Informal STEM Education 101: A Briefing for Policymakers on the Basics of

“What We Mean when We Talk about Informal STEM Education”

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Informal STEM 101
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| • National policy  
  o Families & children; STEM  
• Advocacy day on Capitol Hill  
• Lights On Afterschool | • Translate & synthesize research  
• Issue briefs & reports  
• Collect data | • 48 state networks  
• Partnerships for policy, research, & practice  
• Best practices & models  
• Webinars, blogs, toolkits, & other resources |
# Why STEM in Afterschool?

**Youth Development Goals**
- Empowering young people
- Socio-emotional competence
- 21st century skills like teamwork & collaboration, leadership, service, problem solving
- Positive relationships with adults

**Approach to STEM Learning**
- Hands-on, experiential
- Project-based
- Experimentation & failure
- New entry points to science for diverse learners
- Connected to communities, home cultures, and student knowledge & experiences

**Environment**
- Low-stakes
- Flexible in time and space
- Community partnerships
Real Programs, Real Impacts

Science Club
Chicago, IL
- Dramatic science skills increases - Based on interview-based assessments & science fair scores
- 100% of recent graduates chose STEM majors in college

Project GUTS
Santa Fe, NM
- 82% completed a working computer simulation model
- 80% would use modeling & simulation as a strategy to solve community social issues in the future

Girl Start
Austin, TX
- 91% demonstrated mastery of scientific inquiry & the engineering design process
- 84% were interested in taking STEM classes in middle or high school
### Who is “Afterschool”?

#### Afterschool Providers
- 4-H
- Boys & Girls Club
- YMCA/YWCA
- Girls, Inc.
- Schools
- Libraries
- Parks & Rec
- Comm. Centers
- Religious Orgs

#### National Organizations
- Afterschool Alliance
- National Afterschool Association
- National Summer Learning Association

#### State & Local Orgs
- Statewide Afterschool Networks (48 states)
- City intermediaries (e.g. Every Hour Counts)

#### Partners
- Universities
- Government labs
- Science centers
- Museums
- Zoos
- Aquaria
- Industry
- Researchers

#### Key Players

America After 3PM

DEMAND IS HIGH

More youth than ever before—
10.2 million
—are in afterschool programs.

For every child in a program,
2 are waiting to get in.

- Household survey of how kids spend the hours after school
- Attendance & demand much higher in low-income, African-American, & Latino households
America After 3PM – STEM teaser

• **Coming Fall 2015!** Special report on STEM in afterschool

• Preliminary data analysis shows that:
  
  o Nearly 7 in 10 parents (69%) say their afterschool program offers STEM
  
  o More than half (53%) say that STEM was an important factor in choosing their child’s program
  
  o 78% of parents with a child in an afterschool program agree that such programs help children gain interest and skills related to STEM
State of STEM in afterschool

- Providers enthusiastically embracing STEM
- Funders recognizing role of space
- Support systems growing rapidly
- Ongoing research on outcomes and assessments
- Public policy catching up
Support afterschool STEM

• ESEA
  o 21st Century Community Learning Centers (21CCLC)
  o Build a STEM ecosystem - Afterschool as eligible partner in other STEM improvement amendments, including professional development

• America COMPETES

• Supporting Afterschool STEM Act - S. 444; H.R. 831
Thank you!

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Read Us Afterschool Snack Blog

www.afterschoolalliance.org/STEM

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Identifying and Supporting Productive STEM Programs in Out-of-School Settings

with funding from

Informal STEM Education 101

July 7, 2015
Study Goals

• Outline criteria for identifying effective out-of-school STEM programs

• Describe the strength of the evidence for the criteria
Related Reports
www.nap.edu
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Overarching Perspective
Overarching Perspective
Overarching Perspective
Overarching Perspective
Overarching Perspective
Overarching Perspective
What we Found

• There is a connection between well run programs and learning outcomes

• Out-of-School STEM programing is expanding but gaps still exist

• Evidence of impact is difficult to come by
Qualities of Productive Programs

ENGAGING
RESPONSIVE
CONNECTIONS
Qualities of Productive Programs

ENGAGING
Engage Young People Intellectually, Academically, Socially and Emotionally

- Program provides firsthand experiences with phenomena and materials.
- Program engages young people in sustained STEM practices.
- Program establishes a supportive learning community.

RESPONSIVE CONNECTIONS
Qualities of Productive Programs

ENGAGING
RESPONSIVE

Respond to Young People’s Interests, Experiences, and Cultural Practices
- Program positions STEM as socially meaningful and culturally relevant.
- Program supports young people to collaborate and to take on leadership roles in STEM learning activities.
- Program positions staff as co-investigators and learners alongside young people.

CONNECTIONS
Qualities of Productive Programs

Connect STEM Learning in Out-of-School, School, Home and Other Settings

- Program connects learning experiences across settings.
- Program leverages community resources and partnerships.
- Program actively brokers additional STEM learning opportunities.
Recommendations

• Build a map and bridge the gaps
• Connect young people to STEM learning opportunities
• Build an infrastructure that will last
• Provide professional development
• Support innovative evaluation approaches
• Research how STEM learning ecosystems work
Thank You

The reports can be downloaded for free at www.nap.edu
Informal STEM
at U.S. Department of Education

Dr. Ellen Lettvin
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7/7/15
STEM INVESTMENT AT ED:
STEM IS A PRIORITY IN OVER 60 FUNDING OPPORTUNITIES

Career and Technical Education: Basic Grants to States *
Education Research Grants – Effective Teachers and Teaching
Green Ribbon Schools *
Hispanic Serving Institutions STEM and Articulation Programs
Investing in Innovation (I3) *
Magnet Schools Assistance Program *
Math Science Partnerships *
Minority Science and Engineering Improvement Program
Race to the Top *
Ready to Learn *
Special Education Research Grants – Professional Development
Teacher Incentive Fund (TIF)
Teachers for a Competitive Tomorrow (TCT)
Teacher Quality Partnerships
21st Century Community Learning Centers *
STEM-RICH PARTNERSHIPS (21ST CCLC): NASA

- Student teams solve real-world engineering design challenges, engage with high-quality STEM content, interact directly with NASA scientists and engineers.
- Professional development and technical assistance build staff capacity by supporting acquisition of new content knowledge and development of new teaching strategies.
- Pilot collaboration (winter, 2014):
  - 3 challenges offered at 20 sites in 3 states
  - Implementation study to characterize program quality, lessons learned
- Expanded collaboration (winter, 2015)
  - 6 challenges offered at 80 sites in 10 states
  - Program evaluation to capture learning outcomes, program quality
STEM-RICH PARTNERSHIPS (21ST CCLC):

INSTITUTE OF MUSEUM AND LIBRARY SERVICES

- Students experience STEM-rich Tinkering and Making, engage with high-quality STEM content and activities, interact directly with Maker experts
- Professional development and technical assistance build staff capacity, support acquisition of new content knowledge and development of new teaching strategies
  - Improvisational problem solving, no one “right way”
  - Creative solutions, self-expression
  - Developing and building out an idea – testing, learning from feedback, re-designing, re-testing, persisting through frustrations
  - STEM as a means not an end: work with STEM tools, concepts, phenomena
  - Establish linkages between school-day learning and out-of-school applications
- Pilot collaboration (2015), reaching 25 sites in 5 states; implementation study

Photographs and graphic courtesy of the Exploratorium ©
STEM-RICH PARTNERSHIPS (21ST CCLC)

NATIONAL PARK SERVICE

- Students engage in Citizen Science and Environmental Monitoring, engage with high-quality STEM content and activities, interact directly with park rangers.
- Professional development and technical assistance build staff capacity, support acquisition of new content knowledge and development of new teaching strategies.
- Citizen science: collection and analysis of data relating to the natural world by members of the general public in collaboration with professional scientists.
- Focus on phenology - study of the timing of natural events in plants and animals using established monitoring protocols - reinvigorated with changing climate (e.g., When do frogs begin to call? When do wildflowers bloom? When do songbirds return?).
- Link school-day learning and out-of-school applications.
- Pilot collaboration (2015), reaching 11 sites in 5 states; implementation study.

Focus on reaching students in Bureau of Indian Education schools.
STEM LEARNING ECOSYSTEMS
WWW.STEMECOSYSTEMS.ORG

STEM-Rich Institutions
Business Community
Institutes of Higher Education
Learner centric
Formal P-12 Education
Family
Out-of-School Programs
A global organization providing collective voice and professional support for science centers, museums, and related institutions, whose innovative approaches to science learning inspire people of all ages about the wonders and the meaning of science in their lives.
• Incorporated in 1973 with 20 founding science center and museum members

• Over **400** institutions (centers, museums, universities, research laboratories, corporations) in all 50 U.S. states

• An estimated **73 million visits** were made to ASTC’s science center and museum members in the U.S. in 2013
U.S. Science Center
Science Centers and Museums:

• inspire a desire to experience and learn in a STEM-rich setting.

• offer creative complements to the formal education environment.

• encourage interest, exploration and even career choices in science.
Science Centers and Museums:

• translate complex science into comprehensible, relevant form.

• build trust between the scientific establishment and the general public.
Non-school learning environments provide valuable venues for informal STEM learning experiences - generating interest, engagement, capacity, confidence, academic performance, and pursuit of academic and career paths.
Science Centers = Centers for Science

- COMMUNITY ORGANIZATIONS
- CORPORATIONS
- UNIVERSITIES
- THINK TANKS
- LIBRARIES
- RESEARCH LABORATORIES
- ZOOS
- AQUARIUMS
- PLANETARIUMS
- MEDIA ORGANIZATIONS
- SCHOOLS
ISE Professional Support

Skills Development
• Conference
• Publications
• Communities of Practice
• Professional Development and Leadership Institute

Operational Support
• Surveys and Research
• Traveling Exhibition Services
• Grants, Partnerships, and Contributions
Girls in Engineering

Showcase Categories

- Girls RISEnet Hubs in Action (28)
- Newsworthy Events (35)
- Girls RISEnet Newsletters (19)

Resources Tag Cloud

research/report/data, science instructional strategies, STEM, girl-friendly strategies, outreach/recruitment, gender, disparities/stereotypes, workforce, careers, technology/computer science, women/mujeres, women, diversity, minorities,

Showcase

July 29, 2014

Science Central's Ms. Tech Camp

With support from a Girls RISEnet Minigrant, Science Central, a hands-on science center in northeast Indiana, partnered with the Boys and Girls Club of Fort Wayne and the Fort Wayne Urban League, as well as the general public, to host our first ever exclusive girls technology camp. Abi Martin, the Special Program’s Manager, has a passion for promoting STEM education for girls. The camp ran 5 days from 12:30 pm until 5:00 pm for 24 girls during the week of July 28 through August 1, 2014.
Intersections

Connecting science center educators and National Writing Project teachers

• 10 partnerships funded to develop, pilot, and refine programs at the intersection of science and literacy learning

• participate in a national network to share and disseminate learning

• assess and promote promising practices and approaches that strengthen science literacy learning in formal and informal settings
Learning Labs in Libraries and Museums

YOUmedia Network Learning Labs

Welcome to the YOUmedia Learning Labs Community Site!

An open community of educators and mentors who share knowledge, questions, and collaborate with colleagues across the YOUmedia Learning Labs network.

Join the CoP today.
Afterschool Alliance

Twenty Minigrants of $1,500 ASTC-Member Institutions

- Arizona Science Center, Phoenix, AZ
- The Bakken Museum, Minneapolis, MN
- Betty Brinn Children’s Museum, Milwaukee, WI
- Carnegie Science Center, Pittsburgh, PA
- Children’s Discovery Museum, Normal, IL
- Children’s Discovery Museum, Augusta, ME,
- Explora Science Center & Children’s Museum of Albuquerque, Albuquerque, NM
- Exploration Place, The Sedgwick County Science and Discovery Center, Wichita, KS
- The Franklin Institute, Philadelphia, PA
- Headwaters Science Center, Bemidji, MN
- Imagination Station Science and History Museum, Wilson, NC
- miSci – museum of innovation and science, Schenectady, NY,
- Museum of Discovery, Little Rock, AR
- Museum of the Rockies in Bozeman, MT
- Oregon Museum of Science and Industry, Portland, OR
- Perot Museum of Nature and Science, in Dallas, TX
- Roper Mountain Science Center, Greenville, SC
- South Dakota Discovery Center, Pierre, SD
- Staten Island Children’s Museum, Staten Island, NY
- University of Alaska Museum of the North, Fairbanks, AK
Afterschool Alliance

Afterschool for All Challenge

- Youth representatives from museum programs met with Members of Congress to advocate for afterschool programs

- New Jersey Academy of Aquatic Sciences
- Newark Museum
- The Franklin Institute
- National Aquarium
- Natural History Museum of Utah
The Next Generation Science Standards (NGSS) emphasize learning by understanding and application. This points to an increased need for hands-on inquiry and discovery.

Educators and teachers need training and resources to effectively use the framework and to implement state versions of new STEM curricula.

Science centers and museums play a vital role in meeting these needs.
Non-school environments for informal science provide valuable, cost effective venues for teacher training and support.

- Future teachers obtain skills to address STEM ed challenges in the classroom.
- Teachers collaborate with peers, obtain mentoring and professional development support.
- Teachers report that the flexibility and creativity from this training directly transfers to their teaching during the regular school day.
Thank you!
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Thank You!