professional perspectives survey were presented to further illustrate the varied roles imagination plays in STEM practice and STEM education.

Small-group Work: In small groups, a facilitator guided participants through a project documentation activity in Google Sheets, in which participants responded to prompts about a project of their choosing. Data entered into the Sheet was automatically aggregated at the small- and large-group level, and discussion focused on observations and insights about the ways imagination was positioned across projects, and on emergent questions that arose in response to exploring this landscape.

Large-group Review and Share-out: Participants from each group shared top themes and questions that emerged in small-group discussions.

Links to recordings associated with this workshop
- Methods Moment: Professional Perspectives Survey: https://youtu.be/EAMWSFEgHsM
- Positioning Imagination in STEM Practice and STEM Education: https://youtu.be/HN9_Sn-JWFU

Suggested Citation (APA 7th Edition)
May, S. (2021, September 10). Positioning imagination in STEM practice and STEM education [Workshop]. *Unpacking the STEM Imagination Convening*, Museum of Science, Boston, MA, United States.

Creating Conditions for Imaginative Engagement with STEM (Workshop 3)

Wednesday, September 15, 2:00-4:00pm ET

This workshop unpacked the contexts, conditions, and practices that allow imagination to flourish. Participants drew on a variety of examples – including from their own prior, current and forward-looking projects – to analyze and critique the ways that the design of informal STEM education experiences can explicitly attend to imagination to support desirable outcomes for STEM learners.

Agenda

Warm-up: Katie Baur led an activity inspired by Twyla Tharp, in which pairs of participants created a "vivid moment" from the past or future, and then reflected on the strategies used to conjure these moments.

Literature Review Deep Dive: Jessica Ghelichi presented preliminary results from the literature review about strategies for supporting imaginative thinking. As a large group, participants were then invited to add their own ideas of strategies that might support imaginative thinking in their work.

Small-group Work: In small groups, a facilitator led participants to reflect on a project that either successfully integrated imaginative strategies, or could have benefitted from including more imaginative strategies. Participants then shared details about their projects, what worked, and what might have supported more imaginative engagement.

Large-group Share-out: Participants were invited to do a "Chatterfall" activity, in which all participants entered a response to a prompt in the chat box, and then submitted all chats simultaneously creating the feeling of a waterfall of responses cascading in the Zoom chat. One prompt invited reflections on strategies participants were inspired to try, and a second prompt invited reflections on strategies that participants felt they were still less confident about trying. Final discussion focused on lingering questions and hang-ups regarding strategies for intentional imaginative engagement.

Links to recordings associated with this workshop
- Strategies for Supporting Imaginative Thinking: https://youtu.be/GpzVSvBcZBc

Suggested Citation (APA 7th Edition)
Baur, K. & Ghelichi, J. (2021, September 15). Creating conditions for imaginative engagement in STEM [Workshop]. *Unpacking the STEM Imagination Convening*, Museum of Science, Boston, MA, United States.

Framing a More Imaginative Future for ISE Research and Practice (Workshop 4)

Friday, September 17, 1:00-3:00pm ET

This workshop synthesized ideas from panel discussions and the first three workshops to begin generating an actionable agenda for purposefully attending to imagination in informal STEM education research and practice. Participants collaboratively envisioned how a more imagination-infused future might shape the ways we engage ourselves and others in STEM efforts.

Agenda

Warm-up: The team presented Alondra Bobadilla's poem, "seeing is deceiving," which was created as part of Alondra's reflections on preliminary findings from the literature review on imagination in STEM.

Small-group Work: Small groups, organized by participant interests in different emergent "problem areas" related to imagination in STEM, reflected on a series of prompts together that encouraged generating ideas about how to create a more imaginative future for STEM learning and practice. The prompt structure was adapted from Cintron-Rodriguez et al. (2021), and included:

1. Identifying the "imagination problem"
2. Envisioning a future in which that problem has been solved
3. Naming challenges faced along the way
4. Backcasting goals met toward achieving that future vision

Large-group Share-out: Participants from each group shared vivid details about their group's envisioned futures and near-term goals towards achieving that vision.

Links to recordings and resources associated with this workshop
- "seeing is deceiving" video: https://youtu.be/SJI4X_qYL8U
- Cintron-Rodriguez, I. M., Crim, H. A., Morrison, D. L., Niepold, F., Kretser, J., Spitzer, W., & Bowman, T. (2021). Equitable and empowering participatory policy strategies to accelerate just climate action. *Journal of Science Policy & Governance, 18*(2). Retrieved from https://www.sciencepolicyjournal.org/uploads/5/4/3/4/5434385/cintron-rodriguez_et_al._jspg_18.2.pdf

Suggested Citation (APA 7th Edition)

May, S. (2021, September 17). Framing a more imaginative future for ISE research and practice [Workshop]. *Unpacking the STEM Imagination Convening*, Museum of Science, Boston, MA, United States.

Attendee Highlight Reels

Convening participants were invited to share their own reflections on imagination in short videos. Clips from some recordings were compiled into short thematic videos and presented throughout the convening.

- **How do you define imagination? Video #1**
    - Video: https://youtu.be/DB52DYEAu9g
    - Contributors: Cara Murphy, Eric Lee, Gillian Judson
- **How do you define imagination? Video #2**
    - Video: https://youtu.be/L9DSqmfkQic
    - Contributors: Dani LeBlanc, Lucinda Presley, Dorian Juncewicz, Kristen Vogt Veggeberg, Kalie Sacco, Michael Horvath
- **In what ways does imagination matter to Informal Science Education?**
    - Video: https://youtu.be/8khNgzClmLg
    - Contributors: James Monroe, Sarah May
- **How do you think imagination relates to STEM practice?**
    - Video: https://youtu.be/-If6H4cMMWM
    - Contributors: Michelle Kortenaar, Talya Borisy, Larry Bell, Jonathan Fanning
- **How has your understanding of imagination changed in your lifetime?**
    - Video: https://youtu.be/nH0pkJdGSko
    - Contributors: Gillian Judson, Rachel Kupferman
- **What helps spark or sustain your imagination?**
    - Video: https://youtu.be/NF-GtLt_v88
    - Contributors: Dorian Juncewicz, Michael Horvath, Kristen Vogt Veggeberg
- **In what ways does imagination matter to the work of STEM professionals?**
    - Video: https://youtu.be/NCslWFdD5Qw
    - Contributors: Meg Rosenburg, Linda Kebichi, Khushi Chauhan
- **Youth perspectives on imagination:**
    - Video: https://youtu.be/jT0Z0V3RHj8
    - Contributors: Max Kornbluth, Ella Foulkes, Eric Lee, Dilara Bahadir, Linda Kebichi, Talya Borisy, Rachel Kupferman, Khushi Chauhan, Cara Murphy

For More Information

Project documentation will be periodically updated on informalscience.org:

https://www.informalscience.org/conference-interdisciplinary-perspectives-imagination-informal-stem-environments

All video recordings associated with the convening events can be found you YouTube:

https://youtube.com/playlist?list=PLxeUBLGfclB_xz4LbD00_iPnCBa9MpzyB

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