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1. INTRODUCTION

Using This Guidebook

Welcome to this guidebook, brought to you by ExpandED Schools and our Frontiers in Urban Science Education (FUSE) programs. FUSE is an ExpandED Schools initiative to help more out-of-school-time programs and expanded learning time schools offer kids engaging, exciting and inspiring activities that promote science inquiry. Anyone who wants to create or strengthen science, technology, engineering and mathematics (STEM) learning opportunities in programs beyond regular school hours can use this guidebook.

WHAT’S IN THIS GUIDEBOOK?

We offer a framework and practical advice to help you create and maintain a high-quality science learning program at your out-of-school time site. We’re not recommending specific science activities, for example planting a garden. Instead you’ll find information, ideas, and resources that can help you design a science program that matches your kids’ needs and interests and fits within your program. The resources described here can help you increase student engagement in science using methods specifically designed for after-school settings.

WHO SHOULD USE THIS GUIDEBOOK?

You do not have to work in an after-school program to benefit from this information. Principals, classroom teachers, community leaders, museum educators, parents, volunteers or people who work in STEM fields can use this guide to support out-of-school time experiences in their schools or communities. At the same time, this guidebook aims to help after-school leaders and professional youth workers who want to improve the quality of their programs and engage kids in science learning opportunities.

WHAT IF YOU NEED OTHER KINDS OF SUPPORT?

There are many organizations and people available to help you start or expand STEM programs. Contact your local after-school intermediary (that might be a city or state network), science museum or university. National organizations that support after-school, such as the National Afterschool Association, the Department of Education’s 21st Century Community Learning Centers, and the Afterschool Alliance, are building information about STEM on their websites and throughout their work. Turn to the back of this book for more resources and funding appeal letters.

Kids are natural experimenters and inventors. Hands-on science is among their favorite after-school activities, from cooking to gardening to engineering bridges out of toothpicks. After-school, with its informal atmosphere and looser time constraints, is the perfect venue for science discovery. As kids dig into real-life science, technology, engineering and math, concepts learned in class are reinforced.

1 Our use of the word “science” in this document is inclusive of science, technology, engineering and mathematics.
The Case for STEM After School

Expanding kids’ science, technology, engineering and math opportunities is a national imperative. Right now, American high school students are among the lowest-performing in science internationally. Girls and students from disadvantaged backgrounds are disproportionately ill-prepared to pursue STEM college majors or careers.

Learning science from an early age helps children understand the world around them. They learn to think critically, to question, to investigate, to interpret, to solve problems and to begin to understand complex systems. Kids get empowered to figure things out for themselves and have confidence as they interact with the world. When kids learn science from a young age, we get an educated public with the capacity for critical thinking.

According to the U.S. Department of Labor, more than half of the fastest growing occupations will require substantial mathematics or science preparation. This means that all kids must have opportunities to become scientifically literate. Without those opportunities, kids not only miss out on chances to have fun and explore the world around them, but they don’t enter the pipeline toward high-paying, critically important STEM careers. Among students who historically grow up to be under-represented in STEM careers are girls, African-American and Hispanic students, kids with disabilities and kids who do not perform well academically.

But opportunities for quality science learning are in jeopardy in many communities. Recent studies indicate minimal time is devoted to science in school settings. More than 8.4 million children in the United States participate in expanded learning opportunities for as many as three-to-four hours a day. These provide opportunities to engage children in hands-on, experiential science learning. Programs can meet their youth development goals by getting kids excited by science. Many educational leaders recognize the potential of these programs to combine cognitive, social and emotional development in ways consistent with the best advice from learning research.

After-school programs are often staffed by people from similar demographic backgrounds as the youth they serve. This makes after-school educators excellent role models in demonstrating interest in science. They’re also great partners

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3 McMurrer (2007); Dorph et. al (2007)
4 Schwartz & Noam (2007)
The Case for STEM After School

with kids in co-inquiry through activities such as testing water quality in local rivers.

Youth development leaders and champions of more science for kids have a shared goal: supporting kids and helping them develop into happy, productive adults. The resources you will find in this guide offer numerous paths to successful learning, but they all build from the common goal of providing children with the best opportunities for growth and success.

WHAT’S STOPPING YOU?

Many after-school leaders feel that, although they’d like to include STEM in their programs, barriers stand in their way. These include lack of knowledge of age-appropriate science curriculum and resources; limited funds for materials and equipment; and little to no science or science teaching background among most after-school educators.5

These barriers can be overcome. Many excellent curricula are designed for after-school, and the Resources section of this guide will help you find them.

Materials do not have to be expensive. In fact, many of the best curricula use every-day supplies you may already have, or can easily purchase at a grocery store.

Finally, the lack of science background among your program staff can actually be an advantage. They can be co-learners with the kids they serve, showing youth that science inquiry is fun, not scary.

In the next section of this handbook we will consider how to design an after-school STEM program that supports youth development and science learning through high quality opportunities.

5Coalition for Science After School (2007)
2. DESIGNING YOUR PROGRAM

Content: Finding the Right Fit

The content of an after-school program refers to the activities, curricula and learning opportunities for participants. There is no single perfect tool for teaching science in after-school programs. The content you select should suit your unique setting, your students’ interests and needs, and be supported by a well-prepared staff.

Some programs choose to create their own activities or curricula, either from scratch or by piecing together various activities and resources from books and online. This is time-consuming and often produces mixed or low quality results.

There is no need to start from scratch. Experts in the field have done the work of designing many high-quality STEM curricula, some of which provide you with all the resources and supplies you need to do science.

Other engaging science curricula have a set of thematically-related activities for which you can easily buy the supplies. Those developed specifically for out-of-school settings are often designed for maximum flexibility and can be easily tailored to your needs. See the Resource pages for websites that offer information about specific curricula.

WHAT ARE THE FEATURES OF HIGH QUALITY CONTENT THAT WORKS IN AFTER-SCHOOL?

Whether you develop your own content, enlist a partner (such as a science museum or horticultural society) or buy an off-the-shelf option, you can make it easier to achieve high quality STEM experiences by selecting materials that include:

1) Learning that engages kids in science and engineering practices

The Next Generation Science Standards\(^6\) consider science and engineering practices as fundamental to the STEM learning process. These eight practices embody what scientists and engineers actually do as they work. When kids ask questions, investigate and explain their results, they better understand how science develops and what being a scientist is like. Digging into problems and exploring the world in a hands-on way keeps youth engaged. These kinds of STEM learning

\(^6\)http://www.nextgenscience.org/
opportunities are well suited to after-school’s informal atmosphere.

2) Short, stand-alone sessions that are thematically connected

Student attendance in after-school settings can be unpredictable. Attention spans are brief, and after time is set aside for other mandates, sessions may be limited to 45 minutes or fewer. Program leaders should select content suited for single sessions, and which does not rely on previous attendance. These sessions could have optional extensions for students who can continue on subsequent days or want to work at home.

Although each session needs to be designed to stand alone, the sessions should be thematically connected to give students opportunities to think about related concepts over an extended period of time. In programs with stable attendance for a defined period of time, project-based learning\(^7\) can provide rich, extended opportunities for science exploration.

3) Limited & specific goals

Activities should focus on a limited number of specific learning goals that can be realistically accomplished during the amount of time available. The emphasis should be on kids learning STEM practices—such as asking questions or planning investigations—rather than mastering content.

4) Student-driven activities

Materials should allow students to play active roles, relying on instructors mainly for support. Activities could match the existing interests of your students (such as sports or animals) or connect to their daily lives in ways that help them develop new interests (such as greening their schools).

Experts\(^8\) tell us that in order for any child to succeed in science, he or she needs support in three areas:

- **Engagement**, the “spark” of interest that causes a child to pursue a topic.
- **Capacity**, the knowledge and skills needed to understand at the next level.
- **Continuity**, the opportunities, resources, and guidance that support a child’s continual advancement.

Since student choice is so important in many after-school settings, activities should make room for all youth to spend time working in the ways that suit them best. For instance, some students may prefer working individually while others would rather work in groups. Some may prefer drawing while others would rather build.

Younger students may have different needs from older ones.

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\(^7\)See [http://www.bie.org/](http://www.bie.org/) for more information about project based learning.

\(^8\)Jolly, E., Campbell, P., and Perlman, L. (2004)
Content: Finding the Right Fit

5) Activities that fit within or expand instructors’ comfort zones

After-school educators often have significant youth development expertise, but they may have minimal science knowledge and limited experience with hands-on instruction. But effective after-school leadership is more often associated with staff members’ beliefs and attitudes than with their education and skills.

You can encourage your staff to embrace science by using materials that have clear instructions and are easy and fun to implement. Good professional development will increase their confidence and help them advocate for the idea that everyone can do science by giving them the opportunity to see how engaging STEM activities can be. It is vital for them to understand that facilitating great STEM activities is not about being the expert; rather, it is about exploring with kids, working together to find ways to answer questions.

On the other hand, if you have a staff member who is passionate about a specific STEM area, by all means harness that passion and knowledge by seeking STEM activities that complement those interests. Keep in mind that a staff member who is also, for example, an architecture student may still need professional development to support her ability to conduct STEM activities in a fun, youth-focused way.

6) Activities that fit within your program structure

Some programs may be able to adjust their hours or locations to fit the science curricula or materials they’d like to use, but not everyone has that flexibility. Choose content in formats that match your program’s structure and needs. If you need to keep activities to 45-minute blocks, don’t try at first to cut up a curriculum designed for 2-3 hour periods. You can find good options that fit your constraints. However, with experience you will be able to alter curricula to suit your needs. Don’t be afraid to do that once you have built your confidence.

7) Activities that fit within your program budget

You can easily supply a science program for less than a dollar per child per session by using recycled or inexpensive materials (such as cornstarch and water: see http://sciencecafe.org/content/how-to-make-oobleck/) and by training your staff to be co-learners with kids. You could also spend thousands of dollars on robotics kits, microscopes or specialized staff. As you look at curricula, make sure to take into account all the budgetary implications. Does this program require you to hire staff with special skills? Do you need special equipment? If you buy equipment, will it last for multiple years? If supplies will be consumed, how much do they cost? Who will buy replacements to keep science going? If you have the funds to support the program this year, will you have them for the next five years?

8) Opportunities to assess learner progress

The materials should include support and opportunities for instructors to assess student progress “on-the-fly” so they can facilitate
learning. These might include open-ended questions, having kids explain their work, or sharing journals. Increasingly, attention is being focused in after-school on longer-term evaluation. Several tools exist that can assist you in evaluating your STEM program. See the Resources section for details.

TIPS FOR ASSESSING NEW CURRICULA

New materials are being developed all the time, and it can be fun to try them out. In addition to the features above, the following questions will help you determine the quality of a curriculum:

• **Has the material been field tested in after-school programs?**

Many curriculum designers assume that materials that work in school will also be good for after-school or summer. But if they did not consider the unique needs of these settings, the materials may end up requiring a lot of extra work from your staff. There are many good curricula for the classroom that also work in after-school, but field-testing provides an extra guarantee.

• **Who funded the resource or curriculum?**

This may give you information about the quality. For example, National Science Foundation grants require research-based development with rigorous evaluation, so these are likely to be well-designed.

• **Is there a support system?**

When instructors are going to use new curricular materials, they require support. Commercial instructional materials often offer staff development opportunities from the designers or a designated trainer.

You can also look for opportunities to participate in field-testing new curricula. As a field test site, you may receive materials and staff development services in exchange for your participation and feedback. You and your staff will also get an inside look at the materials development and evaluation process.

Most importantly, use materials that excite you and your staff. Everyone should see STEM as a positive program aspect and should approach it as a fun challenge.
Staff: Bringing Them Aboard

The greatest challenge in training your staff members to lead science beyond school time may be changing their ideas about what it means to “do science,” and who can and should do it.

Recent studies describe the community educator workforce as greatly diverse, with a wide variety of ages, education levels and life and work experiences. Many members of the workforce probably have little or no science training, and may have had bad experiences with STEM disciplines in school.

What’s more, after-school experts have found that many after-school educators may fear science. They may view it as dry and academic. They may worry that it will get in the way of their interacting with kids in a playful or encouraging manner. They may think science learning requires listening to a lecture, filling out a worksheet, or doing a scripted lab assignment.

They’re wrong. And it’s time to put those fears to bed.

Many after-school educators have no specific arts or drama background, yet they do a good job of leading those activities. It’s important for them to see that STEM learning begins with play and moves toward disciplined practice, that it’s youth-centered and engaging.

Staff members who have had some training in youth development and literacy training can be effective science leaders, regardless of their level of science knowledge.

But it means that program leaders must pay attention to the way they introduce staff to science and develop their capacities. Staff development activities should emphasize that engagement in STEM is connected to youth development. Trainings should expose staff to key resources, introduce some science content, emphasize science and engineering practices, and provide staff with a context for understanding why science is important beyond the classroom.

Leaders need to work on their own attitudes. Those who run programs must believe that everyone—including students who have been under-represented in STEM pursuits—can do science. They must deliberately plan learning experiences that are accessible and engaging to all students.

See the table and text below (adapted from a report from the Coalition for Science After School) to consider which staffing and professional development model might work best for you. They range from using external providers to having internal staff coached by science educators. For additional models, see the original document.

References:
9 Yohalem & Pittman (2006)
10 Freeman, Dorph, & Chi (2009)
11 Walker, Wahl, & Rivas (2005)
12 Freeman, Dorph, & Chi (2009)
## Staff: Bringing Them Aboard

### Program Staffing and Staff Development Strategy

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Who uses this strategy?</th>
<th>How does the strategy work?</th>
<th>How to support this strategy?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. External STEM program provider</td>
<td>Programs that are not ready to use their existing staff to teach STEM or want to see how students react before investing in staff development.</td>
<td>An outside provider (such as a school-day teacher or external contractor) provides STEM activities directly to students.</td>
<td>After-school staff can be paired with the STEM provider to learn how to teach STEM, build general teaching skills, and eventually take over some of the STEM leadership.</td>
</tr>
<tr>
<td>B. Internal staff development</td>
<td>Programs that do not want to commit significant resources to staff development for STEM or cannot find a partner to help with staff development.</td>
<td>Program leaders provide staff development.</td>
<td>Click2SciencePD modules, SEDL guides (see Resources section for details).</td>
</tr>
<tr>
<td>C. Materials-based staff development</td>
<td>Programs willing to commit to a single set of materials and to the requirements of the materials-provider.</td>
<td>Many curriculum providers offer staff development in connection with their materials. This may be free, available for a fee, or built into the cost of the materials.</td>
<td>Use materials specifically designed for after-school, such as those listed in the Science After School--Consumers Guide (see Resources section for details).</td>
</tr>
<tr>
<td>D. Partnerships with STEM providers</td>
<td>Programs that are open to partnership with museums, universities, and the like, and that are willing to embrace a mutual set of goals and objectives.</td>
<td>Most STEM providers will have a standard program that they can share. Through partnership, this program should become customized to meet the needs of both organizations.</td>
<td>Ensure that the partnership meets the goals of both institutions. In addition to sharing their knowledge, STEM providers should develop an understanding of after-school and youth development goals.</td>
</tr>
<tr>
<td>E. STEM educators as coaches</td>
<td>Programs that have a STEM educator available and are willing to use that individual’s skills as a coach of multiple other staff members.</td>
<td>A STEM educator coaches other program staff members who, in turn, work directly with the youth.</td>
<td>Ensure that coaching is consistent with program goals. Resources listed above for Internal Staff Development will also support coaching.</td>
</tr>
</tbody>
</table>
Staff: Bringing Them Aboard

MODEL A. USE EXTERNAL STEM PROGRAM PROVIDERS TO COACH STAFF

If you currently offer science through an outside provider—such as a contractor that offers activities on a weekly basis, or a classroom teacher who offers a science club—your staff can learn from the outside leader’s methods. Remember that your staff members know your kids best. Kids are much more likely to deeply engage in STEM if they see it is not just a “special event.”

MODEL B. PROVIDE STAFF DEVELOPMENT YOURSELF

Many organizations can only commit to staff development led by someone who is already on staff. While internal staff development is the most likely starting place for many programs, providing training that creates an appropriate expectation of student-centered STEM programming is not simple. For a comparable level of effort, most after-school sites could consider the trade-off of building a partnership with a local museum, 4-H office, university or other organization with STEM expertise.

MODEL C. GET TRAINING IN CONNECTION WITH SPECIFIC MATERIALS

Many curriculum providers offer staff training in connection with their materials. This is a good option if your after-school program is willing and able to commit to a single set of high-quality, flexible materials. Training may be free, available for a fee, or built into the cost of the materials. Curriculum developers may be looking for partners to help evaluate materials. You can defer costs by providing feedback.

MODEL D. BUILD A PARTNERSHIP WITH A SCIENCE PROVIDER

By building a partnership with a local museum, university or other science provider, you can obtain expert advice while building the capacity of your staff. Unlike a contractual agreement, where one organization provides a service to the other, an effective partnership serves the goals of both partners. Partnerships require an investment of time and resources, but they also offer greater rewards. In addition to sharing their knowledge with you, your science partners should develop an understanding of your after-school and youth development goals.

MODEL E. USE SCIENCE EDUCATORS AS COACHES

Many after-school programs have a school-day teacher who leads science activities. To expand on this model, you could invite that science teacher to coach other after-school instructors to lead science activities. After-school providers commonly see employing a science educator as an alternative to building staff capacity. View this instead as an opportunity. The teacher should help after-school staff members integrate science processes and thinking skills into all activities.
Program Features and Structures: Other Considerations

Take advantage of the strengths of your program and respect your constraints in considering the following questions. The answers will help you maximize effective, equitable science learning opportunities in your program.

WHAT ROLE SHOULD SCIENCE PLAY IN YOUR PROGRAM?

Some programs have STEM learning as an integral part of their mission or a significant emphasis. Others offer science as one of many activity choices. Some intend for their science offerings to complement and be aligned with school science; others offer science as an enrichment activity and do not require this alignment.

HOW MUCH TIME DO YOU HAVE TO DEVOTE TO SCIENCE ACTIVITIES?

Think about how you would schedule science in your program—how many minutes you have per day, or hours per week or year. Both your schedule and available time will be important to consider when selecting content or curriculum and arranging to staff science learning.

WHAT THEMES OR SUBJECT AREAS BEST FIT YOUR PROGRAM FOCUS, LEARNING GOALS AND POPULATION?

Some themes may be better aligned with your goals, partners or the interests and needs of your students. You may be open to any theme as long as it fits your program structure. It’s important to select offerings that will engage your kids and support your learning goals.

IS EVERYONE INCLUDED?

Ensure that all children are encouraged to participate in science activities by explicitly and deliberately attending to scheduling, instructors, materials, accessible role models, cross-curricular connections and career connections. For example, if science is only offered to students who don’t need homework help, kids from under-represented groups in science may be excluded. Additional information about creating an equity-aware program can be found at: [http://www.fhi360.org/resource/gender-equitable-stem-strategies-stories-field](http://www.fhi360.org/resource/gender-equitable-stem-strategies-stories-field).

ARE THERE OPPORTUNITIES FOR FAMILY INVOLVEMENT?

Including family members not only gives them opportunities to enjoy and engage in the excitement of science learning, it also helps parents learn to support their children in future academic and career pursuits. This may be especially important for families from traditionally under-served groups who have little exposure to science experiences. Here are several ways to involve families:

- **Family programming**: Use activities that parents can do alongside their children, either at your program or at home.

- **Science center field trips or family passes**: Invite parents to help with trips to
Program Features and Structures: Other Considerations

Science centers or encourage them to take their children on their own. Some science centers and museums are free; others may provide free promotional passes upon request.

- **Communicate with parents:** Regular calls or letters to parents about what their children are learning in your program conveys the importance of science learning for their child’s development and future. You should also let them know how they can support these experiences at home. A sample parent letter is provided in this guide.


**WHAT KIND OF SPACE DO YOU HAVE?**

What kind of classrooms are you using? What are your options for storing equipment or ongoing student projects? Understanding your space will be critical to selecting the learning opportunities that make sense for your program. There are many high quality science programs that can be done in minimal space. Others require specialized space and storage configurations.

**HOW WILL YOU MANAGE SUPPLIES?**

If you choose science activities that require special materials, have a plan to replace those materials. A good curriculum will give you lists of the materials you need and help you find anything that may be hard to get. Either plan to utilize an existing system for refilling items as they run out or create one of your own.

**HOW WILL YOU KNOW IF YOUR PROGRAM IS MEETING YOUR GOALS?**

Evaluation efforts can be designed to help you learn about any of the following: community needs (a.k.a. front end evaluation or needs assessment); details on how the program is designed and is being implemented (formative evaluation); or evidence of the effectiveness of your program at meeting its goals and having an impact on participants (summative evaluation).

It’s a good idea to have an evaluation plan in place at the outset of your program. There are a number of ways you can get the information you need to evaluate your program. Some of the most common data collection methods include: surveys, interviews, focus groups, observations, assessments and analyzing student products. Sometimes funding agencies suggest or require the use of professional, independent evaluators. Whether required or not, professional evaluators can help you design an evaluation plan that meets your program needs. For more information about conducting evaluations, see Resources in this guide.
A Note About Safety

- Instructors should be certain to review safety rules with students for each session.
- Safety is always a consideration for any science program, and after-school science is no exception.
- Students should always have adequate adult supervision—a good rule of thumb is 1 adult for 5 to 10 children.
- When working on projects outside of school, pair up students and always have them within your sight.
- Remind students to wash their hands before their fingers end up in their mouths or eyes and to always use eye protection. Safety goggles or spectacles are available from any science materials vendor.
- Anticipate the worst that could happen and plan for it.
- Have a first-aid kit available and follow your site’s guidelines for emergencies.
- For more information on safety, look for safety reference books from the National Science Teachers Association (NSTA).
- Science is about exploration, and we teach children to explore using their five senses. However there are times when this is not a good idea. Teach your students that they should NEVER taste anything if they do not know what it is.

Still not sure how to know if you’re ready to incorporate STEM in your program? Check out the STEM Readiness Reflection at the end of this Guide. It will help you specify your program’s needs and assets so you can make the best choices. The STEM Infusion Guide, also in the back, will give you ideas about how to integrate STEM into your program given your assets and constraints.
3. SUPPORTING YOUR PROGRAM

Finding Partners and Funding

You can build partnerships with many local and regional organizations interested in serving kids who attend after-school programs. Some of these partners will bring funding or other resources to support your program, or you can apply for grants as a team. Funders are often more interested in organizations that have partners.

Don’t forget to consider other after-school organizations as possible partners as you can share best practices and training costs. Also check out the Resources section in this guide. Some of the information there may lead you to organizations that have funding opportunities. For example, curriculum developers want their materials to be used, and may have special prices or bonus offers.

Above all, remember that there are great, inexpensive curricula that can be implemented by your current staff using common household materials. Science programs do not have to be expensive, but as your program develops those costs should be included in your normal operating budget.

Matchmaking, Problem-Solving and Breaking Up

Creating, maintaining and evaluating partnerships takes time and effort and can be more trouble than they’re worth. One way to think about partnerships is that they need a matchmaker, regular problem-solving and sometimes, a break-up. It’s not a perfect metaphor but a useful one when considering the life cycle of a partnership: Identifying your need and potential partners is the first step, creating and maintaining a functional relationship is the second, and knowing if and when the partnership should be ended is the third.

MATCHMAKING: PICKING THE RIGHT PARTNERS

When considering partnerships, ask yourself the following questions:

• What are my goals and is a partnership the best way to achieve them?

• Will all partners benefit from the relationship? Does the partnership take advantage of existing resources or does something new need to be created within any of the partners?

• Is this a good relationship? Is there trust, shared language and common values? Have we had problems in the past and how have those been amicably solved?

In order for partnerships to be sustainable, the answers to all of these questions should be yes, and over time, it’s worth reassessing the answers as organizations and individuals change. As your needs change, your partnership may or may not hold the same value. Once you understand what you hope to gain from the partnership, you can assess what type of partner you need.

SOLVING PROBLEMS

Even in the best of circumstances, partners...
Finding Partners and Funding

will need to solve problems together. A good relationship can be defined by the partners' ability to acknowledge problems and proactively solve them to both parties' satisfaction.

The elements of a good working relationship can include:

• Regular meetings where parties can air their concerns and address them in a manner agreeable to both.

• Trust and shared values so that “the benefit of the doubt” is the first response when something goes wrong.

• The ability to recognize problems before they start.

• The ability to recognize points of friction, which over time have the potential to turn into bigger problems.

While tension is normal and partners will have to solve problems together, sometimes the partnership will have come to a natural conclusion.

LETTING GO GRACEFULLY

A partnership must bring value to both parties, but often the value changes as organizations change. Dissolving partnerships involves knowing when and how to part ways.

This is subjective and each situation, individual and organization is going to be different. Some signs that your partnership is fading can include:

• A feeling that you’re putting in significantly more work than your partner,

• Questioning the value of the partnership and finding excuses to keep it,

• Other external factors such as new regulations, changes in finances and/or changes in leadership.

There is no one good way to end a partnership, though of course there are many bad ways. One of the worst is to not be clear that it has ended, and why. Letting it fade away can lead to confusion and disappointment, so be clear about what you’re doing and why.

WHERE SHOULD I LOOK FOR PARTNERS?

Schools

If you are a community organization operating a program in a school, make sure to treat your school as a partner. A school may be able to provide resources such as books, access to a computer lab, or the expertise of teachers. You can help your school achieve its educational mission, and it can help you ensure that your STEM programs are high-quality, age-appropriate and aligned with Next Generation Science standards.
Finding Partners and Funding

Informal Science Institutions

Science centers, zoos, botanical gardens and museums offer instructional materials and other educational services. Usually marketed to schools, these resources are often available to after-school programs as well. Along with services for hire like professional development, one-time events and after-school science programs, science centers may be interested in long-term partnerships and can help find funding for this work. Find out about centers near you through the following professional organizations:

Association of Science-Technology Centers: [http://www.astc.org/sciencecenters/find_scicenter.htm](http://www.astc.org/sciencecenters/find_scicenter.htm)

Association of Zoos and Aquariums [http://www.aza.org/FindZooAquarium/](http://www.aza.org/FindZooAquarium/)


4-H and Cooperative Extension Services

Through Cooperative Extension Service offices, 4-H has a presence in each U.S. state and territory. With over seven million members, it is the largest out-of-school youth program in the United States. In 2008, 4-H began a Science, Engineering, and Technology initiative to reach one million new kids through its programs. To meet that goal 4-H is working to make all of its resources easily accessible to the greater after-school field. You can find a 4-H office in your state by visiting: [http://www.fourhcouncil.edu/find4H.aspx](http://www.fourhcouncil.edu/find4H.aspx).

Universities

In addition to 4-H and extension offices, most universities have projects that could connect to your program. Start by contacting the university’s outreach office (which may be called “Community Relations” or something similar). These offices can help you secure volunteers or student employees and may have specific programs to connect you with schools or communities.

You could also seek relationships with science and engineering department offices or faculty. University research grants often include funding for education outreach, and they may be seeking partners. By expressing personal interest, you will take a huge first step. In many cases, university educators are looking for a stable after-school program that offers access to a regular group of engaged youth. At times, they might have access to applicable funding sources.

Other Research Institutions

Other government-funded research organizations around the country may provide opportunities and resources. NASA has ten Education Centers and offers a range of resources, including several specifically designed for after-school. Sea Grant is a nationwide network administered by NOAA that supports coastal communities with research and education. Federal research labs
also offer education programs and partnerships that can connect kids to real scientists engaged in cutting edge research. You can search for a lab in your area here: [http://www.federallabs.org/labs/](http://www.federallabs.org/labs/)

**Science and Technology Corporations and Public Works**

Every region has a local employer with a focus on science and engineering. After all, transportation and utilities depend on STEM workers. There are also thousands of private corporations employing the STEM workforce. Each is a potential source of funding, volunteers or other resources. Contact an organization’s public affairs or corporate giving office to ask for help.

**State Science Teacher Associations**

These groups are affiliated with the National Science Teachers Association. Most state associations host one or more professional development conferences each year, and some have a strand for informal or out-of-school time science. There are similar affiliate groups for technology and math educators.16

“I definitely think museums or cultural institutions can partner with after-school. I think someone has to start that conversation if it’s not already happening. And you might have to have that conversation over and over. Find the person that actually works in the community, not someone in marketing trying to sell you stuff. It is usually the education department or see if they have an outreach department. Keep going until you reach the right person. That is where sometimes people get a little frustrated.”

Diane Miller, St. Louis Science Center, NAA AfterSchool Review, Spring 2008.

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14[http://education.nasa.gov](http://education.nasa.gov)
Resources

This section includes resources known at the time this guidebook was published.

**GENERAL INFORMATION AND SUPPORT**

**Afterschool Training Toolkit**

The National Center for Quality Afterschool’s toolkits (funded through the U.S. Department of Education’s 21st CCLC program) feature many ideas for supporting learning after school in science, math, and technology. [http://www.sedl.org/afterschool/toolkits/about_toolkits.html](http://www.sedl.org/afterschool/toolkits/about_toolkits.html)

**Educate to Innovate**

Here you’ll find information about the federal initiative to improve the participation and performance of American students in STEM. [http://www.whitehouse.gov/issues/education/k-12/educate-innovate](http://www.whitehouse.gov/issues/education/k-12/educate-innovate)

**You4Youth**

The U.S. Department of Education’s website for 21st Century Community Learning Centers provides training materials, advocacy slideshows, and strategies for incorporating STEM into regular program activities, among other resources. [http://y4y.ed.gov/learn/stem](http://y4y.ed.gov/learn/stem)

**Afterschool Alliance**

The Afterschool Alliance has a section of its website devoted to STEM. Find publications, resources, and information about policy and funding. [http://www.afterschoolalliance.org/stem.cfm](http://www.afterschoolalliance.org/stem.cfm)

**INSTRUCTIONAL MATERIALS**

**The Science After School Consumers Guide**

This website contains reviews of science curricula for after-school programs. Each resource is vetted by two experts, one after-school and one science expert. Users can sort entries by title, subject, grade level, target audience and cost. Where available, reviews are linked to an activity from the resource hosted on the Smile Pathway. Newer curricula are added to the site via community-submitted reviews. [http://www.sedl.org/afterschool/science/](http://www.sedl.org/afterschool/science/)

**The SMILE Pathway**

The Science and Math Informal Learning Educators (SMILE) pathway will connect you with the National Science Digital Library, a massive collection of resources. SMILE points you toward resources that are especially useful for educators in out-of-school learning environments (mostly activities, not full curricula). [http://howtosmile.org](http://howtosmile.org)
Resources

TryScience

This project, a partnership between IBM and science-technology centers worldwide, offers activities and ways to connect with the centers, such as video and livecams. http://www.tryscience.org/

The Exploratorium

Located in San Francisco, the Exploratorium is renowned for its innovative, interactive exhibits. Online, a section is devoted specifically to activities for after-school. Each activity includes instructions, a concept map and ideas for going further. http://www.exploratorium.edu/afterschool/activities/index.php

PBS

PBS is committed to education and produces many high-quality STEM programs, often with lesson plans, activities and professional development available on-line. Below are three of their programs; you can also explore their general education site.

- Design Squad: http://pbskids.org/designsquaddesignsquad/parentseducators/
- Sid the Science Kid: http://www.pbs.org/parents/sid/activities/

STAFF DEVELOPMENT

In addition to the resources here, note that some curricula include staff development, whether in-person, on-line, or in written form.

SEDL Center for Professional Learning

The Virtual Academy for Afterschool offers a series of online interactive courses designed to build the knowledge and skills of after-school instructors. http://www.sedl.org/afterschool/resources/pd.html

ZOOM

A product of PBS, this features a short, at-your-own-pace training to help build confidence when facilitating science activities. http://www.pbs.org/parents/zoom/scitraining/

Click2SciencePD

Developed by the University of Nebraska at Lincoln, this resource targets site leaders, building their capacity to help their staff members develop 20 essential skills for facilitating science. Each unit includes a video demonstrating the skill and detailed agendas for meetings, coaching sessions and trainings around that skill. http://www.click2sciencepd.org/
EVALUATION

You can learn a lot about evaluation and program improvement by reading evaluations of other programs. You can also talk to colleagues who have conducted evaluations and ask to borrow the tools they used.

Universities, science centers, museums and other organizations that regularly receive grants from the government and foundations use professional evaluators. These organizations may also conduct evaluations themselves or know of independent evaluators. Building contacts and partners at these organizations is a good way to learn more about others who can help you.

Assessment Tools in Informal Science (ATIS)

This is a database of assessment tools to measure performance of informal and out-of-school STEM programs. [http://www.pearweb.org/atis/](http://www.pearweb.org/atis/)

Informal Science

From CAISE (Center for Advancement of Informal Science Education), this is a collection of STEM education projects, evaluation and research resources. [http://informalscience.org](http://informalscience.org)

National Girls Collaborative Project (NGCP)

This page links to user-friendly surveys and guides to help assess a program. NGCP is also a great site in general for equity in STEM [http://www.ngcproject.org/evaluation-assessment](http://www.ngcproject.org/evaluation-assessment)

FUNDING

Afterschool Alliance

A great resource in general, this page links to funding sources specifically for STEM programs. [http://www.afterschoolalliance.org/STEM-FUNDING.CFM](http://www.afterschoolalliance.org/STEM-FUNDING.CFM)

Foundation Center

This is a central resource for funding opportunities and information about how to pursue funding. [http://foundationcenter.org/](http://foundationcenter.org/)

FOR FAMILIES

Family Science and Family Math

These are resources designed for parents to use with their children at home. The books contain activities for any skill level and encourage cooperation among family members. You can also set up these activities on a family night at your program.

- Family Science: [http://familyscience.org](http://familyscience.org)
Resources

Aspire: The STEM Activity App

This app is designed to foster positive STEM interactions between students and families. Sign up and you'll receive STEM activities suitable for families to share. [http://www.wheelock.edu/about/centers-and-institutes/aspire-institute/current-programs/learning-solutions/stem-activity-app](http://www.wheelock.edu/about/centers-and-institutes/aspire-institute/current-programs/learning-solutions/stem-activity-app)

FOR COMMUNITY AND AFTER-SCHOOL LEADERS

Every Hour Counts: Frontiers In Urban Science Education Resource Guide

This guidebook will help you convince community leaders, principals and others that informal science learning can effectively be incorporated into your program. [http://www.afterschoolsystems.org/content/document/detail/3040/](http://www.afterschoolsystems.org/content/document/detail/3040/)

Afterschool Alliance: Making the Case for STEM in Afterschool

A full set of tools to help you convince stakeholders about the importance and efficacy of offering STEM in your program. [http://www.afterschoolalliance.org/STEM-toolkit.cfm](http://www.afterschoolalliance.org/STEM-toolkit.cfm)

Inquiry-Based Learning

For examples of inquiry-based lessons in after-school settings, visit:


You can also learn more from the Exploratorium’s Institute for Inquiry: [http://www.exploratorium.edu/ifi/resources/](http://www.exploratorium.edu/ifi/resources/)

ExpandED Schools: STEM Videos

For short videos that demonstrate how engaging inquiry-based STEM learning can be, go to the ExpandED Schools YouTube channel and search for videos that focus on science or STEM: [https://www.youtube.com/c/expandedschools](https://www.youtube.com/c/expandedschools)

SCIENTIFIC SUPPLIES

Though wonderful science can be done without special supplies, many scientific suppliers offer interesting materials. The largest science education suppliers include:

- Delta Education: [http://delta-education.com/](http://delta-education.com/)
Making Your Case: Sample Letters

Here you will find sample letters you can customize to promote your after-school science program, engage parents and volunteers, find partners and raise money. Use these to write emails, press releases, flyers, and talking points.

TO A COMMUNITY LEADER
(I.E. ELECTED OFFICIAL, POTENTIAL SPONSOR, MEDIA)

Dear [Name or title here]:

I am writing to introduce you to our program and ask for your support [specify what kind of support you are requesting here].

Although kids finish the school day around 3 PM., the learning day does not end at that time. Many participate in wonderful experiences that enrich and expand on school-day learning. This year, at [insert name of program] kids will have a chance to experience a new offering—science and technology.

Research shows that early interest in science is a better predictor of future academic and career decisions than math achievement test scores. The U.S. Department of Labor predicts that more than half of all careers will require substantial math or science preparation. At the same time, little school time is devoted to science due to accountability requirements for English and math.

Children need time to explore their own ideas about science and technology. Many children view these topics as something that only happens in a classroom, and may not know that science can help them understand the natural world. Further, special attention must be placed on providing youth from groups historically under-represented in scientific pursuits equal access to academic and career pursuits that require scientific and technological knowledge. Gender and ethnic differences in the science workplace persist, not because of academic performance, but because fewer youth from underrepresented groups are exposed to science as a fun, engaging, and compelling pursuit.

Our program is a perfect place to let young people explore science and technology. We offer flexible time for discussion and opportunity to work in groups. Our group leaders let kids play with science in the same way they play sports or explore the arts. High-quality after-school experiences may ignite interests that translate into classroom success and future career options.

I hope you will support our program by [providing a grant for …; coming to visit; writing an article; etc.]
TO A PRINCIPAL

A tailored version of this letter could be sent to the leaders of your school or schools that feed your program. You may also want to send a letter to the teachers, science specialists, or others who may work with students on science during the school day.

Dear [Principal],

This year, [insert name of program], our after-school program, will feature activities that engage the children in [choose from: science, technology, engineering and mathematics]. We would like your support and cooperation as we plan these activities for the year.

Our efforts to include science and technology in our after-school program are based upon evidence that young people need to experience these subjects beyond the school day. Recent research indicates that interest in science before 8th grade is a better predictor of future academic and career decisions than math achievement test scores. Playing with robots, blocks, bugs, and plants will not only support students when it comes time to learn physics, chemistry, and biology, but will also help them stay interested in science over time.

To support our planning, we are using resources that have been developed specifically to help after-school programs guide science and technology learning. Based on these resources, we will select an appropriate curriculum and seek staff development opportunities that will help after-school staff lead the activities.

[THE FOLLOWING PARAGRAPH LISTS SEVERAL WAYS THAT THE PRINCIPAL COULD HELP YOU. YOU SHOULD CHANGE IT TO REFLECT YOUR WANTS AND NEEDS.]

We hope to work with you and the school-day teachers in several ways. In particular, we would appreciate your guidance in relating our activities with your school’s science curriculum, so that the students can connect what they learn in each place. We would also like the science teachers to coach our staff to ensure the quality and accuracy of our activities. Finally, we would appreciate you sharing some classroom and storage space as needed for science projects.

Together, I believe we can create a culture of kids excited about science and technology learning and careers. My staff and I look forward to working with you.
Dear Parents,

This year, [insert name of program], our after-school program, will feature activities designed to engage your child(ren) in [choose from: science, technology, engineering and mathematics]. We would like your support and cooperation as we plan the activities for the year.

As you may know, most careers in the future will require some understanding of science and technology. Recent research shows that interest in science before 8th grade is a better predictor of future academic and career decisions than math achievement test scores. Playing with robots, blocks, bugs, and plants will not only support students when it comes time to learn physics, chemistry, and biology, but it will also help them stay interested in science over time.

After-school science may look very different than the science learning opportunities you had. Your children will be acting as scientists – investigating the world around them, searching for answers to interesting questions, using their hands to gather evidence, and engaging their minds to draw conclusions.

How can parents support science and technology learning outside of school?

- Repeat the activities that we do at the after-school center with your child. Most activities use items found in your kitchen or at the grocery store. We will send instructions home with your child when appropriate.
- Ask your kids about their ideas and how they think things work; encourage them to ask questions.
- Take your child and his/her friends to a park, science center, or museum [you could include information here about specific local opportunities]; encourage them to play with science.
- Help our after-school program connect with local science and technology resources, such as museums, businesses, colleges, and universities.
- Tell local leaders (school board members, city council, etc.) about the potential for after-school science learning.

Together, we can create a culture of kids excited about science and technology learning and careers. My staff and I look forward to working with you.
Dear [insert recipient name or title here]:

This year, [insert name of program], our after-school program, will feature activities that engage children in [choose from: science, technology, engineering and mathematics]. We would like your support and cooperation as we plan these activities for the year.

Our efforts to include science and technology in our after-school program are based upon evidence that young people need to experience these subjects beyond the school day. Recent research indicates that interest in science before 8th grade is a better predictor of future academic and career decisions than math achievement test scores. Playing with robots, blocks, bugs, and plants will not only support students when it comes time to learn physics, chemistry, and biology, but it will also help them stay interested in science over time.

To support our planning, we are using resources that have been developed specifically to help after-school programs guide science and technology learning. Based on these resources, we will select an appropriate curriculum and seek staff development opportunities that will help after-school staff lead the activities.

[THE FOLLOWING PARAGRAPH LISTS SEVERAL WAYS THAT ORGANIZATIONS COULD HELP YOU. TAILOR IT TO REFLECT YOUR WANTS AND NEEDS.]

We are seeking support from local organizations with science and technology expertise. In particular, we are looking for: volunteers to support and coach our staff on relevant content, and to be career role models and mentors for our students. We would also be interested in working with you on a longer-term partnership that would build on the strengths of each of our organizations and expand the connection between our students and the work you are doing.

Together, I believe we can create a culture of kids excited about science and technology learning and and careers. My staff and I look forward to working with you.
4. ACKNOWLEDGEMENTS

Original text and materials for the first edition of this guidebook were provided by Rena Dorph, PhD, and the Lawrence Hall of Science of the University of California, Berkeley. The Coalition for Science After School provided information for this guidebook. We also thank Jason Freeman for his contributions.

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The revised and updated second edition of this guidebook was developed with support from the New York City Department of Youth and Community Development.
5. REFERENCES

The articles listed below include those referred to in this guidebook (marked with an asterisk) as well as others that may be of interest.


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STEM READINESS REFLECTION

Use this tool to reflect on your program and areas in which you can improve your ability to deliver high-quality STEM (Science, Technology, Engineering, Math) opportunities. Check off boxes that most closely match your program, and then look for areas of strength and those that need improvement. Within each row, you may have checks in more than one column. As you build your STEM infrastructure, you will want to take actions that enable you to check off more boxes in the “Advanced” column. However, there may be some areas that will be impossible to change (e.g., having an outdoor space). In that case, being aware of limitations will enable you to make better choices about activities and perhaps inspire you to look for ways to work around them.

<table>
<thead>
<tr>
<th>EXPERIENCE WITH STEM LEARNING</th>
<th>BASIC STEM INFRASTRUCTURE</th>
<th>MODERATE STEM INFRASTRUCTURE</th>
<th>ADVANCED STEM INFRASTRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐ limited to one-offs such as field trips or have never offered STEM</td>
<td>☐ have implemented through staff or partners at least one STEM curriculum or project over a minimum of six sessions</td>
<td>☐ have implemented through staff or partners four or more long-term STEM curricula or projects at multiple grade levels</td>
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<tr>
<td></td>
<td>☐ do not know what curricula or services are available</td>
<td>☐ familiar with 1-3 vetted curricula or partner services and know who to ask about more</td>
<td>☐ familiar with more than 3 vetted curricula or partner services, and actively seek additional resources</td>
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<tr>
<td></td>
<td>☐ do not know where to find curricula or services</td>
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<tr>
<th>COMMITMENT</th>
<th>BASIC STEM INFRASTRUCTURE</th>
<th>MODERATE STEM INFRASTRUCTURE</th>
<th>ADVANCED STEM INFRASTRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ interested in offering STEM in your program</td>
<td>☐ currently offer STEM to part of your population</td>
<td>☐ currently offer STEM to all of your population</td>
<td></td>
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<tr>
<td>☐ your organization does not yet support or encourage STEM offerings in your program</td>
<td>☐ committed to keeping and expanding STEM offerings</td>
<td>☐ committed to improving the quality of STEM offerings</td>
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<td></td>
<td>☐ your organization recognizes the value of STEM and encourages you to invest in it</td>
<td>☐ your organization is fully on-board and supports your STEM initiative in a variety of ways, such as providing materials or brokering partnerships</td>
<td></td>
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<table>
<thead>
<tr>
<th>INCLUSION &amp; EXPOSURE</th>
<th>BASIC STEM INFRASTRUCTURE</th>
<th>MODERATE STEM INFRASTRUCTURE</th>
<th>ADVANCED STEM INFRASTRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ offer STEM only to a specific grade level or demographic</td>
<td>☐ offer STEM to a majority of your youth</td>
<td>☐ offer STEM to all youth</td>
<td></td>
</tr>
<tr>
<td>☐ do not expose youth to STEM careers</td>
<td>☐ expose youth to STEM careers once or twice a year</td>
<td>☐ ensure that the needs of girls, minorities, and children with handicaps are accommodated</td>
<td></td>
</tr>
<tr>
<td>☐ do not expose youth to STEM role models</td>
<td>☐ expose youth to STEM role models once or twice a year</td>
<td>☐ have regular opportunities for youth to be exposed to STEM careers</td>
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<td></td>
<td></td>
<td>☐ seek regular opportunities for youth to interact with STEM role models</td>
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<tr>
<td>BASIC STEM INFRASTRUCTURE</td>
<td>MODERATE STEM INFRASTRUCTURE</td>
<td>ADVANCED STEM INFRASTRUCTURE</td>
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<tr>
<td><strong>STAFF</strong></td>
<td><strong>STAFF</strong></td>
<td><strong>STAFF</strong></td>
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<tr>
<td>- rarely have staff interested in learning to facilitate STEM activities</td>
<td>- when hiring, look for staff interested in or experienced with facilitating STEM activities</td>
<td>- look for interest in STEM when hiring and seek ways to excite staff about facilitating STEM activities</td>
<td></td>
</tr>
<tr>
<td>- send staff to STEM training once a year</td>
<td>- usually send staff to STEM training several times per year</td>
<td>- always have STEM trainings several times per year</td>
<td></td>
</tr>
<tr>
<td>- have just one person trained on each curriculum or project</td>
<td>- whenever possible, have at least two staff trained on a curriculum or project</td>
<td>- always train at least two staff members on each curriculum or project</td>
<td></td>
</tr>
<tr>
<td>- staff members facilitating STEM do not have time for co-planning</td>
<td>- give staff 45-75 minutes per week to plan and prepare</td>
<td>- trained staff serve as mentors in STEM for new staff</td>
<td></td>
</tr>
<tr>
<td>- staff members facilitating STEM have fewer than 30 minutes each week to prepare</td>
<td>- staff members are encouraged to co-plan with colleagues</td>
<td>- give staff two hours or more each week to plan and prepare</td>
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<td></td>
<td>- supervisors are willing to support staff facilitating STEM, e.g. by coaching or assisting</td>
<td>- staff members are required to co-plan with colleagues</td>
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<td></td>
<td>with preparation</td>
<td>- have a person charged with supporting staff facilitating STEM</td>
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<td></td>
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<td>- have a person in your organization who conducts STEM trainings</td>
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<tr>
<td><strong>PARENTS AND CAREGIVERS</strong></td>
<td><strong>PARENTS AND CAREGIVERS</strong></td>
<td><strong>PARENTS AND CAREGIVERS</strong></td>
<td></td>
</tr>
<tr>
<td>- inform parents about STEM activities only as required, e.g. to get permission slips</td>
<td>- inform parents about STEM activities at the beginning of a curriculum or project and when assistance from them is needed; e.g. need youth to bring in newspaper or cans aware of and sometimes make use of parent outreach materials provided in curricula or by partners</td>
<td>- inform parents about STEM activities in an on-going fashion via letters, emails, talks frequently use parent outreach materials provided in curricula or by partners; seek ideas for activities families can do together</td>
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<td>- invite parents to special STEM events, such as family nights</td>
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<td>- invite parents to participate in afterschool activities as chaperones, role models, or co-inquirers</td>
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<tr>
<td>PARTNERS</td>
<td>BASIC STEM INFRASTRUCTURE</td>
<td>MODERATE STEM INFRASTRUCTURE</td>
<td>ADVANCED STEM INFRASTRUCTURE</td>
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</table>
| □ do not have any STEM partners  
□ do not know how to find STEM partners | □ have had 1-3 STEM partners  
□ finding a partner is usually by happenstance | □ have had more than 3 STEM partners  
□ actively seek possible partners  
□ work to build and maintain relationships with organizations that can provide partners |
| PARTNER RELATIONSHIPS (STEM SERVICE PROVIDERS) | □ there is no clear point person with whom partner can coordinate  
□ where services are at another facility, the group is frequently late or doesn't show up  
□ where services are on-site, partner does not know where to go and has to manage materials alone  
□ line staff are disengaged, and do not manage behavior  
□ if evaluation is part of the project, it is not completed  
□ If goods or access to equipment provided, they may never be used, or are lost or damaged.  
□ N/A: do not have STEM partners | □ a staff member coordinates schedule with partner and notifies partner if there are changes  
□ where services are at another facility, line staff usually have the group arrive on time  
□ where services are on-site the door guard is informed about where the partner should be sent  
□ line staff usually remain with the group and manage behavior  
□ if evaluation is a part of the project, it is completed with some prompting  
□ If goods or access to equipment are provided, users are careful to avoid loss or damage. | □ a liaison coordinates schedule and logistics with partner and asks for advance information to share with line staff and/or youth.  
□ Liaison meets with line staff to go over logistics and provide information about the activities  
□ where services are at another facility, line staff ensure that group arrives a few minutes early  
□ where services are on-site staff member meets partner on arrival and assists with set up  
□ line staff are engaged in the activity and manage behavior as necessary  
□ if evaluation is a part of the project, it is done promptly and completely  
□ If goods or access to equipment are provided, users are careful with assets, records are kept of use, and a clear channel of communication with provider is kept open. |
| FUNDING & RESOURCES | □ have minimal funds ($0-100) to spend on STEM activities  
□ funds are not reliable  
□ cannot seek additional monies  
□ organization does not support fundraising efforts  
□ have very limited supplies of | □ have moderate funds ($100-800) to spend on STEM activities  
□ funds are fairly reliable  
□ seek additional funds when opportunity arises  
□ organization is supportive of | □ devote substantial portion of funds to STEM (>800)  
□ funds are very reliable  
□ research and apply for opportunities to obtain additional funds to support STEM |
<table>
<thead>
<tr>
<th>BASIC STEM INFRASTRUCTURE</th>
<th>MODERATE STEM INFRASTRUCTURE</th>
<th>ADVANCED STEM INFRASTRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>everyday consumables to devote to STEM activities</td>
<td>fundraising efforts have adequate supplies of everyday consumables to devote to STEM activities</td>
<td>organization often takes the lead in fundraising for STEM have ample supplies of everyday consumables to devote to STEM activities</td>
</tr>
<tr>
<td>do not have or seek partners who can contribute materials or training</td>
<td>have at least one partner who contributes materials or training; open to engaging others</td>
<td>have and seek partners who can contribute materials or training</td>
</tr>
<tr>
<td><strong>SPACE &amp; EQUIPMENT</strong></td>
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</tr>
<tr>
<td>do not have a dedicated space for STEM activities AND cannot use the normal classrooms</td>
<td>have a dedicated space for STEM OR can conduct activities in normal classrooms</td>
<td>can create a dedicated space for STEM AND can conduct activities in normal classrooms</td>
</tr>
<tr>
<td>do not have any place to store STEM materials</td>
<td>have limited storage for STEM materials in a central area</td>
<td>have adequate storage for STEM materials in each space where STEM is conducted</td>
</tr>
<tr>
<td>do not have a sink in the spaces where STEM is conducted</td>
<td>some spaces used for STEM have a sink</td>
<td>all spaces used for STEM have a sink</td>
</tr>
<tr>
<td>do not have access to computers or Internet</td>
<td>have some access to computers and the Internet</td>
<td>have at-will access to computers and the Internet</td>
</tr>
<tr>
<td>do not have access to an outdoor space</td>
<td>have some access to an outdoor space</td>
<td>have access to at least two types of outdoor space</td>
</tr>
<tr>
<td>do not have access to a school or community garden</td>
<td>have some access to a school or community garden</td>
<td>have access to a school or community garden</td>
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<tr>
<td><strong>EVALUATION &amp; ASSESSMENT</strong></td>
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<td>limited to anecdotal evidence, e.g. kids’ comments about an activity</td>
<td>conduct evaluation when required (e.g. as part of a grant-funded project) sometimes use surveys provided in curricula occasionally observe staff facilitating STEM and discuss how it went afterward</td>
<td>conduct evaluation for all STEM curricula and projects, whether funded or not</td>
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<td>aware of and use surveys and instruments provided in curricula and/or from other sources (e.g., PEAR, Great Science for Girls)</td>
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<td>aware of and use a variety of ways to evaluate and assess efforts (e.g., focus groups, pre- and post-surveys, observation rubrics, portfolio or project assessments)</td>
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<td>use a tool to regularly observe staff facilitating STEM and discuss afterward</td>
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<tr>
<td>ALIGNMENT WITH SCHOOL DAY STANDARDS</td>
<td>BASIC STEM INFRASTRUCTURE</td>
<td>MODERATE STEM INFRASTRUCTURE</td>
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<td>□ have not considered whether STEM activities are aligned with school day standards</td>
<td>□ aware of standards and look for activities and curricula that are explicitly aligned</td>
<td>□ seek to learn more about Next Generation and Common Core standards and keep up with changes</td>
</tr>
<tr>
<td>□ have minimal communication with school or feeder schools</td>
<td>□ communicate with school about STEM activities and how they align with school standards</td>
<td>□ share with school the curricula and activities you use, and ask for help defining alignment where it is not explicit</td>
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<td>□ work with school to refine areas in which your STEM activities can support school learning</td>
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STEM INFUSION TOOL

The chart below shows four ways (called here “STEM Infusion”) to integrate STEM (Science, Technology, Engineering, Math) into your program. The first column shows the type of STEM Infusion, while the second indicates the items you must have or fulfill for successful implementation. The last column offers ideas to positively impact the quality of the project. This chart can also be used along with the STEM Readiness Reflection to help you determine what kind of infusion you can successfully implement now.

The four infusions:

- Visit a STEM-rich cultural institution or city park; invite a person with a STEM-related job to visit your site and engage with your kids (page 1)
- Work with a partner who will conduct a series of sessions for youth or lead a project-based initiative at your site or the partner’s facility (page 2)
- Have line staff trained by an outside source to facilitate STEM curricula or projects (page 3)
- Use trainer/supervisor from your organization to train line staff on STEM curricula or projects (page 4)

<table>
<thead>
<tr>
<th>STEM INFUSION</th>
<th>MUST DO/ HAVE</th>
<th>RECOMMENDED UPGRADES</th>
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<tr>
<td>Visit a STEM-rich cultural institution or city park; invite a person with a STEM-related job to visit your site and engage with your kids</td>
<td>✓ Ensure that reservations, transportation, and times are confirmed with the site (if applicable) and with your staff ✓ Give role model visitors guidelines for their presentations, and make sure they know where they should be and are welcomed and accommodated ✓ Make sure line staff understand their roles in both cases: managing behavior and logistics; serving as positive role models by being attentive and</td>
<td>✓ Check with institution or individual for information or activities to use with the kids pre- and/or post visit ✓ Create a KWL chart (what I know, what I want to know, what I learned) chart before the visit, and revisit after the event ✓ Ask parents and caregivers to accompany field trips. ✓ Ask parent and caregivers to share their expertise as guest STEM role models</td>
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| Work with a partner who will conduct a series of sessions for youth or lead a project-based learning initiative at your site or the partner’s facility. | ✓ Set up clear channel of communication with partner  
✓ Work out with partner details of timing and logistics and convey these to relevant staff  
✓ Discuss with partner space and equipment needed and determine that what you have will be adequate  
✓ Make sure line staff understand their role in partner visit: they must stay with the group and manage behavior as well as assist partner where possible  
✓ Where services occur at the partner's facility, make sure transportation and permission slips are arranged in advance  
✓ Make sure group arrives on time (if travelling to partner’s facility) or is ready for program (if partner travels to you)  
✓ Ensure that security expect partner's arrival and know who to contact/where to send partner  
✓ Complete in a timely manner any evaluations required by the partner | ✓ Assign a staff member as liaison to the project (could be line staff facilitating the project)  
✓ Ask partner for pre and post activities to use with the kids  
✓ Ask partner if staff development is included in the project  
✓ Have liaison meet with staff to plan and prepare for pre/post activities and partner visits  
✓ Ask partner to provide details of alignment of activities with standards  
✓ Ask partner to provide evaluation instruments; if they do not have them, use those available on the Internet or design your own  
✓ Have a staff member meet partner upon arrival and assist with set up  
✓ Host a family event about the project and ask partner to present  
✓ Invite parents to participate in sessions  
✓ Share information about sessions with school staff  
✓ Invite school staff to attend sessions  
✓ Discuss with school staff how these activities support STEM learning |
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<td>Have line staff trained by an outside source to facilitate STEM curricula</td>
<td>✓ You have the space, equipment, and funding necessary to implement the curriculum</td>
<td>❖ Be intentional about a strategy for assigning staff to STEM and change as necessary: for example, you might decide to have a “STEM Specialist” for each grade band, or you might prefer to have each group leader lead STEM activities</td>
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<td>or projects.</td>
<td>✓ Assign at least two staff to attend training(s) for each curriculum or project</td>
<td>❖ Have a supervisor attend at least one training for each curriculum</td>
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<td>Examples: TASC, PASE, some STEM cultural organizations</td>
<td>✓ If curriculum training has multiple sessions, have the same staff attend every session OR arrange for staff attending to turnkey to staff facilitating activities</td>
<td>❖ Prefer multiple trainings over the year to a single training. Supplement single trainings with informal meetings to discuss progress and issues</td>
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<td>✓ Allot time for staff to plan and prepare for implementation</td>
<td>❖ Encourage staff who have trained on the same curriculum to plan together and—as much as possible—to cover the same activities as the same time</td>
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<td>✓ Purchase or obtain curriculum and materials</td>
<td>❖ Invite parents to participate in the activities, either by attending the sessions or sending home activity instructions. Host a family event where youth run the activities. Ask parents to help with supplies, expertise, recommendations...</td>
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<td>✓ Conduct a basic evaluation/assessment</td>
<td>❖ Check curriculum for evaluation instruments, or go online to find vetted evaluations. Observe staff facilitation on a regular basis and discuss.</td>
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<td>✓ Inform parents/caregivers about the curriculum</td>
<td>❖ Share information about sessions with school staff</td>
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| Use trainer from your organization to train line staff on STEM curricula or projects | ✓ Site Director, Instructional Coordinator, Organizational Trainer, or other staff are experienced trainers
✓ Trainer understands that the focus in OST STEM learning should be on STEM practices and cross cutting core ideas
✓ Trainer believes that staff without STEM background can successfully implement the curriculum
✓ You have the space, equipment, and funding necessary to implement the curriculum
✓ Assign at least two staff to attend training(s) for each curriculum or project
✓ Allot time for staff to plan and prepare for implementation
✓ Purchase or obtain curriculum and materials
✓ Conduct a basic evaluation/assessment
✓ Inform parents/caregivers about the curriculum | ✓ Trainer should seek opportunities to hone their STEM training skills
✓ Look for ways to excite staff about STEM learning and facilitation. Ask trainer to do a presentation about STEM in after-school
✓ Because training is within the organization, promote ongoing relationships and cultivate a community of practice
✓ Invite parents to participate in the activities, either by attending the sessions or sending home activity instructions. Host a family event where youth run the activities. Ask parents to help with supplies, expertise, recommendations...
✓ Check curriculum for evaluation instruments, or go online to find vetted evaluations. Observe staff facilitation on a regular basis and discuss. Use a rubric to regularize and clarify observations.
✓ Share information about sessions with school staff
✓ Invite school staff to attend sessions or to serve as trainers
✓ Discuss with school staff how these activities support STEM learning |