

CONNECTED STEM LEARNING: TRANSITIONING TO A NEW VISION OF DELIVERING STEM EDUCATION

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Connected STEM Learning: Transitioning to a New Vision of Delivering STEM Education

Comments by Dennis Schatz

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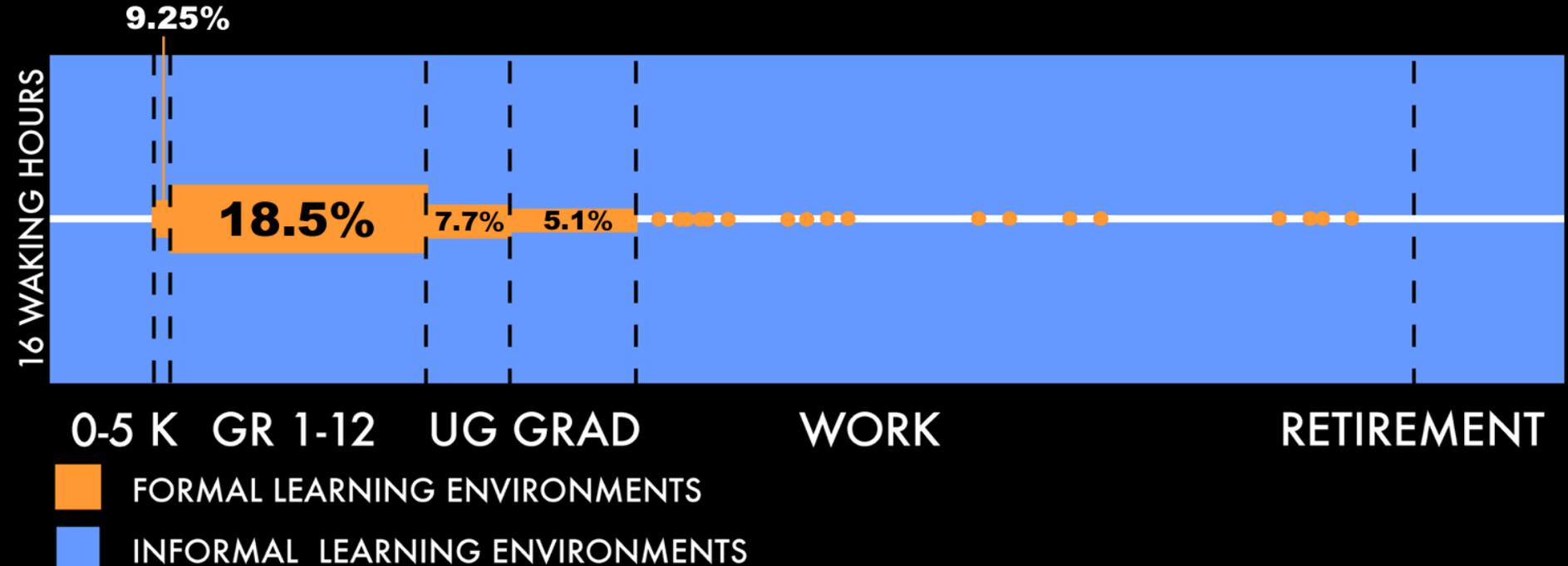
Representing

National Science Teachers Association (NSTA)

Association of Science Technology Centers (ASTC)

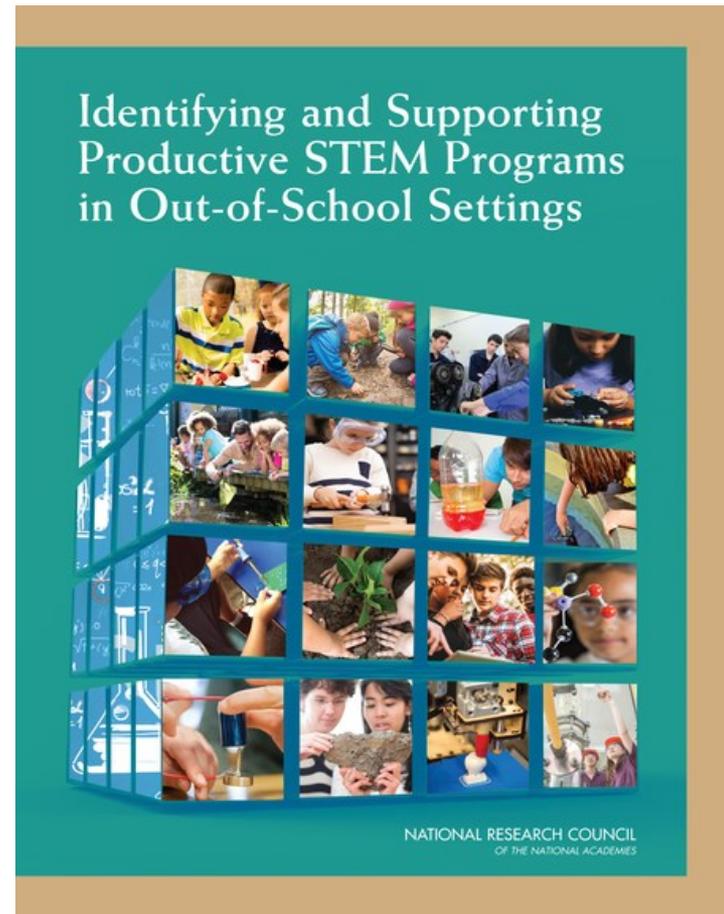
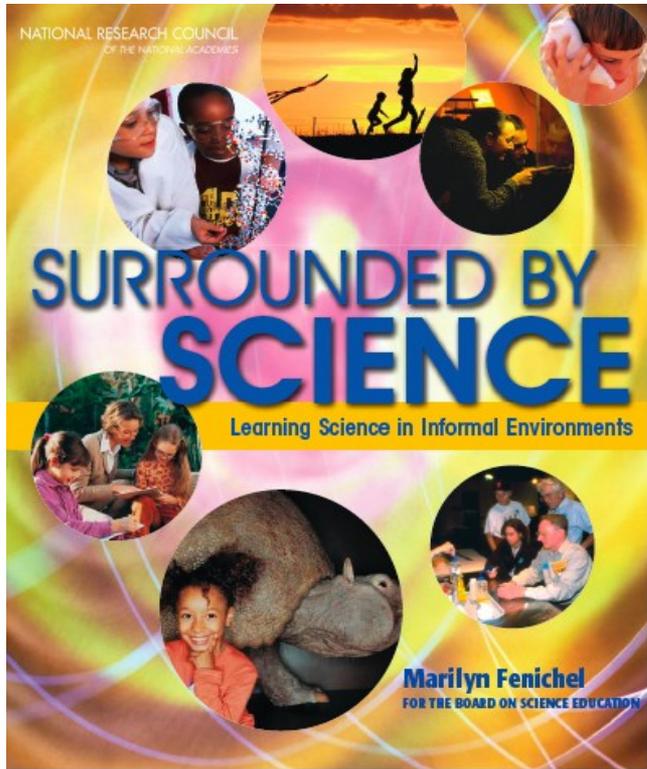
December 6, 2016

LIFELONG AND LIFEWIDE LEARNING



Life-Deep Learning embraces religious, moral, ethnical, and social values that guide what people believe, how they act, and how they judge themselves and others. Learning, development, and education are deeply grounded in value systems operating in society—frequently in implicit ways.

Source: Stevens, R. & Bransford, J. in Banks, et al., *Learning In and Out of School in Diverse Environments*, 2007.





Full STEM Ahead: Afterschool Programs Step Up as Key Partners in STEM Education



The impact of afterschool STEM:

Examples from the field

Afterschool programs are increasingly recognized as crucial components of the larger learning ecosystem for science, technology, engineering and math (STEM). Evidence shows that afterschool programs that provide high-quality STEM learning experiences are making an impact on participating youth. Participants not only become interested and engaged in STEM, but develop tangible STEM skills and proficiencies, come to value these fields and their contributions to society, and begin to see themselves as potential contributors to the STEM enterprise.

This paper summarizes evaluation data from a selection of strong afterschool STEM programs, providing a snapshot of the types of substantive impacts afterschool programs are having on youth. It is an update to the Afterschool Alliance's 2014 paper, "Examining the impact of afterschool STEM programs." We've added seven new afterschool programs, and included newer evaluation data for many. Consistent with our 2014 paper, new evaluation data continues to document afterschool programs' impact on participants' interest in STEM.

- In Philadelphia, Pennsylvania at STEM 3D, youth show statistically significant growth in science engagement through agreeing strongly to statements such as: "I like to participate in science projects" and "I get excited about learning about new discoveries or inventions."

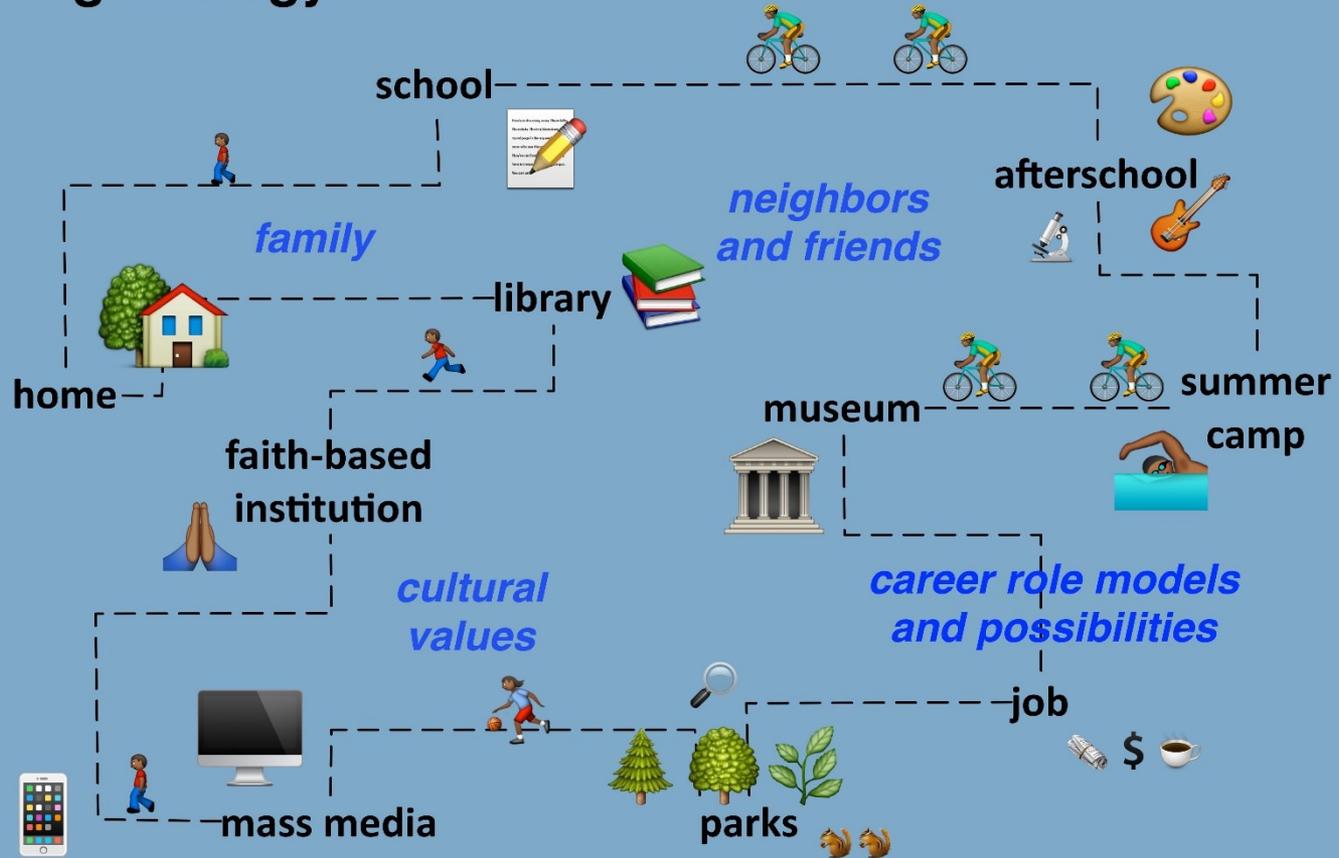


Photo courtesy of GirlStart

Youth also demonstrated gains in STEM competencies and 21st century skills:

- In the Texas program Girlstart After School, all participants engage weekly in iterative design and scientific inquiry to solve problems, and as a result Girlstart girls perform better on the state science and math tests compared to non-participants. In addition, girls demonstrate persistence—92 percent reported a willingness to redesign a project if it did not work on the first try and 92 percent agreed that, "if I try hard, I can be good at science."

Learning Ecology





LINKING IN-SCHOOL AND OUT-OF-SCHOOL STEM LEARNING.

A publication of NSTA and ASTC



EDITORIAL

FEATURED

RESEARCH TO PRACTICE, PRACTICE TO RESEARCH

DIVERSITY AND EQUITY

EMERGING CONNECTIONS

BRIEFS

ISSUE 2

Professional Development

PART 1



A Hub for STEM Learning

From Curiosity to Conservation Careers

First Issue of Connected Science Learning a Great Success

<http://csl.nsta.org>

FROM THE ARCHIVES



Bridging Neuroscience and Education Through Museum-School Partnerships

The Franklin Institute provides programs that help educators of all disciplines understand the key ideas and recommendations for enhanced teaching practices based on new research from the field of neuroscience.



Zoo Academy

Omaha's Henry Doorly Zoo and Aquarium and the Omaha Public School District partnered to form the Zoo Academy, a school-within-a-zoo model that relies on the successful collaboration between an informal science education organization and a school district.



When Spider Webs Unite, They Can Tie Up a Lion

Urban Advantage Denver builds collaboration between formal and informal education partners to meet a common



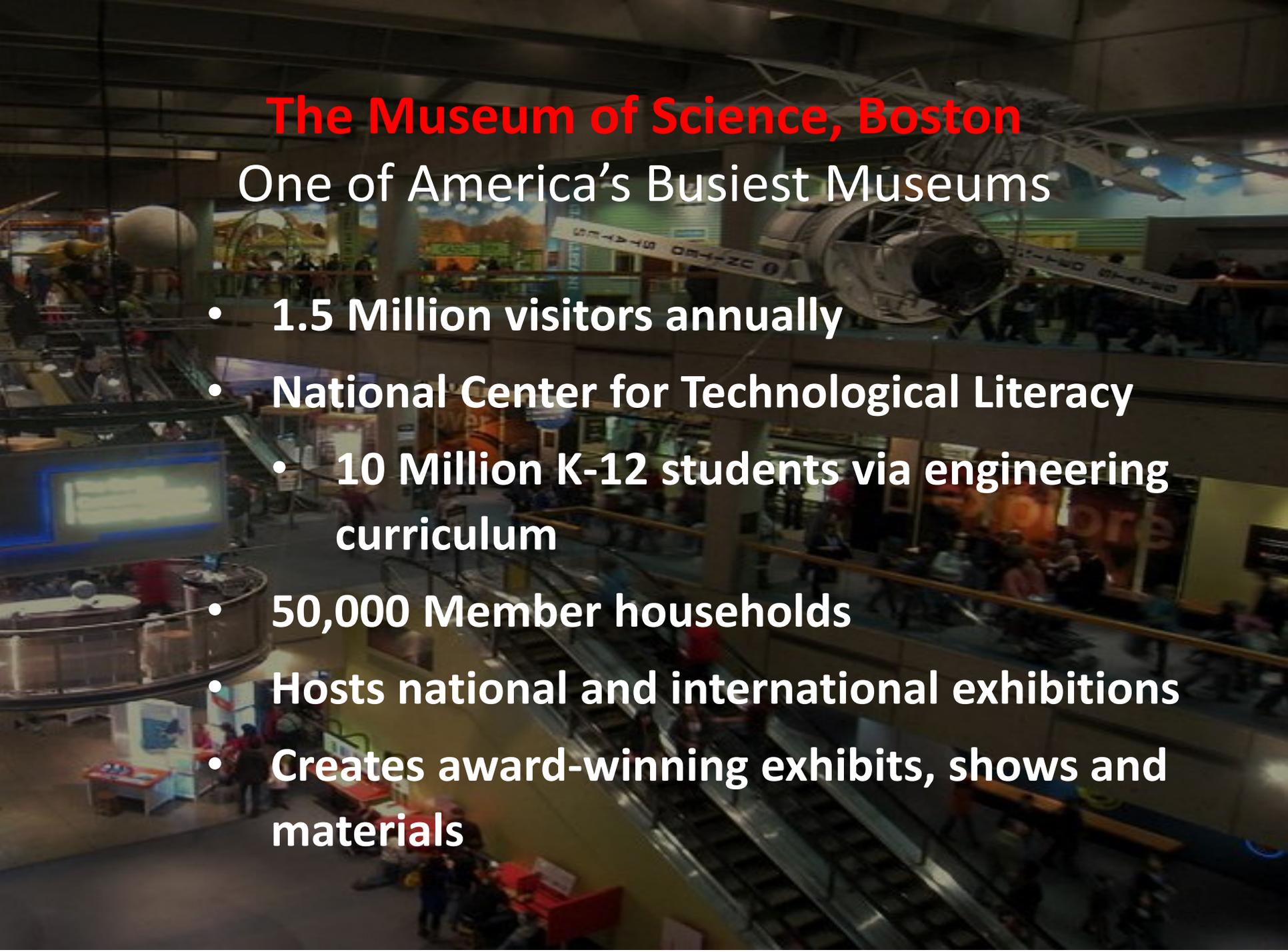
Taking an Ecosystem Approach to STEM Learning

Explore the *Synergies* project, a case study for how to comprehensively integrate three exemplary teaching practices into a STEM









The Museum of Science, Boston

One of America's Busiest Museums

- **1.5 Million visitors annually**
- **National Center for Technological Literacy**
 - **10 Million K-12 students via engineering curriculum**
- **50,000 Member households**
- **Hosts national and international exhibitions**
- **Creates award-winning exhibits, shows and materials**



Stop, Look
& Read
This

But wait,
a hands-
on bear.

Blockbuster Exhibits



STAR WARS
WHERE SCIENCE MEETS
IMAGINATION

The Science Behind
PIXAR



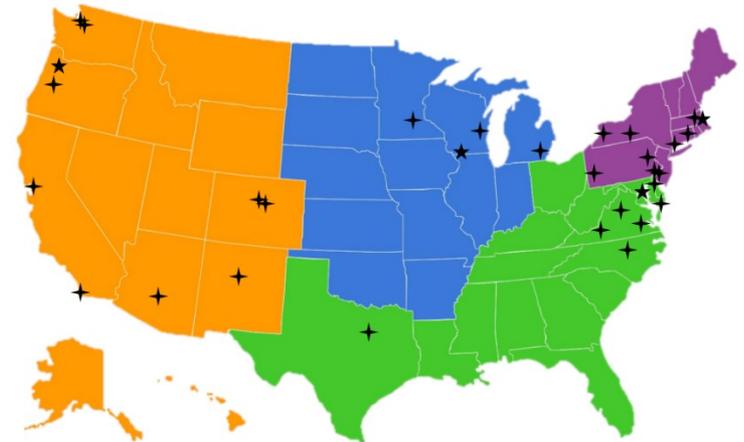
ScienceBehindPixar.org

National Living Laboratory

supports museum-researcher collaborations that foster public awareness, engagement and understanding of the scientific study of children's development

700+ Community Members in 48 states and 21 countries

- 245 informal learning organizations
- 95 universities, colleges and research centers
- 10 professional organizations



www.livinglab.org



150,000+ families face-to-face with scientists at US sites

70+ peer-reviewed research articles, as of August 2016

NISE Network

NISEnet.org



More than
30 MILLION PEOPLE have
participated in NISE Net
programs, events, and
exhibitions



NISE Net's online
library includes
OVER 500
PRODUCTS
free to download
and use

The Clubhouse Network

A global clubhouse network engaging under-represented youth in creative STEM learning.

96 clubhouses in
19 countries reaching
20,000+ youth per year



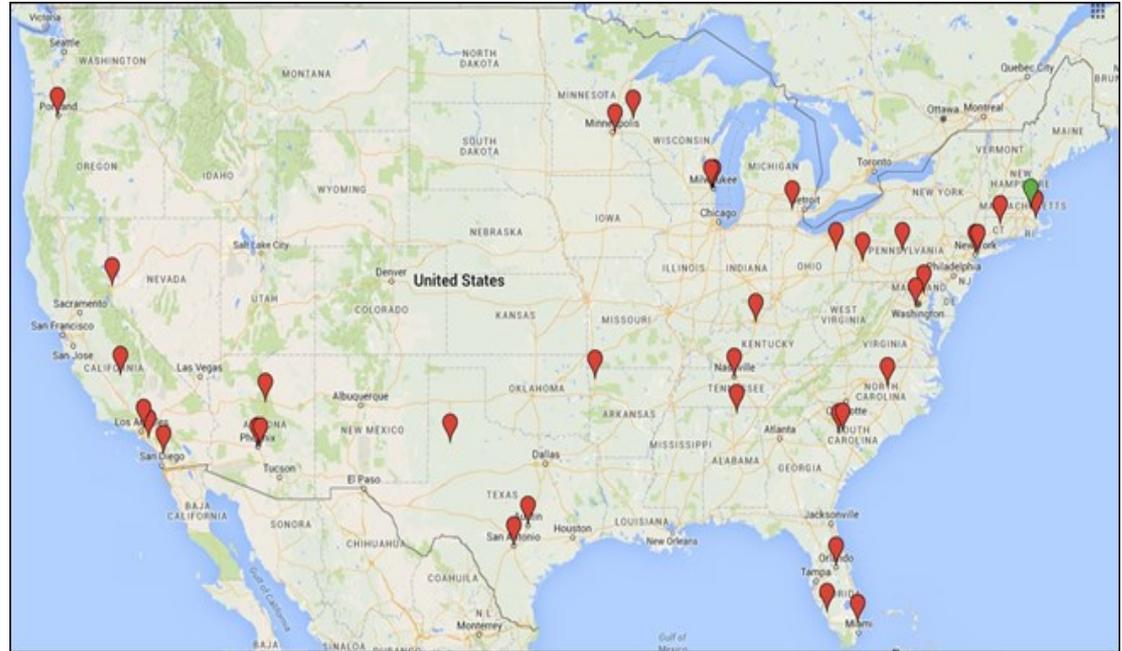
Engineering is Elementary (EiE)



- 20 Units Aligned with Science & Field of Engineering
 - Story Book
 - Teacher Guides
 - Classroom Kits
 - Online Resources

Network of EiE PD Providers

- 75 sites and growing
- Provide professional development
- Help with funding



OnLine Educator Video Resources



Out of School Time Engineering

Engineering Adventures

- 3rd through 5th grades
- 8 units available for **FREE** online



Engineering Everywhere

- 6th through 8th grade
- 10 units available for **FREE** online

MOS & STEM Connectivity

- **Families** via Programs & Exhibits
- **Students** via Field Trips & Clubhouse
- **Universities** via Programs & Exhibit Content
- **Businesses** via Mentor Programs, Internships
- **Other Science Centers** via Networked Learning Models and Traveling Exhibits
- **Teachers** via Classroom Curricula & Teacher PD
- **AfterSchool** via STEM Curricula & Educator PD

What Can Congress Do?

- Encourage Researchers to Budget for Public Engagement Efforts
- Encourage Businesses to Connect with Science Centers for STEM Workforce Development Opportunities
- Support Networked Science Center Programs via IMLS and/or NSF
- Support Integrated STEM Professional Development Teachers & After School Educators (ESSA Title II & IV)
- Connect with you local Science Center!

www.mos.org

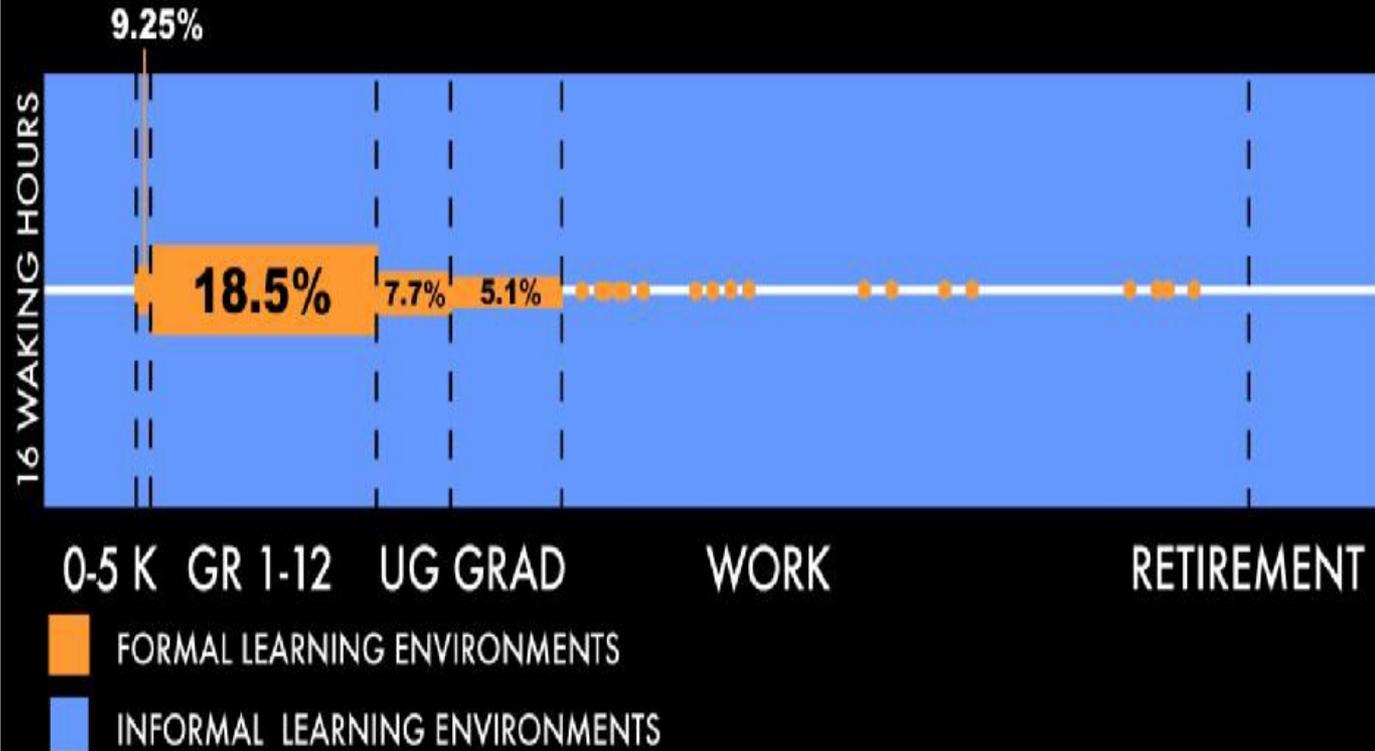
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Connecting STEM Learning In School & Out of School

Ellie Mitchell
Director
Maryland Out of School
Time Network



LIFELONG AND LIFEWIDE LEARNING



Source: Stevens, R. & Bransford, J. in Banks, et al., Learning In and Out of School in Diverse Environments, 2007.

STEM & Out of School Time

- **20 %** - The amount of waking hours a young person spends at school
 - Much of youth learning occurs on the weekends, after school, and during the summer, regardless of zip code.
- **Fluency and immersion**
 - Afterschool programs serve children by increasing the level of exposure to science, technology, engineering, and mathematical activities and experiences.
- **Igniting curiosity about STEM starts with real-world situations**
 - Afterschool programs can be the venue for those experiences.



Talking points from [Afterschool STEM Hub](#)

Statewide Afterschool Networks & STEM

The Noyce and Mott Foundations joined forces to leverage their investments and build off the existing state afterschool infrastructure to expand the availability of quality STEM in afterschool.



System Building Elements

- Fostering Partnerships:
In School & Out of
School
- Improving and
Measuring Quality:
Professional
Development &
Evaluation Tools
- Policy: ESSA & State
Priorities
- Sustainability



MOST's STEMBassador Program



DIGITAL HARBOR FOUNDATION



Dimensions of Success
a peer observation tool



STEMBassador Professional Development

- Professional learning community of in-school, OST and informal educators
- Training on the [DoS](#) observation tool to measure **program quality**.
- Support via [Click2Science](#) on **curriculum implementation**.
- Access to three Digital Harbor Foundation ([DHF](#)) workshops on **3D printing, making, and technology**.

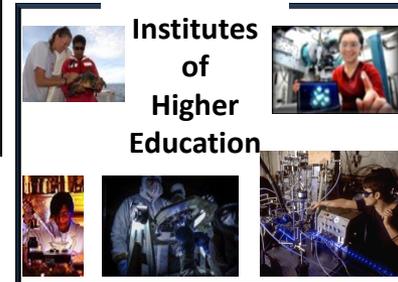




STEM-Rich Institution



Business Community



Institutes of Higher Education



Formal PK-12 Education



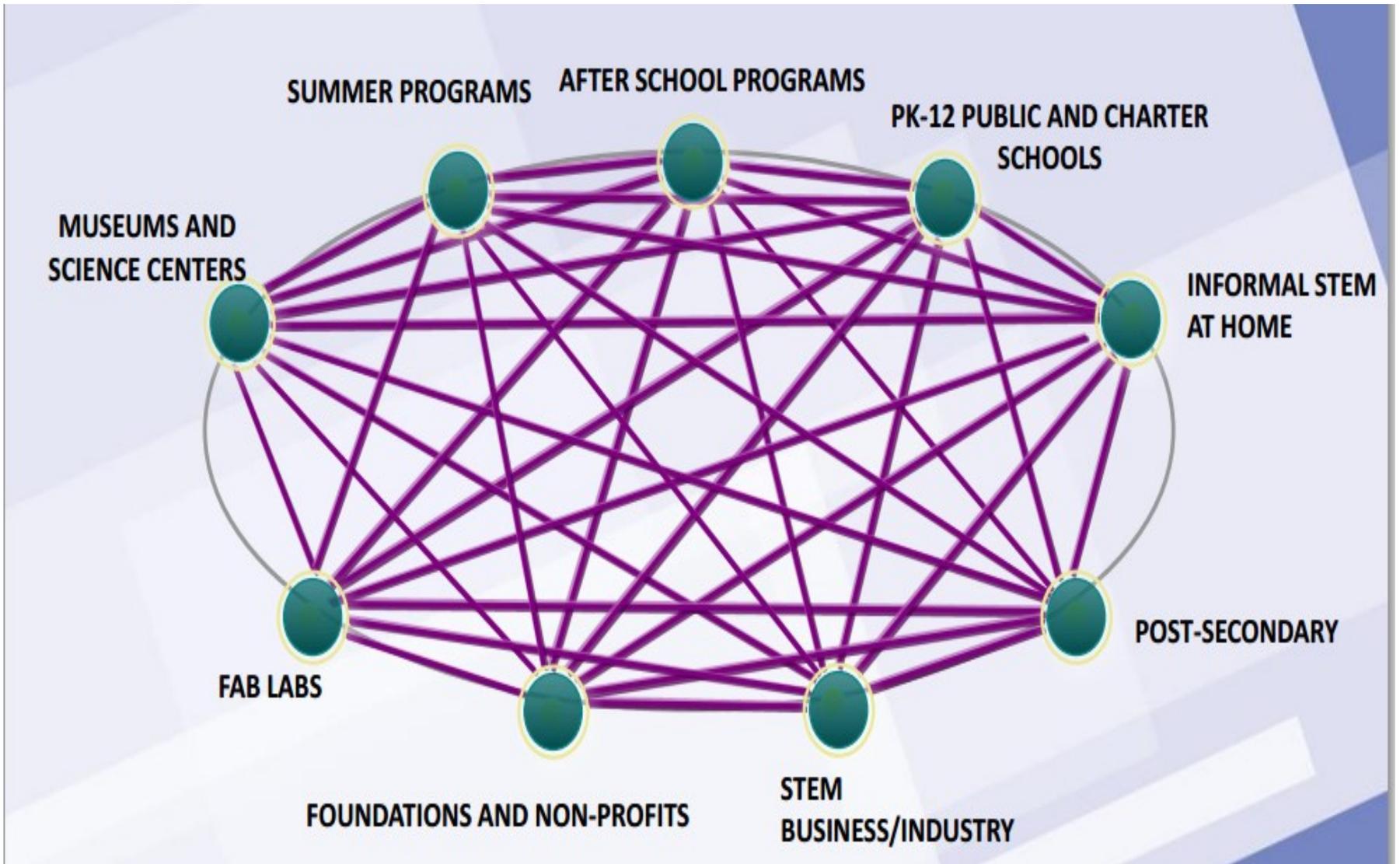
Learner Centric



Family



Out-of-School Programs



Credit: Teaching Institute for Excellence in STEM

Cohorts 1 & 2 (36 Ecosystems)



STEM Learning Ecosystem Elements

Key Partners

1. **PreK-12 school system** receptive to external partnerships
2. High-quality **after school** programs
3. **Out-of-school** STEM-rich programs such as expert museums, science centers,
4. Institutions of **higher education**
5. Private sector STEM-focused **businesses**
6. **Parent** and community-based organizations

Critical Attributes

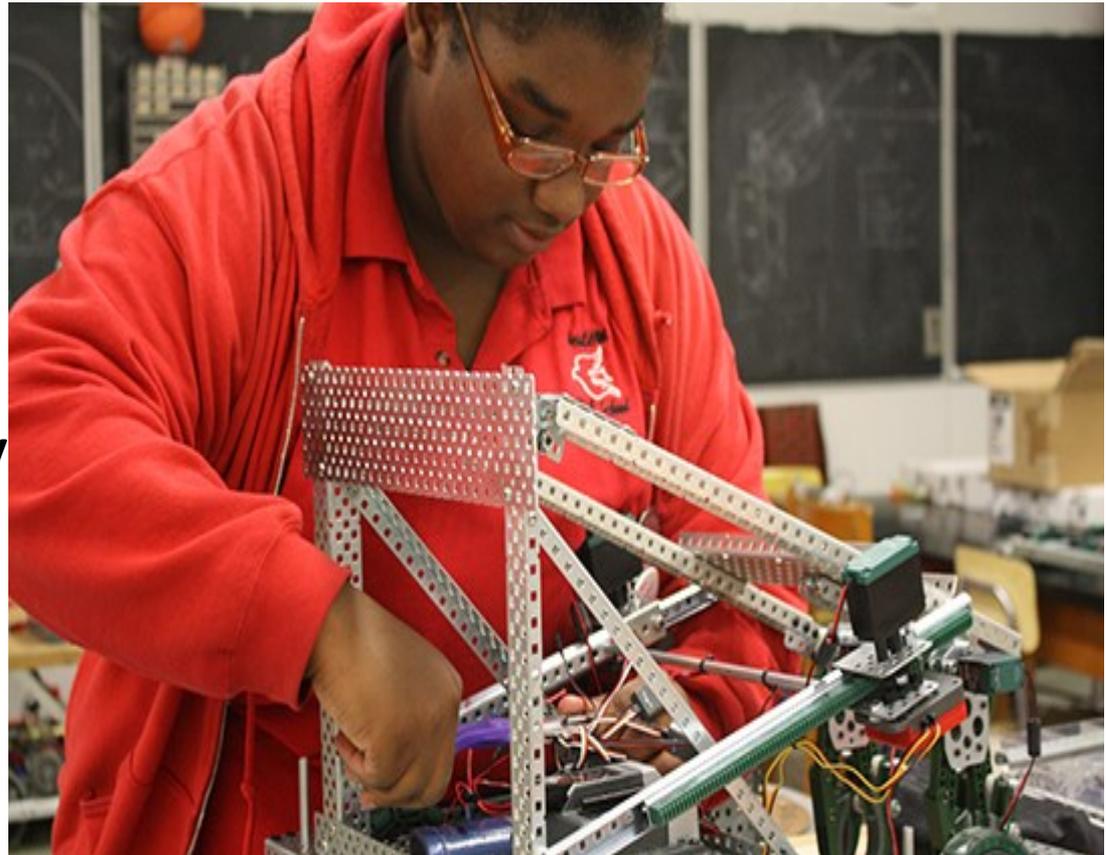
1. Anchored by a **passionate leader(s)** with a collaborative vision and practice
2. Attentive to the **enlightened self-interest** of all partners
3. Philanthropic and public sector **support** and in-kind resources

Focus Areas

1. **Building the capacity** of educators in all sectors.
2. Equipping educators with **tools and structures** to enable sustained collaboration.
3. **Linking in-** and out-of-school STEM learning.
4. Creating **learning progressions** that connect and deepen STEM experiences over time.
5. Focusing instruction on **inquiry, project-based learning** and real-world connections to increase relevance.
6. Engaging **families** and communities.
7. Exposing young people to potential STEM **careers.**

Ecosystem IMpact

- ↑ Access
- ↑ Equity
- ↑ Quality
- ↑ Relevance
- ↑ STEM Identity
- ↑ Pathways

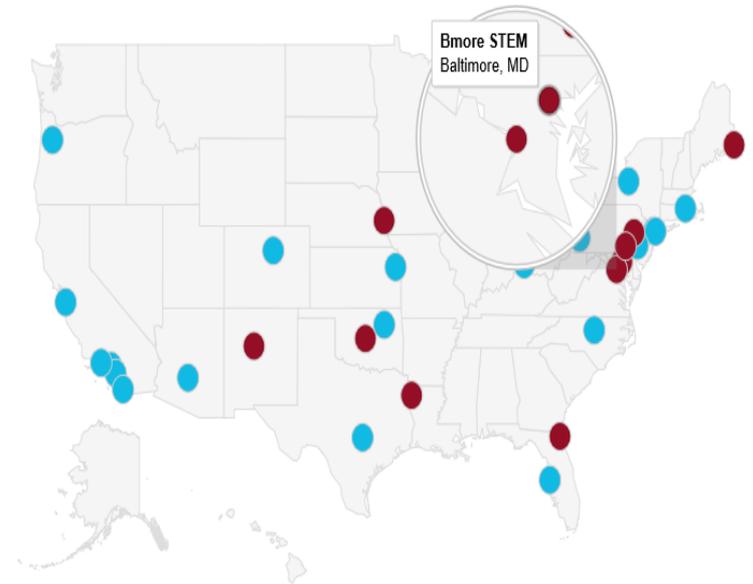




bmorestem

BmoreSTEM is a cross-sector collaboration working to build, promote, and sustain a STEM learning culture throughout Baltimore City. STEM learning happens everywhere, and BmoreSTEM seeks to connect and align STEM learning opportunities to ensure greater impact and outcomes for all of Baltimore's young people that will, in turn, develop a thriving STEM economy in the region.

BmoreSTEM participates within a national community of practice designed to scale effective STEM learning opportunities for all young people, and communicate the importance of STEM.





bmorestem

- 2014: MOST published [Landscaping Baltimore's STEM Ecosystem](#) report
- 2015: MOST created bmorestem.net, the online home of BmoreSTEM
- Parent Engagement Events piloted at East Baltimore schools
- Partnered with Wide Angle Youth Media and Digital Harbor Foundation on Digital Badge pilots through the Mozilla Foundation
- 2016 Design Studio Established Principles & Priorities



Additional Resources

- www.stemecosystems.org
- www.expandingstemlearning.org
- www.mdoutofschooltime.org/initiatives/stem

**2017 Afterschool STEM Institute – Double Tree, Silver Spring
February 27 & 28, 2016**

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