

From Modest to Moonshot: What's Next for Museum R&D?

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ASTC
Toronto, ON, Canada
September 22, 2019

Session overview

- Briefly define Museum R&D
- Motivate the session — why are we here?
- Present R&D plans from CAISE and 3 museums
- Generate and share new R&D ideas together
- Record our ideas for posting by CAISE

What is Museum R&D?

Focus: Visitor Experience / Learning



Research

Research
with
Development

Learning
from
Practice

R&D is a way for us to learn

- Improve specific exhibits or programs

How can this design be optimized?



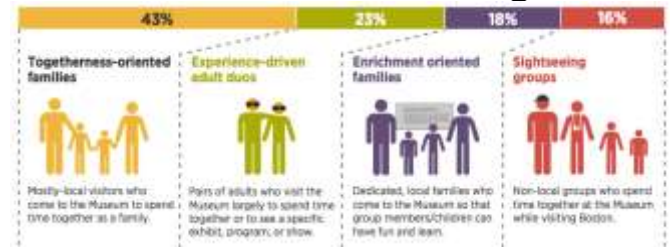
R&D is a way for us to learn

How does Productive Struggle affect learning?

- Improve specific exhibits or programs
- Develop Institutional understanding



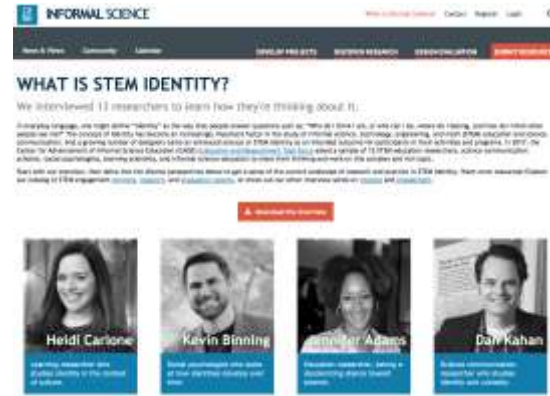
What are our Audience Segments?



R&D is a way for us to learn

What is STEM Identity?

- Improve specific exhibits or programs
- Develop Institutional understanding
- Field-wide knowledge



Which exhibit designs engage girls?



Share R&D Topics

caise

center for advancement of
informal science education

Jamie Bell

children's
museum.
pittsburgh

museumlab

Lisa Brahms & Chip Lindsey



Museum of Science

Liz Kunz-Kollmann & Christine Reich

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Tom Rockwell (& Josh Gutwill)

InformalScience.org is a collection of project, research, and evaluation resources designed to support the informal STEM education community in a variety of learning environments.

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Any opinions, findings, and conclusions or recommendations expressed are those of the speakers and do not necessarily reflect the views of NSF.



Sample of current NSF AISL-Funded Museum R & D (2019)

- + **Audiences:** Latinx, American Indian, Alaska Native, early learners, families, older adults, girls, people with disabilities, women transitioning from the justice system
- + **Youth:** career awareness, best practice for outcomes, longitudinal impact
- + **STEM topics:** water, ocean literacy, snow, light, exoplanets, food, engineering, robotics, imagination
- + **Approaches/settings:** making and tinkering spaces, exhibits, podcasts, STEAM, non-science-related art, planetarium shows
- + **Constructs/theory:** intersectional identity, resilience, cultural competence, inclusivity, authenticity, constructivism, DBR & DBIR

What is STEM Identity, Interest, & Engagement?



35 experts share their projects, perspectives, resources, and advice related to how these phenomena show up with diverse audiences in different contexts.

Explore the resources:
<http://bit.ly/eval-measure>

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WHAT IS STEM INTEREST?


We interviewed 10 researchers to learn how they're thinking about it.

The landmark National Research Council consensus report *Learning Science in Informal Environments* (2009), which was based on a review of the literature to date, posited that learners in informal environments "experience excitement, interest, and motivation to learn about phenomena in the natural and physical world" as one of six strands of informal science learning. In 2018, the American Association for the Advancement of Science (AAAS) Center for Public Engagement with Science and Technology identified "increased interest and motivation" around STEM topics as a short-term, measurable outcome of science engagement activities. For many designers, evaluators, and researchers, these findings and developments affirmed a long-held claim that catalyzing interest is one of the key strengths of informal STEM learning and engagement experiences.


But what do we mean by "interest"? In 2018, our *Evaluation and Measurement Task Force* asked a sample of US STEM education researchers, science communication scholars, social psychologists, learning scientists, and informal science educators to share their thinking and work on this complex and rich topic.

Start with our overview, then delve into the diverse perspectives below. Looking for more resources? Explore our catalog of interest-related projects, research, and evaluation, or check out our other interview series on identity and engagement.


[Download the Overview](#)




Adam Maltese
Science education researcher interested in investigating of large STEM datasets.




Flavio Azevedo
Professor exploring out-of-school time STEM learning and foundations of cognition.




Janet Yang
Professor who studies the communication of risk information about science.




Julla Metag
Communication science professor interested in climate change and online media.




Nancy Staus



Nichole Pinkard



Preeti Gupta



Rena Dorgh

caise center for advancement of informal science education



The Role of Interest in STEM Learning and Science Communication

Reflections on Interviews from the Field

Background

The landmark National Research Council consensus report *Learning Science in Informal Environments* (2009), which was based on a review of the literature to date, posited that learners in informal environments "experience excitement, interest, and motivation to learn about phenomena in the natural and physical world" as one of six strands of informal science learning. In 2018, the American Association for the Advancement of Science (AAAS) Center for Public Engagement with Science and Technology identified "increased interest and motivation" around STEM topics as a short-term, measurable outcome of science engagement activities. For many designers, evaluators,

JANUARY 2021

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What Does Informal STEM Education Research Tell Us?

What Does Informal STEM Education Research Look Like?

What Are The Important Gaps in Informal STEM Education Research?

How Can I Integrate More Research Into My Practice?

Access Peer-Reviewed Literature (EBSCO)



608



in



30

Accessing Peer-Reviewed Literature on EBSCO

Full text of more than 2,000 peer-reviewed journals like *Curator: The Museum Journal*, *Science Education*, *Cultural Studies of Science Education*, and *Science Communication*.



Monthly newsletter



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Thank You

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How do we create the conditions to **notice** opportunities for learning?

children's
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museumlab™

How do we create the conditions to
notice document, reflect, respond
and design to support opportunities
for learning?



values-based reflective practice



MAKESHOP[®]

learning practices

The Learning Practices of Making is an empirically identified framework that describes observable behaviors of learners in MAKESHOP, the makerspace at Children's Museum of Pittsburgh. These practices capture the learning objectives that we value and design to support.

LEARNING PRACTICE	PRACTICE DESCRIPTION
INQUIRE	Learners' openness and curious approach to the possibilities of the context through exploration and questioning of its material properties.
tinker	Learners' purposeful play, testing, risk taking, and evaluation of the properties of materials, tools, and processes.
seek & share resources	Learners' identification, pursuit, and sharing of expertise with others; includes collaboration and recognition of one's own not-knowing and desire to learn.
hack & repurpose	Learners' harnessing and salvaging of materials, tools and processes to modify, enhance, or create a new product or process; includes disassociating object property from familiar use.
express intention	Learners' discovery, evolution, and refinement of personal identity and interest areas through determination of short and long term goals; includes learners' responsive choice, negotiation, and pursuit of goals alone and with others.
DEVELOP FLUENCY	Learners' development of comfort and competence with diverse tools, materials, and processes; developing craft.
SIMPLIFY to complexify	Learners' demonstration of understanding of materials and processes by connecting and combining component elements to make new meaning.



ART STUDIO

learning practices

LEARNING PRACTICE	DESCRIPTION
Material Play	Learners experiment with the properties and personal boundaries of a material, tool, or concept through sensory exploration.
Develop Craft	Learners develop comfort, confidence, and skillful use of materials, tools, and techniques.
Notice	Learners use their senses and personal experience to observe and describe the world around them.
Wonder	Learners are inspired to ask questions and discover new problems to solve by engaging in the art-making process.
Revise	Learners make intentional choices and changes to their artwork and/or art-making process.
Contextualize	Learners develop awareness of the local and global communities that surround and influence their own art-making.

We seek to create a context where learners are supported to express their personal voice and vision.

children's
museum
PITTSBURGH

values-based reflective practice

small bets methodology



museumlab



small bets methodology



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small bets methodology





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social emotional learning



Museum of Science[®]

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2019 ASTC Conference

Toronto, ON, Canada

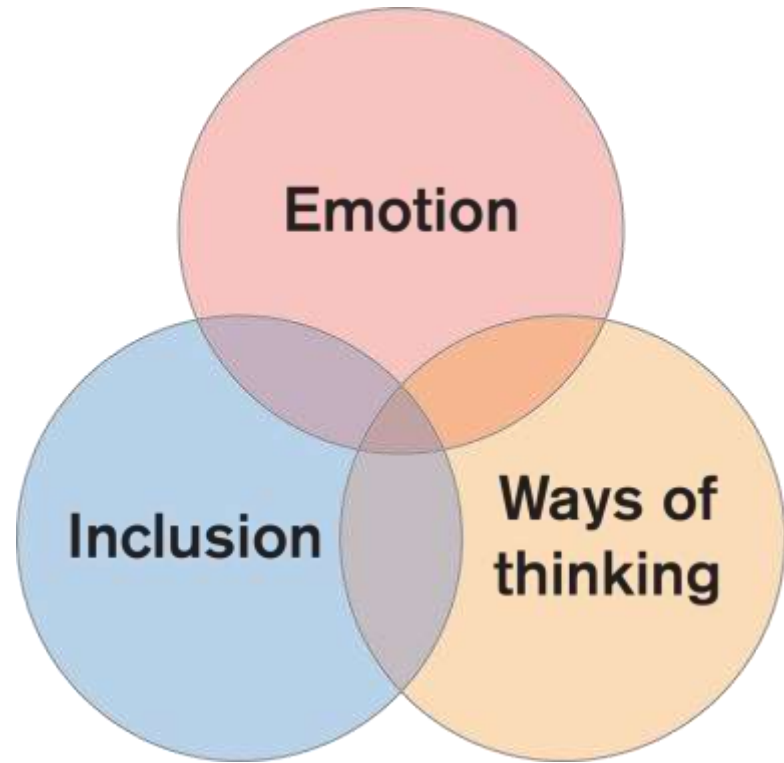
Christine Reich and Elizabeth Kunz Kollmann

September 22, 2019

Overarching goal

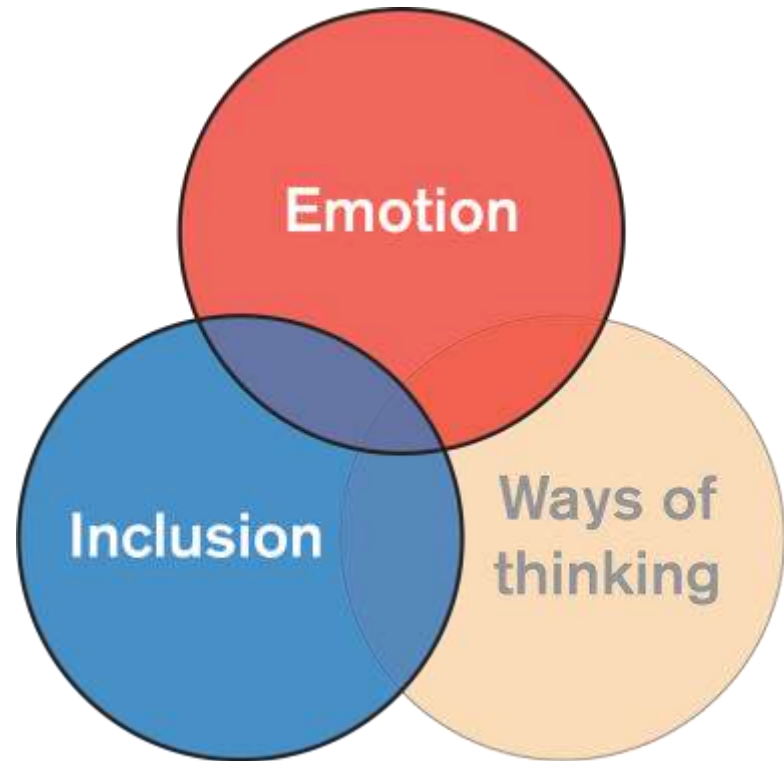
Excite, empower, and engage everyone
to be the thinkers and innovators
needed to shape our future

How do we empower everyone to leverage STEM ways of thinking and take action to shape a better future?



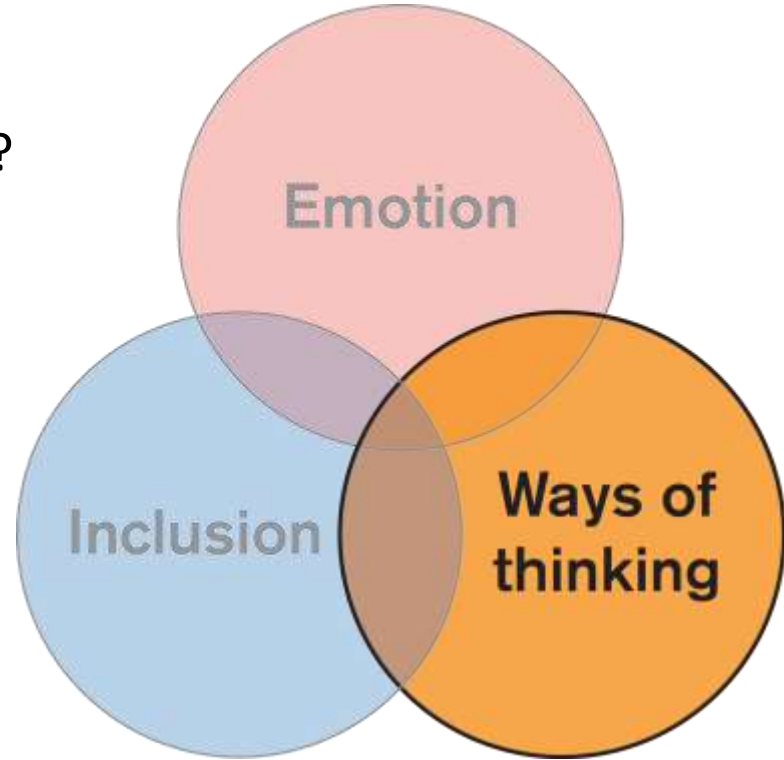
How do we empower everyone to leverage STEM ways of thinking and take action to shape a better future?

How do we empower everyone to see themselves as STEM learners?



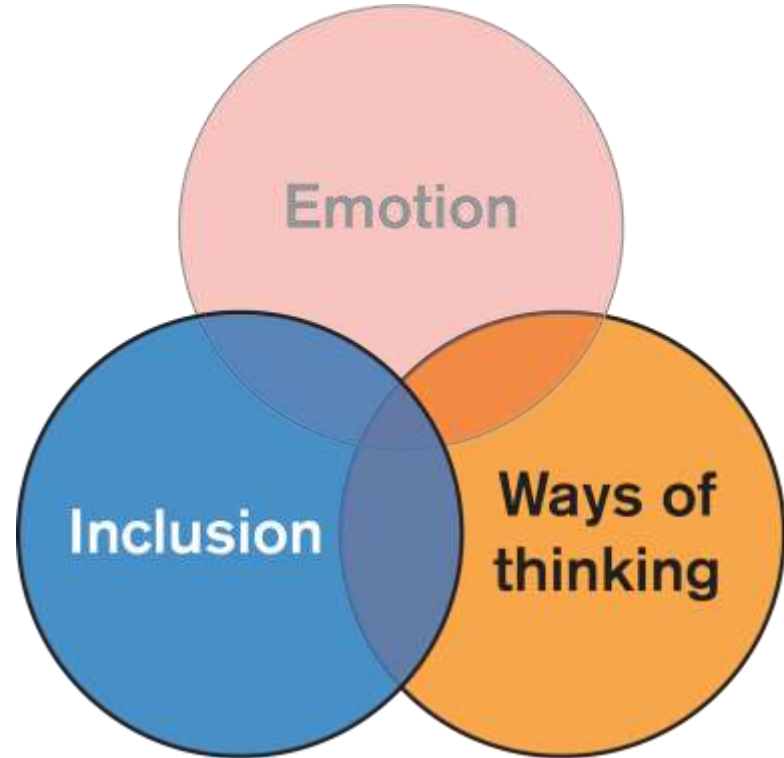
How do we empower everyone to leverage STEM ways of thinking and take action to shape a better future?

How do we leverage STEM ways of thinking to imagine a better future?



How do we empower everyone to leverage STEM ways of thinking and take action to shape a better future?

How do we create STEM experiences where everyone feels supported to learn?



Thank you

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The Exploratorium R&D Agenda

A Focus for Our Future

From Modest to Moonshot: What's Next for Museum R&D?
ASTC, September 22, 2019





The R&D Agenda expresses our organization's learning intentions and provides direction to help us prioritize our activities over the next few years.



Advancing Inquiry:

Broadening and Deepening Inquiry-Based Learning Experiences

Advancing Inquiry

What **new topics and new modalities of engagement** beyond phenomena-based interactive exhibitry, successfully compel people to think more critically?

How can we inspire people to **go deeper in their line of inquiry**—seeing a thought through from initial idea to evaluating evidence to interpreting outcomes?

What **new professional learning practices** lead to greater reach, new audiences, and innovative partnerships?



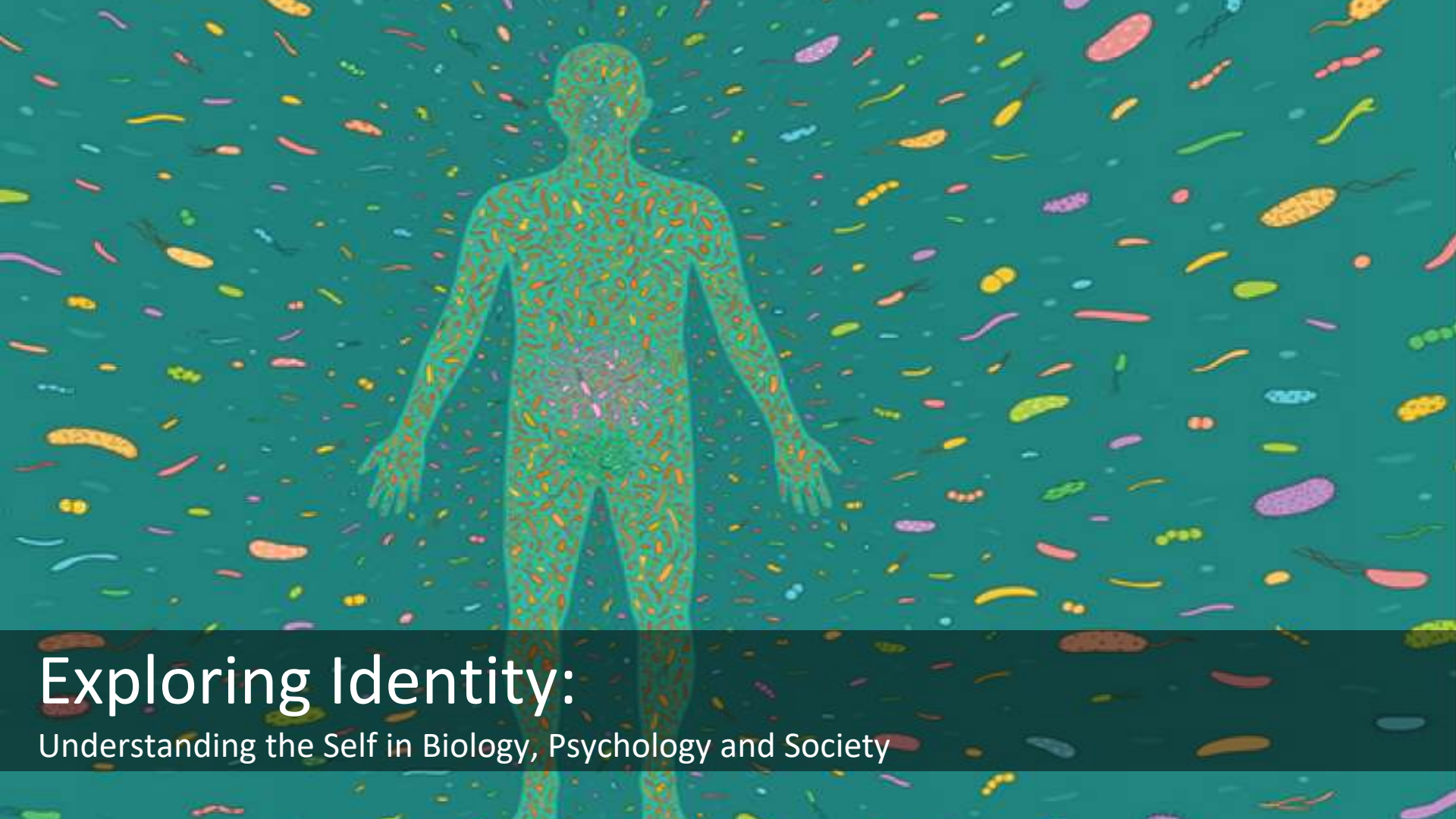
Living Liquid



ELL & Science



STEAM Starters



Exploring Identity:

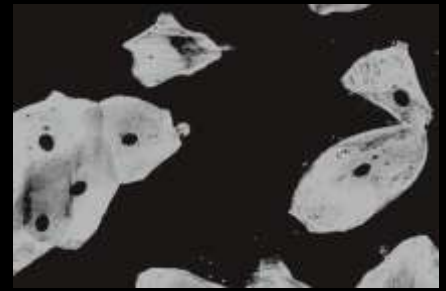
Understanding the Self in Biology, Psychology and Society

Exploring Identity

What **new scientific phenomena and designed interactions** enable people to expand the way they understand overlapping biological and social selves?

How can informal learning experiences centered on **the role of social identity** illuminate inequities and advance social justice?

How can we **develop our practices** to be more welcoming, representative, and just toward diverse audiences and collaborations?



Cells to Self



Self, Made



Middle Ground



Engaging Ecology:

Expanding Place-Based Environmental Pedagogies

Engaging Ecology

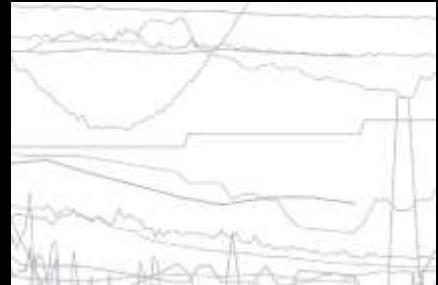
What **communication strategies catalyze people** to be more open, engaged, and positive in response to environmental issues?

What **tools can we build** to enable public and professional audiences to become change agents and successful collaborators addressing the most pressing environmental issues of our times?

What **new professional learning practices** lead to greater reach, new audiences, and innovative partnerships?



Instrumenting the Landscape



Wired Pier



Conversations about Landscape



Fostering Civic Agency:

Enabling Individuals to Impact Their Physical and Social World

Fostering Civic Agency

How do we identify, convene, learn from, and inspire different groups of people—policy-makers, scientists, artists, community members, etc.—to **collaboratively envision and construct** a mutually beneficial and just society?

How do we **learn from and support diverse communities** in inclusive and welcoming ways that inspires open-minded learning, thinking, dialogue, and decision-making skills?

How do we measure and assess how effective our different strategies are in instilling a greater **sense of agency in individuals** and accessibility in institutions to affect change?



Resilience by Design



Buchanan Mall



Emergent Adult Learners

Generate new ideas

- R&D Questions
 - Your institution is pursuing
 - You'd like to pursue
 - You'd like someone to pursue

Categorize new ideas

