Youth Outcomes for Afterschool STEM Programs

Afterschool Alliance
AFTERSCHOOL FOR ALL

STEM & afterschool

Welcome

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Motivation for Study

- Afterschool STEM programming growing at rapid pace
- Support systems and partnerships being put in place
- Ongoing debates about role of afterschool in (STEM) education
- Informal science assessment receiving increased scrutiny

Need to ensure afterschool field has voice in defining appropriate outcomes!

Study Methodology

- Delphi study
  - Iterative surveys of an "expert" panel to pinpoint consensus positions
- Three rounds of surveys from April to October; panel composed of "providers" and "supporters"
- Presented initial framework of outcomes for them to react to, changes made in response to input
- Consensus reached in third round around outcomes, indicators and sub-indicators

Terms Used

Outcomes	The major developmental impacts on young people
Indicators	Concrete ways that young people demonstrate progress towards intended program outcomes
Sub-Indicators	Represent specific, measurable dimensions of the indicators

Main Findings

Study results show that afterschool providers and supporters believe that afterschool STEM programs can support young people to:

A Develop interest in STEM and STEM learning activities

B Develop capacities to productively engage in STEM learning activities

C Come to value the goal of STEM and STEM learning activities

These **OUTCOMES** represent the major developmental impacts on young people.

Indicators

These are the concrete ways that youth demonstrate progress toward the intended program outcomes. According to the study results, afterschool programs may be best positioned, in this rank order, to support and expand young people's:

1. Active participation in STEM learning opportunities
2. Curiosity about STEM topics, concepts or practices
3. Ability to productively engage in STEM processes of investigation
4. Awareness of STEM professions
5. Ability to exercise STEM-relevant life and career skills
6. Understanding the value of STEM in society

Sub-Indicators

High Confidence

- Active engagement and focus in STEM learning activities
- Ability to work in teams to conduct STEM investigations
- Active inquiries into STEM topics, concepts, or practices
- Understanding of the variety of STEM careers related to different fields of study
- Understanding of relevance of STEM to everyday life, including personal life
- Demonstration of STEM skills
- Applied problem-solving abilities to conduct STEM investigations
- Awareness of opportunities to contribute to society through STEM

This set stresses the DOING of science and developing skills to do science, including 21st century skills such as teamwork and problem-solving. This set also includes developing views on the possibilities with STEM in the future including career choices and relevance to everyday living.

Sub-Indicators

Medium Confidence

- Understanding of STEM methods of investigation
- Knowledge of how to pursue STEM careers
- Mastery of technologies and tools that can assist in STEM investigations
- Knowledge of important civic, global, and local problems that can be addressed by STEM
- Pursuit of in-school STEM learning opportunities
- Awareness that STEM is accessible to all
- Active information seeking about mechanical or natural phenomena or objects
- Demonstration of STEM knowledge

This set is perhaps more specific in terms of links to STEM resources or expertise – here, youth demonstrate very specific types of knowledge. Afterschool experts express less confidence in this set, but still believe STEM afterschool can deliver these outcomes.

Overall, sub-indicators tend to be more immediate, representing things that can be documented in the short-term.

Afterschool experts express less confidence about school outcomes e.g. enrolling in future STEM courses, improving academic performance in school, etc.

Observations

- Difficulty relating observables to STEM education outcomes
- Some differences in perspectives between panelists:
  - Relative rankings of indicators
  - Ratings of sub-indicators
- Resources:
  - Needed – professional development, partnerships, curricula (and funding)
  - Assessment tools (difference of opinion on availability)
- Need for dialogue between various stakeholders

Mapping Outcomes

- **Engineering Adventures** is a free engineering curriculum developed especially for out-of-school time programs
  - http://www.eie.org/content/engineering-adventures

- Developed by Engineering is Elementary, a school-day curriculum development project at the **Museum of Science, Boston**.

- Focused on grades 3-5, and engages students to solve real-world problems through the engineering design process.

Mapping Outcomes

Selected observations of the Engineering Adventure program:

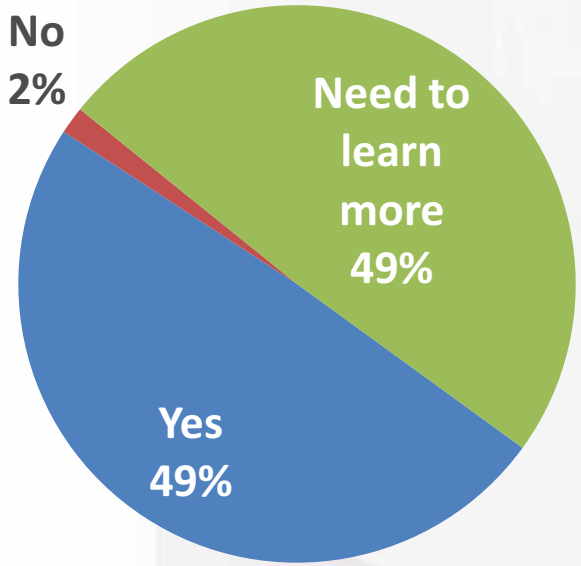
1. Kids are observed **applying knowledge** they gained through **observation and experimentation** earlier in the unit, they record designs and reasoning in their engineering journals.
2. Kids are observed **collaborating** with others to imagine creative solutions to problems, **thinking critically** while in their groups and in their engineering journals.
3. Kids reference and record uses of the **engineering design process** in their journals, highlighting how and why they improved designs.
4. Kids reference the engineering design process and how they used its steps to help them **solve engineering problems**, kids verbally identify objects that are not hi-tech as technologies.
5. Kids are observed **discussing** pros and cons of ideas with their group members, **combining the ideas** of different group members.
6. During testing process, commenting on their designs, **questioning** why components may not work the way they expected, and **brainstorming** ways to **troubleshoot** problems.

Mapping Outcomes

Sub-Indicators (w/observations)	Indicator	Outcome
✓ **Demonstration of STEM knowledge** 1. Applying knowledge gained through observation and experimentation earlier in unit, they record designs and reasoning in their engineering journals. ✓ **Demonstration of STEM skills** 2. Collaborating with others to imagine creative solutions to problems, thinking critically while in groups and in their engineering journals. ✓ **Demonstration of an understanding of STEM methods of investigation** 3. Reference and record uses of the engineering design process in their journals, highlighting how and why they improved designs.	1 ✓ **Ability to productively engage in STEM processes of investigation**	B ✓ **Develop capacities to productively engage in STEM learning activities**

Polling Question:

Can you use this framework of outcomes, indicators, and sub-indicators to describe the impacts of your afterschool STEM programs?



Outcomes are a Target

- Guidepost
- Match after school competencies

- Consistent with notions of quality expanded learning
  - Learning in Afterschool and Summer
  - Expanded Learning in Afterschool

    http://www.expandinglearning.org/

Learning in Afterschool

Learning In Afterschool & Summer

Preparing Youth for the 21st Century

A project of Temescal Associates and The Partnership for Children and Youth

Five Core Learning Principles:

- Active
- Collaborative
- Meaningful
- Supports Mastery
- Expands Horizons

www.learninginafterschool.org

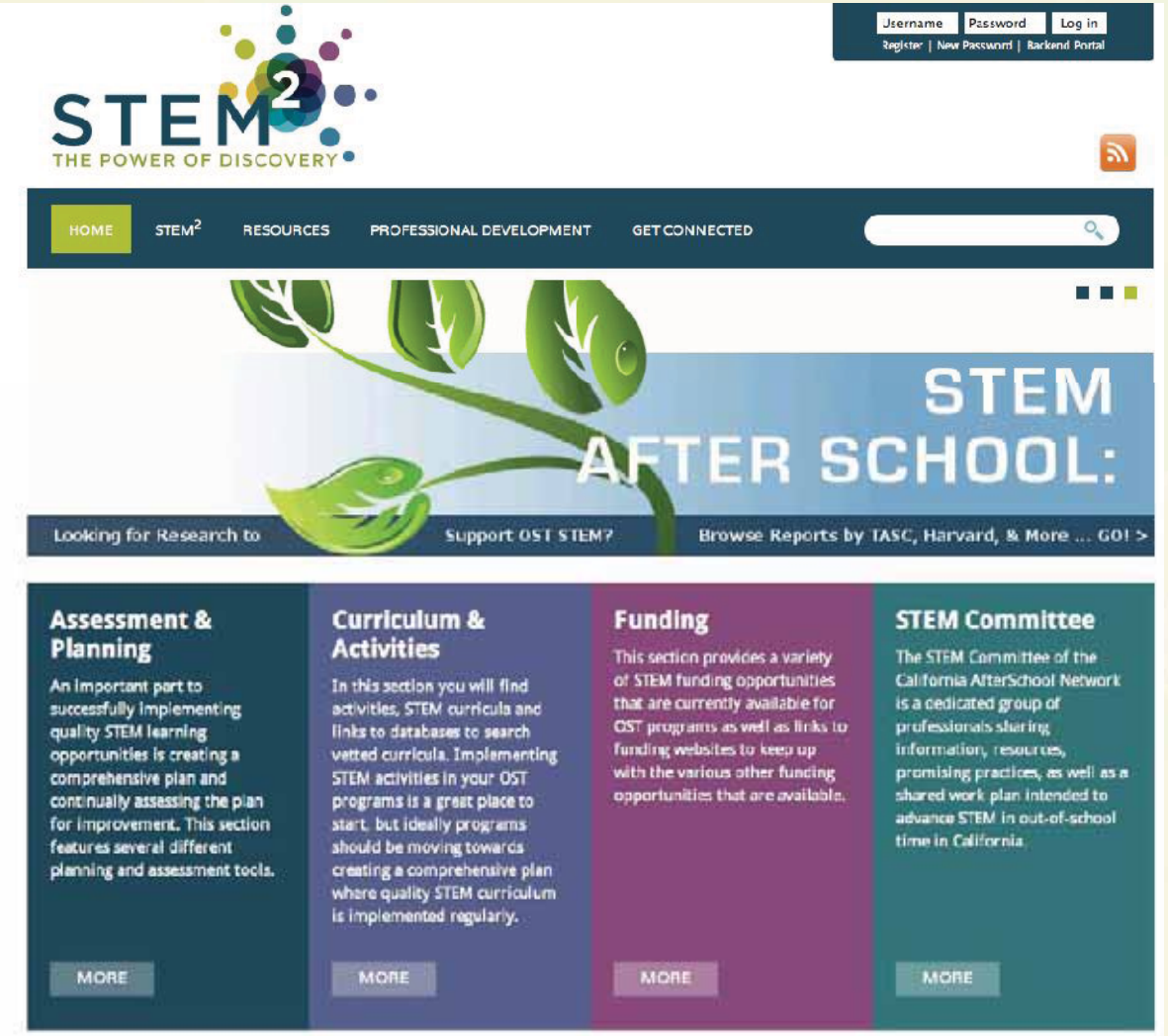
Key Take Away for Statewide Agency

- **Messaging** (Policy and Partnership Implications):
  - Framing the role of OST programs in advancing STEM learning.
  - How are OST outcomes complimentary to current education reforms?
- **Supporting Quality and Building Capacity**
  - Outcomes used as a framework for planning.
  - Creating access to necessary assessment tools to build and advance quality.

Program Implications

- Utilizing outcomes as a framework for planning.
- Plan for multiple levels of capacity building, and multiple modalities as strategies to achieve outcomes.
- Embed authentic assessment and opportunities to adapt, plan for improvement toward reaching desired outcomes.
- Seek the necessary core instructional day, and community partners (with mutually beneficial goals) to support efforts to reach outcomes.

A Resource to Support You:
www.powerofdiscovery.org



- Readiness and Needs Assessment
- STEM in OST program planning tool
  - Plan for realistic and achievable outcomes
- Virtual tools, resources and professional development you can utilize as part of your program plan

Thank You

Keep up the good work out there!

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Recommendations

- **Practitioners** – Use the framework (Table 3) to map out how your work contributes to STEM education overall. Use common language.
- **Evaluation and Assessment Experts** – Have a conversation with providers about available tools and map it to this framework. Study should inform new tools and measures.
- **Policymakers** – Use study to define appropriate niche for afterschool in ecosystem of STEM education.

Discussion Questions

- How will you use the results of this study in your own practice or programs?
- Will it help you to have some common language to describe impacts of afterschool STEM learning?

More Information:

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