

Afterschool STEM Tool Kit

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Introduction and Overview

Networks will frequently make the same requests: How do we find research to inform what we do? What are the elements of a successful partnership? What does high quality programming look like? How do I find funding for STEM (science, technology, engineering, math) programs in the afterschool setting?

This Afterschool STEM Tool is an attempt to answer some of those questions. The Tool Kit is meant as a starting place—there are many, many resources out there.

The Afterschool Tool Kit contains:

- Equity Checklist
 - This checklist is designed to ensure that programs reach *all kids*—especially the kids who are most underrepresented and underserved in the STEM pathway: girls (who are the most underrepresented group across any demographic), kids of color, kids with disabilities, kids for whom English is their second language, and kids from low income backgrounds.
- Research Citations
 - This list of citations includes research on several STEM related topics including: STEM identity, engagement, culturally relevant curriculum, gender and STEM and family involvement.
- Research-Based Strategies
 - Research helps to inform what we do in STEM education. This short list of strategies can jumpstart a quality approach.
- Family Involvement
 - Family involvement is a primary predictor of retention and success in the STEM pathway. This “cheat sheet” of strategies can be shared with afterschool sites to increase family involvement.
- Finding Funding
 - STEM education is a critical national issue that is being supported by government agencies, private foundations, and industry/business. This listing provides information on sources of funding that are STEM focused.
- Proposal Template
 - STEM industries have a vested interest in partnering with afterschool educators to promote quality STEM programs. The proposal template provides a suggestion on how to approach possible supporters.
- Partnership Checklist

- How do you form a successful partnership that will endure? This checklist contains suggestions for building the foundation for a partnership and keeping it going beyond an initial project.
- STEM Professional Organizations
 - STEM professional organizations can be great for a variety of resources including role models and mentors, allies for policy, funding, and networking.
- Curriculum Vetting Tool
 - How can sites ensure that their curriculum choices will be effective in supporting STEM identity, creating engagement, and providing academic enrichment? The curriculum vetting tool is a checklist for 20 different criteria for excellence.
- Other Tools Worth Noting
 - No need to reinvent the wheel--excellent observation tools, planning instruments, evaluation instruments and other tools already exist.

Please note that some materials are for use specifically by networks, some are designed to be shared with intermediaries and some will also be valuable for afterschool site-based staff.

Equity Checklist

To ensure that we reach *all kids* with high quality STEM programming we have to be aware of some equity issues. The most well intentioned staff may think that by doing a STEM activity the same way with everyone in the group that they are reaching everyone. But, there are factors that may keep that from happening: Are girls and boys going to be equally engaged by the materials and ideas? Are the materials culturally familiar to everyone? Is every child's voice heard and encouraged to participate? Do the activities reinforce stereotypes? There are pit-falls that we can only avoid if we are aware of them. This checklist may help.

	Aware of the issue	Working on It	Constantly Addressing the Issue
1. Agency offers a wide variety of activities and programs for <i>all kids</i> that meet different interests and abilities.			
2. Agency offers some activities and programs targeted specifically to <i>kids from groups underrepresented in STEM</i> .			
3. Agency offers a variety of group programming (mixed gender, girls-only, ESL)			
4. Activities do not conform to gender stereotypes. e.g., girls' programming does not focus on cooking, sewing, or decorating			
5. <i>All kids</i> have equal access (physical and intellectual) to equipment.			
6. <i>All kids'</i> ideas for projects, activities, etc. are valued.			
7. Programs encourage <i>all kids</i> to think, probe, and be inquisitive			
8. Programs and activities expose <i>all kids</i> to a broad variety of careers and encourage a wide view of everyone's potential.			

9. Staff engages girls and boys equally in group discussions, interactions and activities, especially in mixed-gender programs.			
10. Staff develops caring and trusting relationships with <i>all kids</i> regardless of gender, race, ability.			
11. Staff are role models for personal and professional behaviors around equity issues.			
12. All staff are knowledgeable about equity issues.			
13. All staff are knowledgeable about developmental needs of the population served.			
14. Staff maintains the same behavior standards for <i>all kids</i> regardless of gender, ethnicity, ability.			
15. Staff fosters inclusiveness among participants and celebrates commonalities and differences (in terms of race/ethnicity, economic status, ability/disability, sexual orientation, culture, etc.)			
16. Staff addresses kids by their names.			
17. Staff does not assign tasks based on stereotypes-e.g., both girls and boys are asked to decorate, clean-up, perform secretarial tasks, carry or move things, climb ladders, make decisions.			
18. Staff compliments kids on their accomplishments rather than on their appearance.			
19. Staff has high expectations for <i>all kids</i> , encouraging them to take appropriate risks, explore, ask questions and challenge themselves.			
20. Staff encourages <i>all kids</i> to be assertive, speak up for themselves, and take action.			

* This tool was adapted from the Great Science for Girls Gender Equity Checklist which was developed from an instrument by Anita Baker, Cheri Fancsali, and Jodi Paroff for Girls Inc. of New York City (2002).

Research Citations

These citations are provided for two purposes. First, to inform the work. Second, to convince collaborators, staff, funders, and others that the work is important and has specific goals and strategies that need the support of every sector of the community.

These research citations cover several relevant topics: positive STEM identity, culturally relevant curriculum (as it relates to STEM identity and engagement), engagement in STEM, gender and STEM, and family involvement in STEM education. There's a great deal out there – these have had significant impact on the field.

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Research-Based Strategies to Support High Quality STEM Programing

After browsing the research, some strategies for successful STEM programing may become apparent:

- Create a collaborative vision/agree on goals with partners.
- Keep equity in mind—and remember that equal is not necessarily equitable. Consider getting training or coaching around this issue.
- Invest in professional development. More highly trained staff result in a more highly skilled workforce.
- Make STEM an expectation (like snack or homework help). The research says that when organizations and educators make STEM an expectation, it becomes an expectation – and a part of the day—for kids.
- Encourage a positive STEM identity in youth:
 - Give kids an opportunity to be the STEM experts (kids share activities with other kids, families, or become *Explainers*)
 - Introduce kids to role models—people who have something in common with them (gender, race, age, experiences) and who have a STEM identity
 - Help kids acknowledge the STEM that happens around them all day, everyday
- Involve families
 - Send home letters that let families know what the kids are doing in STEM programs
 - Send home information on STEM activities that families can share (hands-on activities using materials found at home, local experiences available to them through museums and science centers, astronomy clubs, at the local college or university)
- Make STEM fun!
- Connect with mentoring programs
- Form partnerships and alliances with others (schools, industry, museums, zoos, aquaria, planetariums, garden clubs, astronomy clubs, professional organizations, other State-wide Networks)

- Make STEM affordable (the less expensive it is to do, the more often it will be done)
- ***Design, try, evaluate, re-design.*** Have an idea for a STEM program? Try it, get feedback, and make any changes for improvement.

Family Involvement

Research confirms that family involvement is a key indicator for success and retention in the STEM pathway for youth (PTA 1999; Henderson and Mapp 2002; Pate and Andrews 2006). And, there is a correlation between the level of family involvement and the level of engagement for kids (Cotton and Wikelund 2001).

While it is an additional task for Networks and partner agencies to support family involvement, the impact is substantial and worth the effort.

Strategies to involve families are:

- Push information out to parents via newsletters, blogs, webinars, Facebook
- Make flyers, booklets, other print material about the importance of STEM and actions families can take readily available
- Connect with schools and PTAs
- Have the kids do the outreach (letters home, kid-made invitations)
- Hold family events (have the kids facilitate the activities)
- Send home information with hands-on, minds-on activities to do as a family
- Provide a list of local STEM opportunities in the region (museums, zoos, aquaria, parks/beaches, etc.)
- Ask families to volunteer for STEM events or to lend their expertise in another way
- Give kids an opportunity to “be a scientist” when their parents can be the audience (pick up time, special event, activities at home)
- Involve the local PTAs by asking for feedback on the STEM aspect of afterschool
- Hold an event where families have an opportunity to have a conversation with afterschool providers, ask parents to be part of the planning of events and programs
- Survey families on what they have observed in their kids regarding STEM in the afterschool space
- Ask parents to be the STEM role models (everyone does STEM!)

Remember! The best marketing tool is a great program.

Finding Funding

Giving kids high quality STEM experiences, increasing engagement for young people, and supporting a positive STEM identity have become priority for government agencies, industry, community--based organizations, educators, families, and funders. Places to find funding to support this important work include:

- National Science Foundation
 - www.NSF.gov
 - Several solicitations including Advancing Informal Science Learning (AISL), Innovative Technology Experiences for Students and Teachers (ITEST), Discovery Research PreK-12 program (DRK-12), Early-Concept Grants for Exploratory Research (EAGER) are released annually.
 - NSF grants are multi-year, range between \$200, 000 and \$5,000,00 and cover a broad range of topics.
 - The NSF proposal process takes several months, so begin early! For example, proposals that are due in November may not be funded until the following June.
- NASA
 - <https://nspires.nasaprs.com/external/>
 - NASA funding is available in many forms—for example, support for museums and minority serving institutions and through a variety of solicitations. NASA funds activities across the STEM spectrum including environmental education and mission based funding.
 - NASA funds may be available through a general solicitation (ROSES) or may be mission based. Check the NSPIRES website frequently.
- NOAA
 - www.noaa.gov/office-education/elp/grants/apply
 - NOAA's current solicitation is [NOAA USA: Environmental Literacy Grants: Supporting the education of K-12 students and the public for community resilience NOAA-SEC-OED-2018-2005455](#)
- US Department of Education
 - <https://www.ed.gov>
 - I3/Investing in Innovation—Solicitation released
 - IES/Institute of Education Sciences (<https://ies.ed.gov/funding/futureComp.asp>)
The mission of the Institute of Education Sciences (IES) is to provide rigorous and relevant evidence on which to ground education practice and policy and share this information broadly. The next deadline for this solicitation is March 1, 2017

- Corporate Foundations (Many STEM industries support foundations that will fund STEM education. These are some examples, but there are many more.)
 - Motorola Solutions Foundation www.motorolasolutions.com
 - ExxonMobil Foundation <http://corporate.exxonmobil.com/>
 - Toyota Foundation
https://www.toyota.com/usa/community/articles/community_grants_foundation.html
 - Honda America Foundation <https://www.honda.com/community/applying-for-a-grant>
 - Chevron Foundation <http://grantsoffice.com/GrantDetails.aspx?gid=10308>
 - GE <http://www.gesustainability.com/enabling-progress/ge-foundation/>

- Industry
 - STEM related industries are interested in developing the next generation workforce and so invest in STEM education. Some examples are:
 - Hess Corporation, Johnson & Johnson, Banco Santander, IBM, Wells Fargo *See the template for proposal to a potential business funder in the tool kit.

Other Sources

- The Afterschool Alliance (www.afterschoolalliance.org) has information at the “Toolbox” tab. It lists links to additional resources. The Alliance has identified more than 120 sources of funding for the afterschool setting:
<http://www.afterschoolalliance.org/fundingFederalAtAGlance.cfm>
- Professional organizations (see list in this Tool)
- Software associations
- Colleges and Universities (always looking for partners)
- Technology companies
- Banks
- Local community foundations (find a list at www.foundationcenter.org)

Proposal Template for Business or Industry

The following template may be used to introduce your organization to potential business partners:

We are seeking partners in building a high quality science, technology, engineering and math (STEM) program that will meet the academic and social needs of our students. We are also creating the next generation workforce for STEM. As you know, the United States has a severe shortage of STEM workers and we must focus now on the next generation workforce to bridge this gap. The skills and knowledge that our youth develop in our program are designed to prepare them for the future.

(Name of organization) has extensive experience in afterschool and youth development and seeks to increase expertise in STEM education. INSERT SHORT ORGANIZATIONAL PROFILE.

(Name of organization) is seeking funding to support STEM programs in the afterschool setting. Our goal is to broaden and sustain youth interest and persistence in STEM education, through participation in inquiry-based informal science learning. To this end, (Name of Organization) is working in partnership with existing intermediary organizations to build the capacity of afterschool centers to deliver evidence-based science programming for students in grades (insert grades) who attend these programs. We will support (professional development and technical assistance? Other?) at XX sites across our state.

As the field of STEM education has grown in importance the role of afterschool has become increasingly critical. Throughout the country, intermediaries are providing multi-faceted technical assistance and support services for afterschool centers within their networks. In doing so, the field has followed the lead of the business community, whose partnerships and collaborative arrangements help to increase the pool of available resources supporting the next generation of STEM professionals. Intermediaries serving afterschool centers foster professional development and learning; help their constituents develop new initiatives; establish standards of quality and accountability; and help to leverage resources that are beyond the capacity of a single center.

Funding Request

In order to accomplish these goals our organization has identified the following needs:

- What you will need to add to your current resources
- Other

The budget for our participation in this unique endeavor is \$\$\$ (see detailed budget)

We hope to accomplish a great deal with this project. Our experience in the field of afterschool indicates that we have the right elements in place but that we can't do it alone. We view this as an opportunity to greatly enhance our capacity to serve the youth in afterschool programs and look forward to your partnership in accomplishing this goal.

*Adapted from *Great Science for Girls*, a National Science Foundation funded program.

Partnerships

Ensuring high quality STEM programming for youth takes the combined efforts of a community: afterschool educators, families, industry/businesses, schools (from early childhood through university!), museums and science centers, and many, many others.

These “tips” can help build the foundation for a productive partnership that will endure!

- Identify and agree on common goals.
- Use common language.
- Identify a team (intermediaries, afterschool staff, key local partners) for participation.
- Clarify roles for the team members.
- Support on-going, regular communications between team members. Agree on what will be communicated to the community.
- Expect to learn from each other and be open to change.
- Identify the resources and capacities of the partnership. Make note of what can be done better together.
- Identify specific actions for the partnership and how success will be measured.
- Agree on best practice.
- Agree on how records/data will be maintained.
- Link intermediaries to resources (research, curriculum partners, capacity-building resources).
- Try to include partners in planning (not just executing) aspects of the work.
- Identify whether partners' roles' are regional or local.

Organizations for Partnerships

Organizations of STEM professionals offer a myriad of resources. Everything from role models (looking for a mathematician who is a woman?) to networking opportunities (get connected to local STEM industry) to funding (grants, scholarships) is available through these organizations.

This list of organizations contains examples from the field – there are many more organizations out there!

Organization Name	Acronym	Website	Potential (but not limited to...)
Society of Women Engineers	SWE	www.SWE.org	Mentors, partnerships, funding, role models
National Society of Black Engineers	NSBE	www.nsbe.org	Scholarships, competitions, internships, webinars, mentors and role modes
National Indian Education Association	NIEA	www.niea.org	Networking and communications, mentors, policy ally, site communications, advocacy toolkit, role models
National Action Council for Minorities in Engineering	NACME	www.nacme.org	Scholarships, corporate support for programs, role models
Society for Advancement of Chicanos/Hispanics and Native Americans in Science	SACNAS	www.SACNAS.org	Leadership programs, policy ally, scholarships and awards, mentors and role models
Mathematical Association of America	MMA	www.maa.org/	Special Interest Groups, mentors, research source,

			policy ally, role models
American Indian Science and Engineering Society	AISES	www.aises.org	Policy ally, scholarships/awards, mentors and role models
American Society of Mechanical Engineers	ASME	www.asme.org	Mentors, connections to industry, role models
Association for Women in Mathematics	AWM	https://sites.google.com/site/awmmath/home	Corporate sponsorship, mentors, networking and communications, role models
WomenDoMath		WomenDoMath.org	Events, research, and an international hub of mathematicians, role models
American Academy of Forensic Scientists	AAFS	www.aafs.org/	Summer camps, mentors, college and career readiness, role models
American Society of Animal Science	ASAS	www.asas.org/	Student supports, mentors and role models
American Astronomical Society	AAS	https://aas.org/	Career information, events, networking opportunities
Association of Science-Technology Centers	ASTC	www.astc.org	Over 600 STEM museums and science centers participate in this organization. The national organization will connect youth serving

			organizations to their local member organization.
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Curriculum Vetting Tool

EVIDENCE BASED CURRICULUM	
SELECTION CRITERIA	EVIDENCE
1. Shows positive outcomes around supporting STEM identity.	
2. Gender equitable and inclusive (strategies to reach youth from underrepresented/underserved groups).	
3. Uses inquiry-based, hands-on methodology.	
4. Creates (high) levels of engagement for learners.	
5. Incorporates knowledge about a variety of learning styles (cooperative and active learning groups, etc.) and provides opportunities for a variety of approaches.	
6. Involves students in decision-making, planning, problem-solving, risk-taking and reflection (Youth voice).	
7. Activities are age appropriate.	
8. Includes strategies for a variety of learners including special needs students (or can be adapted).	
9. Increases students' sense of self as learners.	
10. Meets STEM standards (NGSS, Common Core).	
11. Rigorous and engaging STEM content.	
12. Has a written curriculum or guide book that is user-friendly and accessible?	
13. Uses affordable, culturally familiar, and easy to obtain materials.	
14. Is adaptable for a variety of settings (urban, suburban, rural).	
15. Meets youth development criteria (list).	
16. Includes multiple strategies for parent involvement.	
17. Includes activities around career connections.	

18. Includes role model activities.	
19. Includes literacy connections.	
20. Adheres to NSTA safety guidelines and cyberspace safety guidelines where applicable (see http://www.nsta.org/pdfs/440.pdf)	
OTHER INFORMATION	

*The Curriculum Vetting Tool is adapted from Great Science for Girls, a National Science Foundation funded program.

Other Tools

PEAR Suite of Tools <https://www.thepearinstitute.org/assessments> Partnerships in Education and Resilience

- Common Instrument Suite <https://www.thepearinstitute.org/common-instrument-suite>
The Common Instrument Suite (CIS) is a self-report survey that measures a variety of science, technology, engineering, and math (STEM)-related attitudes, including STEM interest, STEM career knowledge, and STEM identity.
- Dimensions of Success (DoS) <https://www.thepearinstitute.org/dimensions-of-success>
The DoS suite includes a Planning Tool, Observation Tool, and a Feedback & Coaching Guide. The observation tool delivers both data for evaluation purposes and information for feedback and technical assistance to the site.

Are We a Partnership? Diagnostic Rubric <http://learndbir.org/resources/diagnostic-rubric-are-we-a-partnership-yet> Design Based Implementation Research

- This rubric allows partners to assess the maturity of a partnership and provides some direction for growth.

Assessing Women and Men in Engineering <http://www.engr.psu.edu/awe/>

- Surveys and other assessment tools that can be used to evaluate afterschool STEM programs.

CAISE Evaluation Tool Kit <http://www.informalscience.org/evaluation/evaluation-tools-instruments>

- Several tools originally designed for National Science Foundation-funded projects are listed and can be appropriately used to evaluate afterschool STEM programs.

Assessment Tools in Informal Science (ATIS) <http://www.pearweb.org/atis>

- A data base of assessment and evaluation tools, this site provides a variety of approaches to using “off the shelf” tools.