STEAM Initiative
CAMBRIDGE

STEAM Habits of Mind Study

In this presentation

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- Study Design and Findings
- Key Practices from the Research
- Recommendations
- Questions, Implications and Actions
- Closing

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STEAM Initiative CAMBRIDGE

STEAM - Science, Technology, Engineering, Art and Math

The Cambridge STEAM Initiative is a joint venture between the City of Cambridge Department of Human Service Programs, Cambridge Public School Department, and the Cambridge Public Library. STEAM is an integrated approach to learning that incorporates STEAM Habits of Mind using any combination of STEAM areas of study - Science, Technology, Engineering, Arts, and Math - as access points for inquiry, dialogue, and critical thinking.

Using a racial justice lens to frame all of its efforts, the STEAM Initiative works to ensure that Cambridge residents who are most impacted by systemic inequities have access to high quality STEAM programming, resources, and skill-building opportunities.

Why this study?

Employment Data in STEAM Fields

Only 16%
Of STEM Workforce

Is Black or Latino, while the same groups make up **27%** of US population

Only 29%
Of STEM jobs

held by women, are outside of healthcare

77%
Cite gaps in access

Early access to STEM education considered a factor in gaps in employment, particularly for BIPOC workers.

71,000
Culture Sector Jobs in Mass.

The arts & culture sector is a $2.3billion industry in Mass.

Income 2X higher
In STEM Fields

Median salaries in STEM fields are more than twice that of non-STEM fields, and this sector is growing rapidly in Mass.

Sources: U.S Bureau of Labor and Statistics, Pew Research Foundation, Mass. Executive Office of Education

STEAM in our lives

Artificial intelligence

Facial recognition software

Community makerspaces and libraries

Pulse oximeters

21st century schooling

Pandemics and vaccines

Science fiction writers

Climate change and response

Earth and planetary science

Deep ocean exploration

STEAM Habits of Mind Study

Goals:

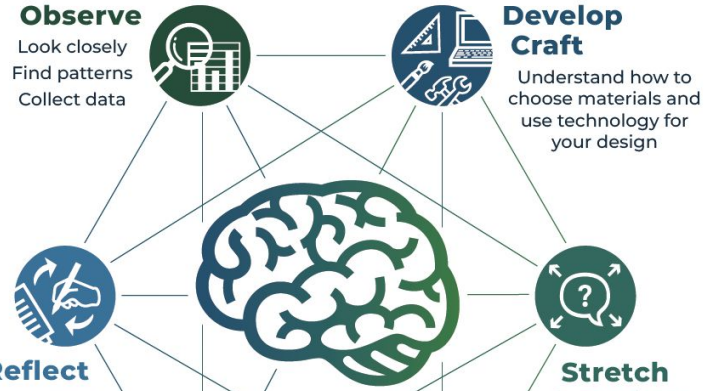
- How are STEAM Habits of Mind being developed and nurtured?
- What strategies are programs using that support youth engagement and identity formation?
- How are the STEAM habits developing self-efficacy in young people?

Study Design

- 11 interviews with teachers, leaders and innovators.
- Interviews Spring 2021. Observations and focus groups, ongoing.
- Organizations include youth centers; gardening, science, math and design programs; workforce development; young men's leadership; public makerspaces; youth community theater; and middle school classrooms.

STEAM Habits of Mind

Habits of mind are critical to engagement, identity formation, and self-efficacy in young people.



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Findings

In our study, we found that three of the six Habits of Mind were mentioned most often, and Curiosity was frequently described as a core element.

Stretch and Explore

Engage and Persist

Develop Craft

Emerging themes:

- Study found unique and distinct programs, with similar practices to build Habits of Mind
- Existence of diverse options in STEAM programs creates a rich landscape for youth in Cambridge
- Opportunities for identity formation and self-efficacy at individual, peer and program levels.

Deeper Dive

Curiosity

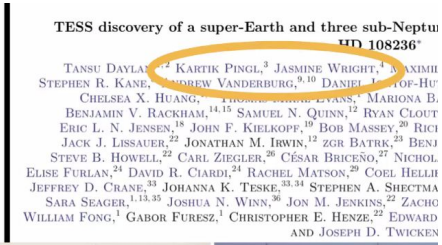
Programs emphasized the importance of nurturing curious young people:

- Curiosity is at the center of program decisions and design
- Programs are grounded in a belief that curiosity is innate in all children
- Curiosity fuels staff engagement and interest

1. Engage and Persist

Middle School Social Studies:
Collaboration on a “Just World” project

Central Square Theater:
Iteration on the way to finalizing a script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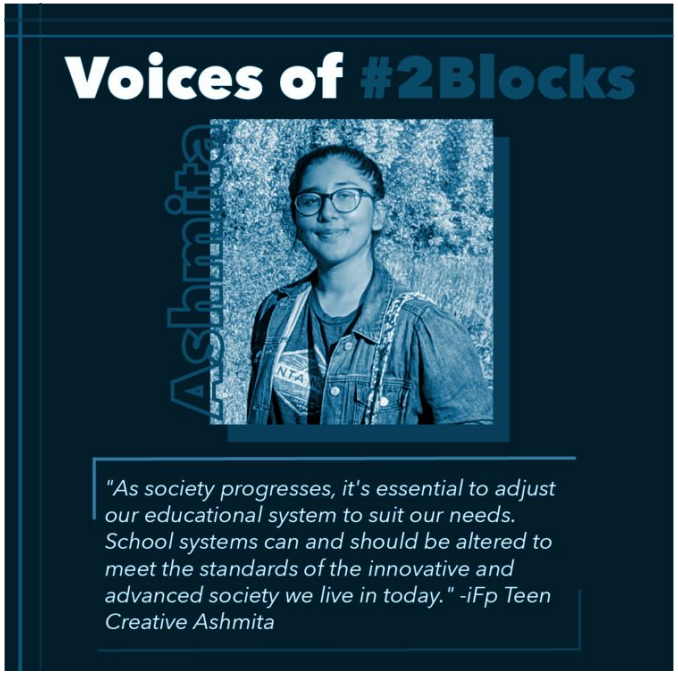
Chelsea X. Huang,[illegible] Evans,[illegible] Mariona B.
Benjamin V. Rackham,14,15 Samuel N. Quinn,12 Ryan Clout
Eric L. N. Jensen,18 John F. Kielkopf,19 Bob Massey,20 Ric
Jack J. Lissauer,22 Jonathan M. Irwin,12 zgr Batrk,23 Benj
Steve B. Howell,22 Carl Ziegler,26 César Briceño,27 Nichol
Elise Furlan,24 David R. Ciardi,24 Rachel Matson,29 Coel Hellie
Jeffrey D. Crane,33 Johanna K. Teske,33,34 Stephen A. Shectma
Sara Seager,1,13,35 Joshua N. Winn,36 Jon M. Jenkins,22 Zacho
William Fong,1 Gabor Furesz,1 Christopher E. Henze,22 Edward
and Joseph D. Twicken

SRMP:
Original astrophysics research

2. Stretch and Explore

Science Club for Girls:
Designing mini-rockets.

Innovators for Purpose:
Producing the “2 Blocks” Podcast.

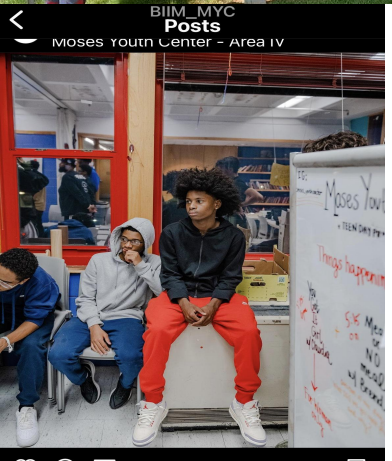


City Sprouts:
Building solar ovens

3. Develop Craft

Russell Youth Center:
Cardboard game engineering

Innovators for Purpose:
Public art design for the real world



Boys II Men/Moses Youth Center:
Crafting our selves through self-actualization

Engagement, Self-efficacy, Identity

Frisoli Youth Center:
Focus on relationships.

SRMP:
Mentorship in small groups

Young People's Project:
Building confidence through
"I Know What I Know"

STEAM-y Strategies

Key practices identified in the study for engaging youth in STEAM and developing Habits of Mind.

1. High expectations

Staff hold high expectations for youth and prepare them to persist.

2. Questioning minds

Staff practice constant inquiry to develop curious minds for STEAM and for life.

3. Real World

Lessons and projects have real-world applications and exposure.

Recommendations

Recommendations

One: Expand Representation

Students learn to engage from what they know and who they are. Connect students to mentors, teachers, supporters and others who share similar backgrounds and can guide and inspire.

Two: Expand Investment

Habits take time to build. Increase and nurture human and financial resources to support programs, organizations, and partnerships for the short and long-term. Be creative and expansive.

Three: Codify Best Practices

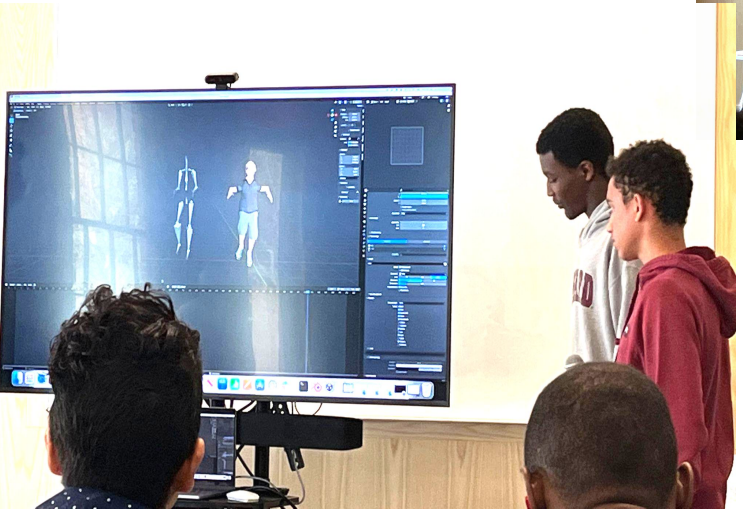
Excellent practice with youth cannot be taken for granted. It needs to be supported, protected and projected within the field and beyond.

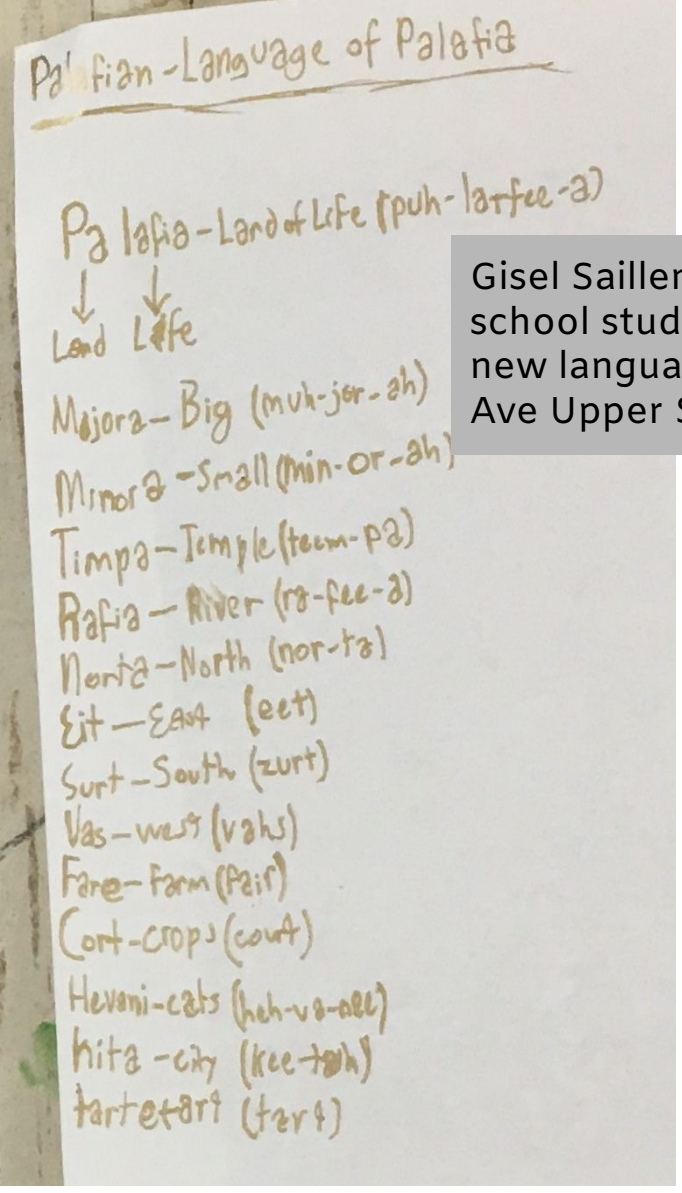
Examples from STEAM Programs

City Sprouts:
Mushroom day

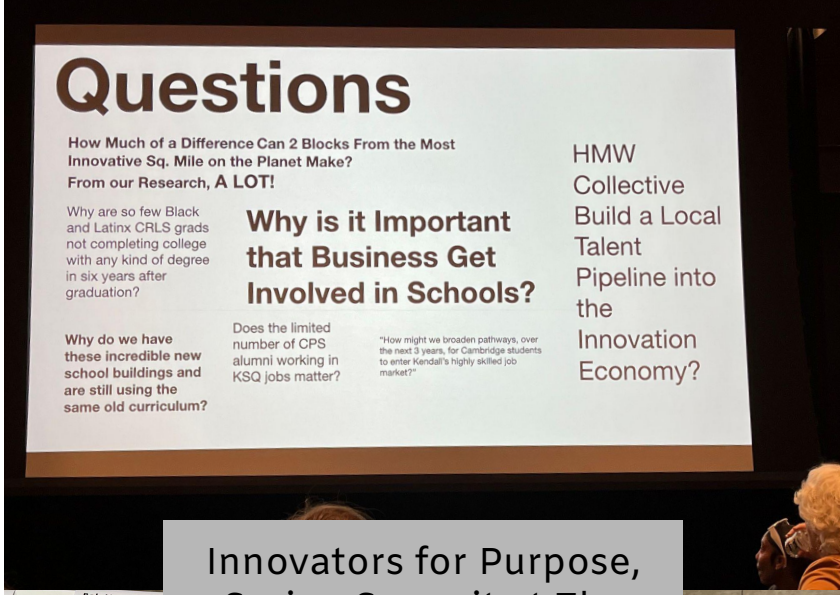
Paul MacGuiness’
science class at
Cambridge Rindge
and Latin High School

Lemelson-MIT Internship Program, Spring Summit at The Foundry

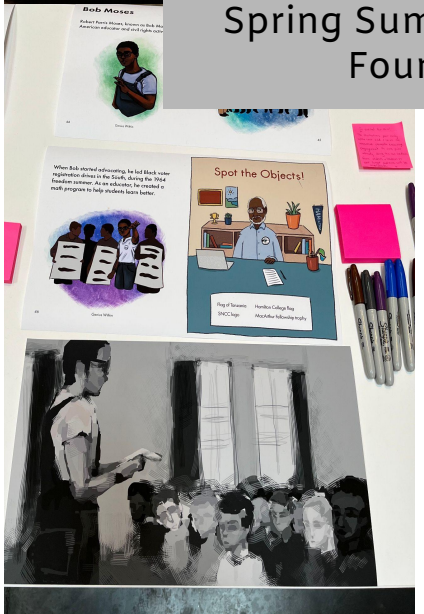


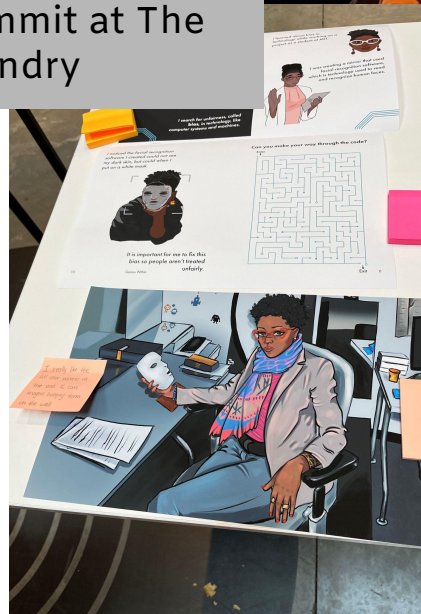


Gisel Saillent's middle school students inventing a new language at Rindge Ave Upper School



Innovators for Purpose, Spring Summit at The Foundry





Olin College STEAM Storytelling event at The Foundry:
Innovators for Purpose youth presenters

THANK YOU

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