Energy Is Everywhere!

Public Service of Colorado Ponnequin Wind Farm

STEM Learning Ecosystems

Webinar Series sponsored by Housing and Urban Development, Department of Energy and Department of Education

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STEM Learning Ecosystems

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DISCLAIMER

- **The U.S. Department of Education does not endorse the work of the STEM Learning Ecosystems initiative.**

- There may (or may not) be synergies and/or connections between STEM Learning Ecosystems and other federal programs.

- The purpose of this webinar is to bring the STEM Learning Ecosystems initiative to the attention of interested colleagues **so they can determine whether there are adequate synergies and/or connections to merit further exploration.**

The idea of a learning ecosystem is not new:

Bronfenbrenner's Ecological Theory of Development (1972)
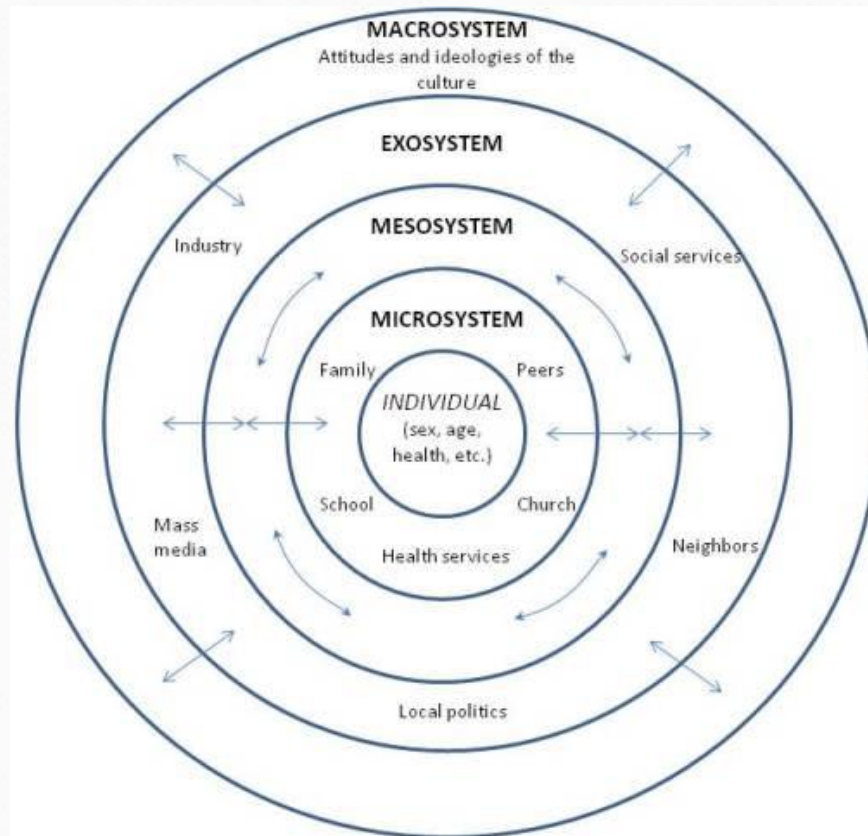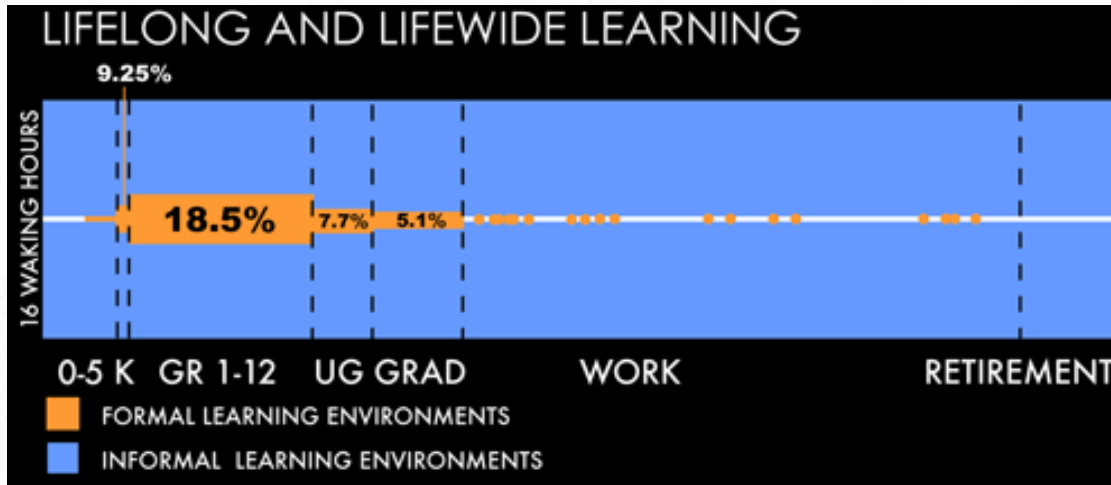
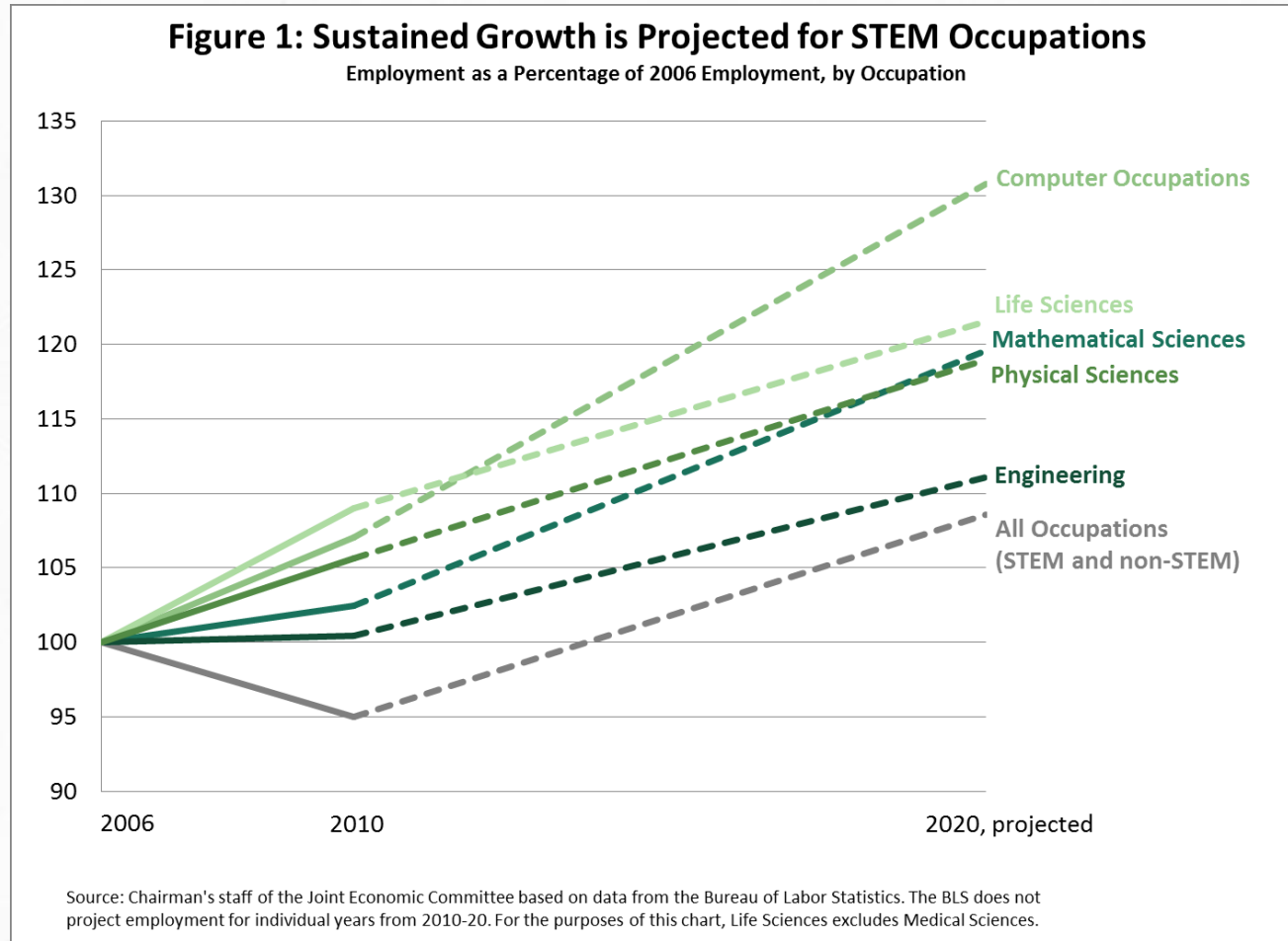## We know learning takes place across many places and times.

Estimated time spent in school and informal learning environments.
This diagram shows the relative percentage of waking hours that people across the lifespan spend in formal educational environments and other activities.
(**Stevens, R. Bransford, J. & Stevens, A., 2005,** Reproduced with permission of The LIFE Center.)

STEM IS IMPORTANT TO OUR ECONOMIC FUTURE

Figure 1: Sustained Growth is Projected for STEM Occupations
Employment as a Percentage of 2006 Employment, by Occupation

Source: Chairman's staff of the Joint Economic Committee based on data from the Bureau of Labor Statistics. The BLS does not project employment for individual years from 2010-20. For the purposes of this chart, Life Sciences excludes Medical Sciences.

ITS NOT JUST WORKFORCE PIPELINE, BUT BASIC SKILLS

Trends in Routine and Nonroutine Task Input in U.S. Occupations: 1960 to 2002
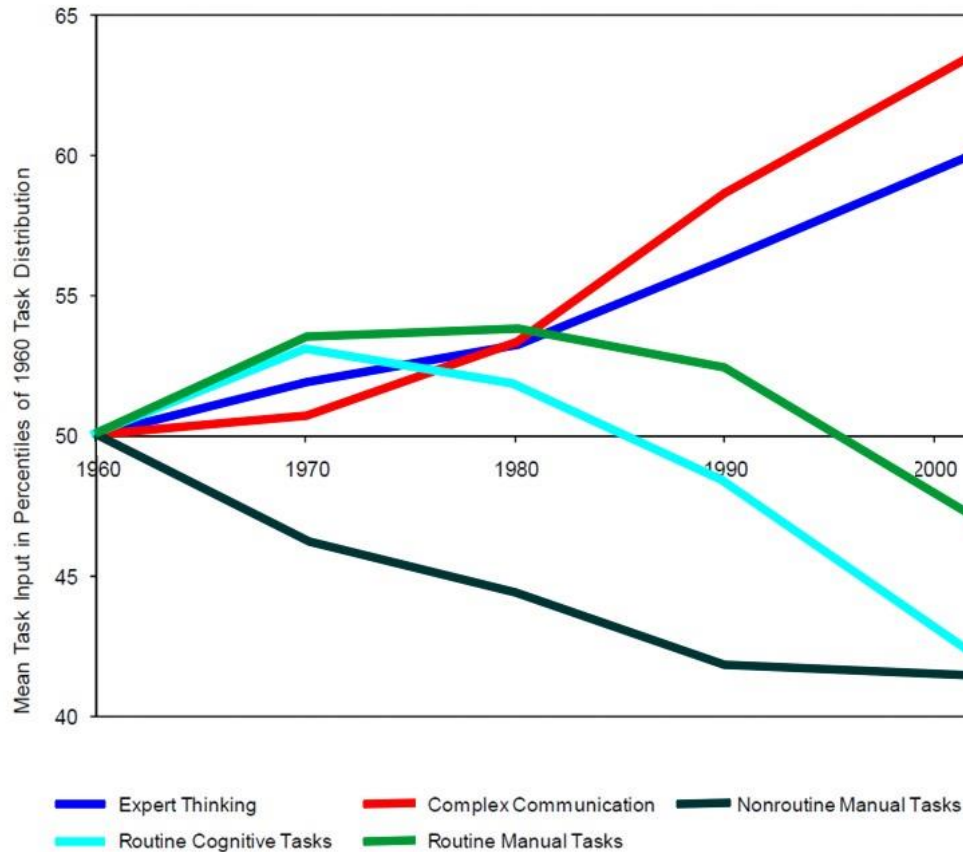
Source: Autor, Levy and Murnane (2003) updated to 2002 by David Autor.

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IT'S NOT JUST WORKFORCE PIPELINE, BUT BASIC SKILLS

How important do you think each of the following is for a student to be ready for college and a career?

	Teachers	Parents	Students	Fortune 1000 Executives
Base	n=1000	n=580	n=2002	n=301
Problem solving skills				
Absolutely essential/Very Important (NET)	98%	93%	92%	99%
Absolutely Essential	64%	60%	55%	73%
Critical thinking skills				
Absolutely essential/Very Important (NET)	97%	91%	93%	99%
Absolutely Essential	64%	61%	56%	71%
Ability to write clearly and persuasively				
Absolutely essential/Very Important (NET)	96%	90%	88%	97%
Absolutely Essential	53%	57%	50%	59%
Ability to work independently				
Absolutely essential/Very Important (NET)	95%	93%	92%	90%
Absolutely Essential	55%	59%	55%	40%
Ability to work in teams				
Absolutely essential/Very Important (NET)	86%	85%	83%	94%
Absolutely Essential	42%	42%	41%	59%
Knowledge of other nations and cultures and international issues				
Absolutely essential/Very Important (NET)	63%	63%	49%	65%
Absolutely Essential	19%	24%	15%	18%
Knowledge and ability in higher-level science such as chemistry and physics				
Absolutely essential/Very Important (NET)	50%	71%	64%	31%
Absolutely Essential	11%	29%	24%	4%
Knowledge and ability in higher-level mathematics, such as trigonometry or calculus				
Absolutely essential/Very Important (NET)	46%	69%	66%	40%
Absolutely Essential	11%	31%	27%	8%

[3] The MetLife Survey of THE AMERICAN TEACHER Preparing Students for College and Career

ISSUES OF EQUITY DURING THE SCHOOL DAY

African American and American Indian students have less access to a full range* of math and science courses in their high schools.
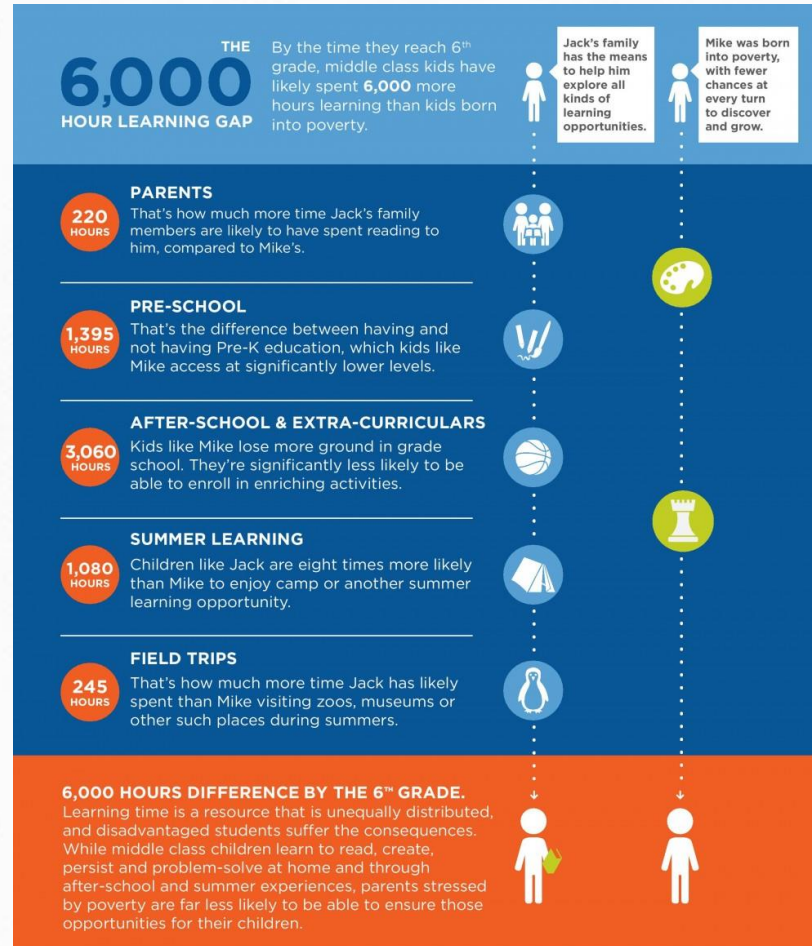

Students with access to the full range of math and science courses, by race and ethnicity
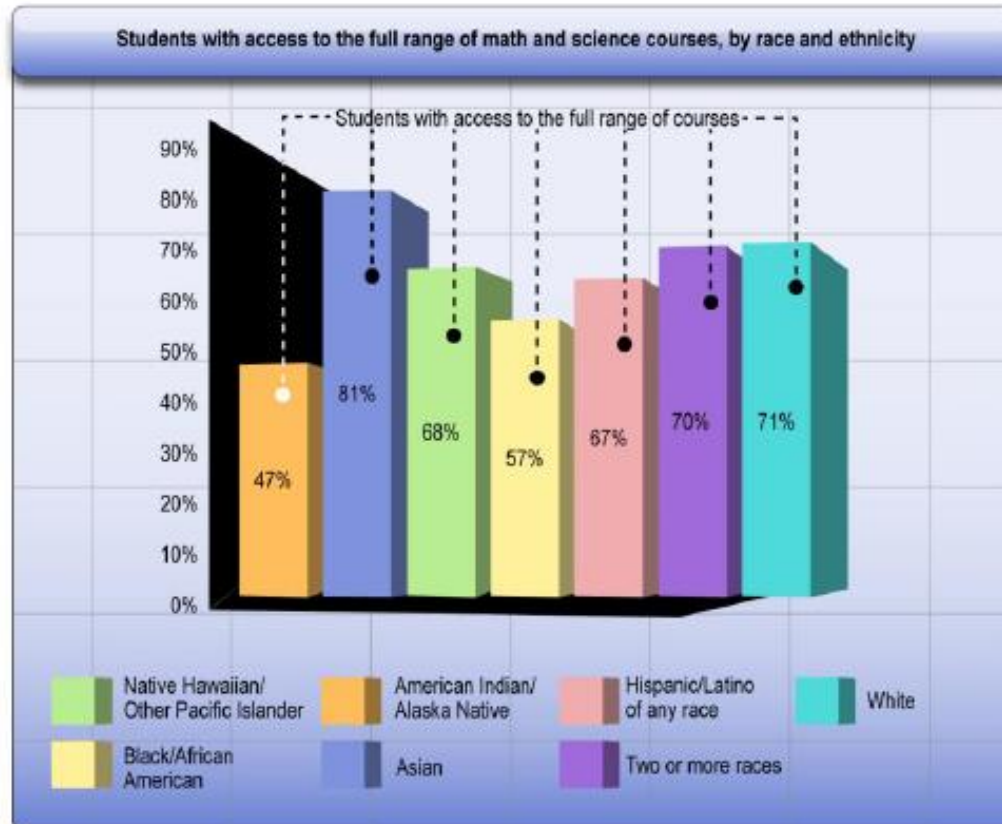
Source: US Department of Education, Office for Civil Rights, Civil Rights Data Collection, 2011-2012
* Algebra I, Geometry, Algebra II, Calculus, Biology, Chemistry, Physics

ISSUES OF EQUTY DURING OUT-OF-SCHOOL TIME

STEM-Rich Institutions

Business Community

Institutes of Higher Education

Learner centric

Formal P-12 Education

Family
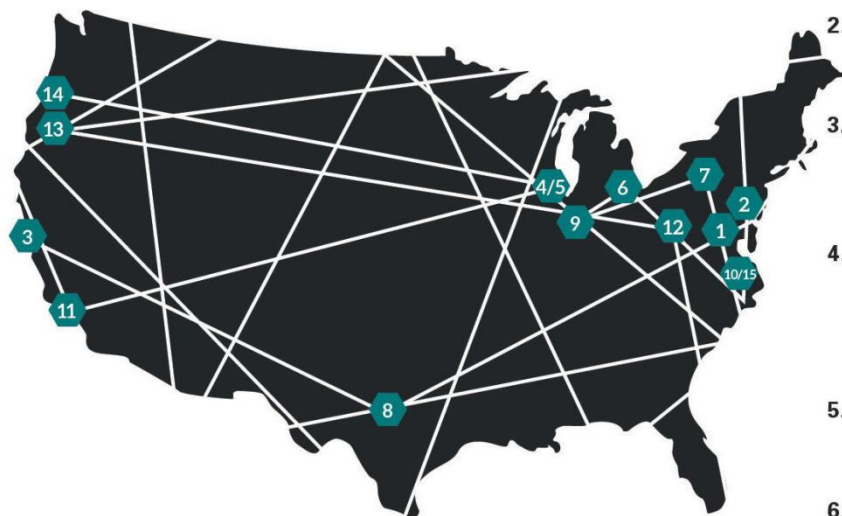
Out-of-School

COMMUNITIES PROFILED BY TRAPHAGEN AND TRAILL (2014)

1. **AFTERZONE SUMMER SCHOLARS**
   Providence, RI

2. **BOSTON SUMMER LEARNING PROJECT**
   Boston, MA

3. **CALIFORNIA ACADEMY OF SCIENCES, SCIENCE ACTION CLUBS**
   San Francisco, CA

4. **CENTER FOR THE ADVANCE-MENT OF SCIENCE EDUCATION, MUSEUM OF SCIENCE AND INDUSTRY**
   Chicago IL

5. **CHICAGO PRE-COLLEGE SCIENCE AND ENGINEERING PROGRAM**
   Chicago, IL

6. **DETROIT AREA PRE-COLLEGE SCIENCE AND ENGINEERING PROGRAM**
   Detroit, MI

7. **EXPANDED LEARNING NETWORK OF THE SOUTHERN TIER**
   Corning, NY

8. **GIRLSTART**
   Central Texas

9. **INDIANA AFTERSCHOOL STEM INITIATIVE**
   Indiana

10. **NEW YORK CITY STEM EDUCATORS ACADEMY**
    New York, NY

11. **ORANGE COUNTY STEM INITIATIVE**
    Orange County, CA

12. **SHINE (SCHOOLS AND HOMES IN EDUCATION) AFTERSCHOOL PROGRAM**
    Carbon and Schuylkill counties, PA

13. **SMILE (SCIENCE AND MATH INVESTIGATIVE LEARNING EXPERIENCES)**
    Oregon

14. **SYNERGIES**
    Portland, Oregon

15. **URBAN ADVANTAGE**
    New York, NY

STEM Ecosystem Elements

Key Partners

1. PreK-12 school system receptive to external partnerships

2. High-quality out-of-school time/youth development system and programs

3. STEM-expert museums, science centers, professional associations, and businesses

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.

STEM ecosystems Cultivate. Learn. Innovate.

THE STEM FUNDERS NETWORK:

Initiative Overview

2015–16
- 25 sites
- Technical Assistance
- Communities of Practice

➕

10 sites awarded $10k collaboration grants

10 sites awarded opportunity to host AmeriCorps Member

2016–17
- 25 sites + 10 new sites
- Technical Assistance
- Communities of Practice

➕

10 sites awarded $10k collaboration grants

10 sites awarded opportunity to host AmeriCorps Member

10 sites awarded implementation grants

2017–18
- 35 sites + 10 new sites
- Technical Assistance
- Communities of Practice

➕

10 sites awarded $10k collaboration grants

10 sites awarded opportunity to host AmeriCorps Member

10 sites awarded implementation grants

Evaluation →

- **Phoenix, AZ**
- **San Jose, Los Angeles, Corona Del Mar, San Diego, Camarillo, CA**
- **Boston, MA**
- **Chicago, Evanston, IL**
- **Denver, CO**
- **East Syracuse, Buffalo, New York, Corona, NY**
- **Kansas City, MO**
- **Freeland, MI**
- **Austin, TX**
- **Cincinnati, Cleveland OH**
- **Indianapolis, IN**
- **Research Triangle Park, NC**
- **Salem, OR**
- **Pittsburgh, Conshohocken, PA**
- **Providence, RI**
- **Tampa, FL**
- **Tulsa, OK**

Additional funding cohorts anticipated for 2016 and 2017
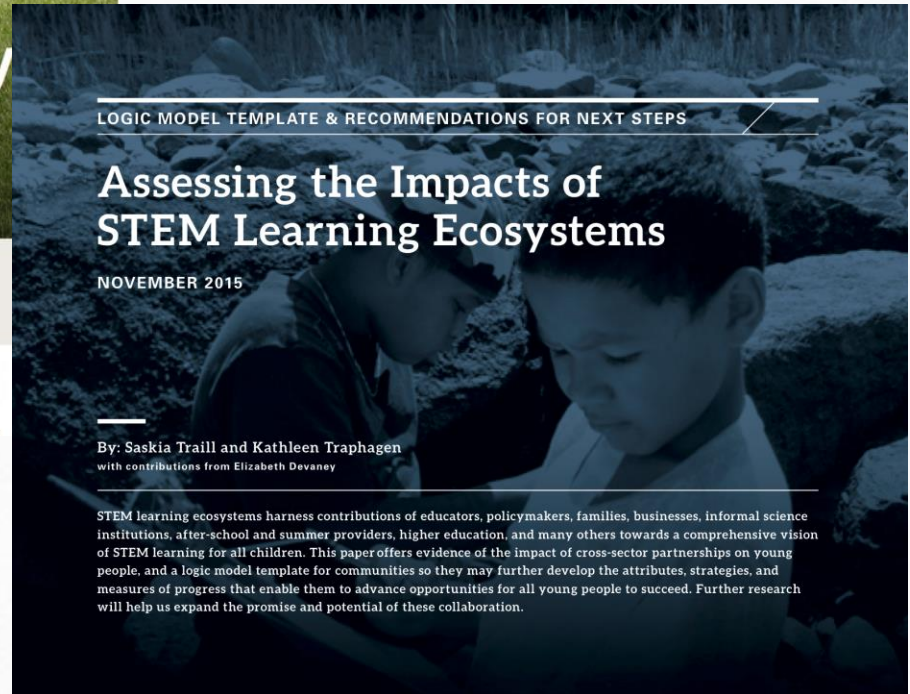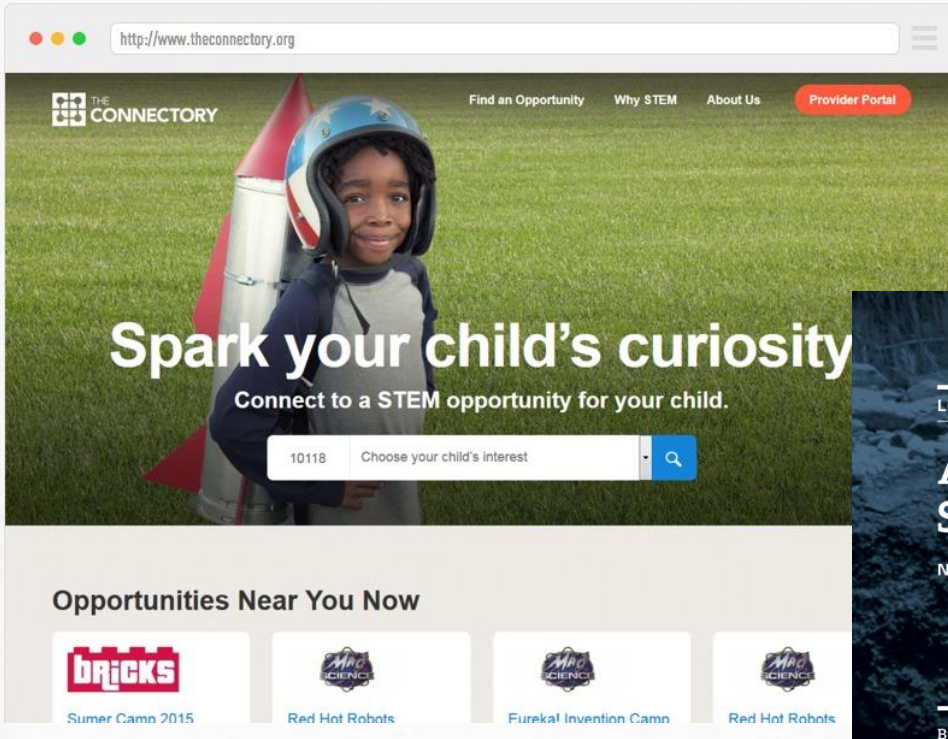
Technical Assistance:
www.stemecosystems.org

- National Academies: STEM Learning is Everywhere (2014)
  http://www.nap.edu/catalog/18818/stem-learning-is-everywhere-summary-of-a-convocation-on-building

- National Academies: Identifying and Supporting Productive STEM Programs in Out-of-School Settings (2015)
  http://www.nap.edu/catalog/21740/identifying-and-supporting-productive-stem-programs-in-out-of-school-settings

  Companion study to report from National Academies: Successful K-12 STEM Education (2011)

  http://www.nap.edu/catalog/13158/successful-k-12-stem-education-identifying-effective-approaches-in-science

- Traphagen and Traill: How Cross-Sector Collaborations are Advancing
  STEM Learning
  (2014)http://www.noycefdn.org/documents/STEM_ECOSYSTEMS_REPORT_140128.pdf
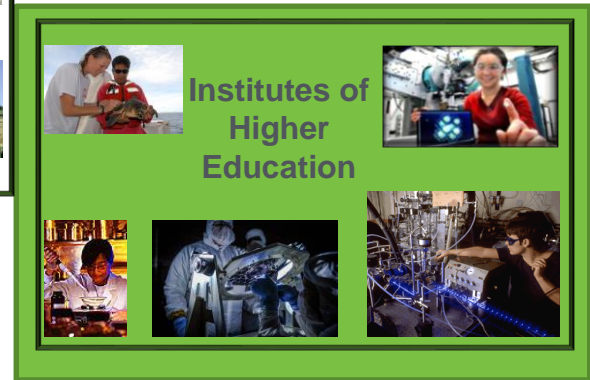
STEM-Rich Institutions
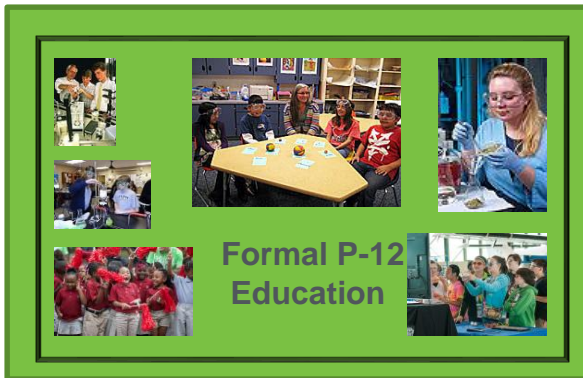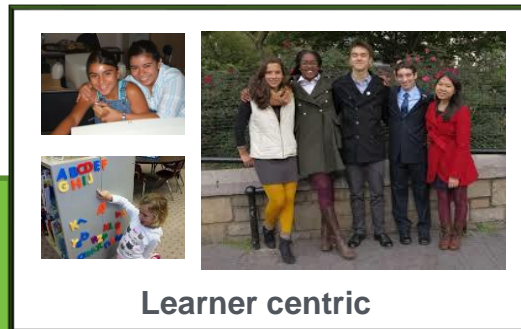
Business Community

Institutes of Higher Education

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Out-of-School Pr

STEM ECOSYSTEMS CAN HELP AMPLIFY AND SUSTAIN ED'S INVESTMENTS

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STEM Learning Ecosystems can:

- Leverage existing community relationships/foster new ones
- Leverage and sustain existing sources of support
- Connect with other community-based learning networks
- Provide technical assistance www.STEMEcosystems.org
- Access to seed funding: [2015], 2016, 2017

You may wish to:

- Connect with an existing STEM Learning Ecosystem
  I will introduce you to the Ecosystem lead in your community
  Email me: Ellen.Lettvin@ED.gov
- Create a new STEM Learning Ecosystem with members of your community
  If one doesn't currently exist
- Neither

THANK YOU

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