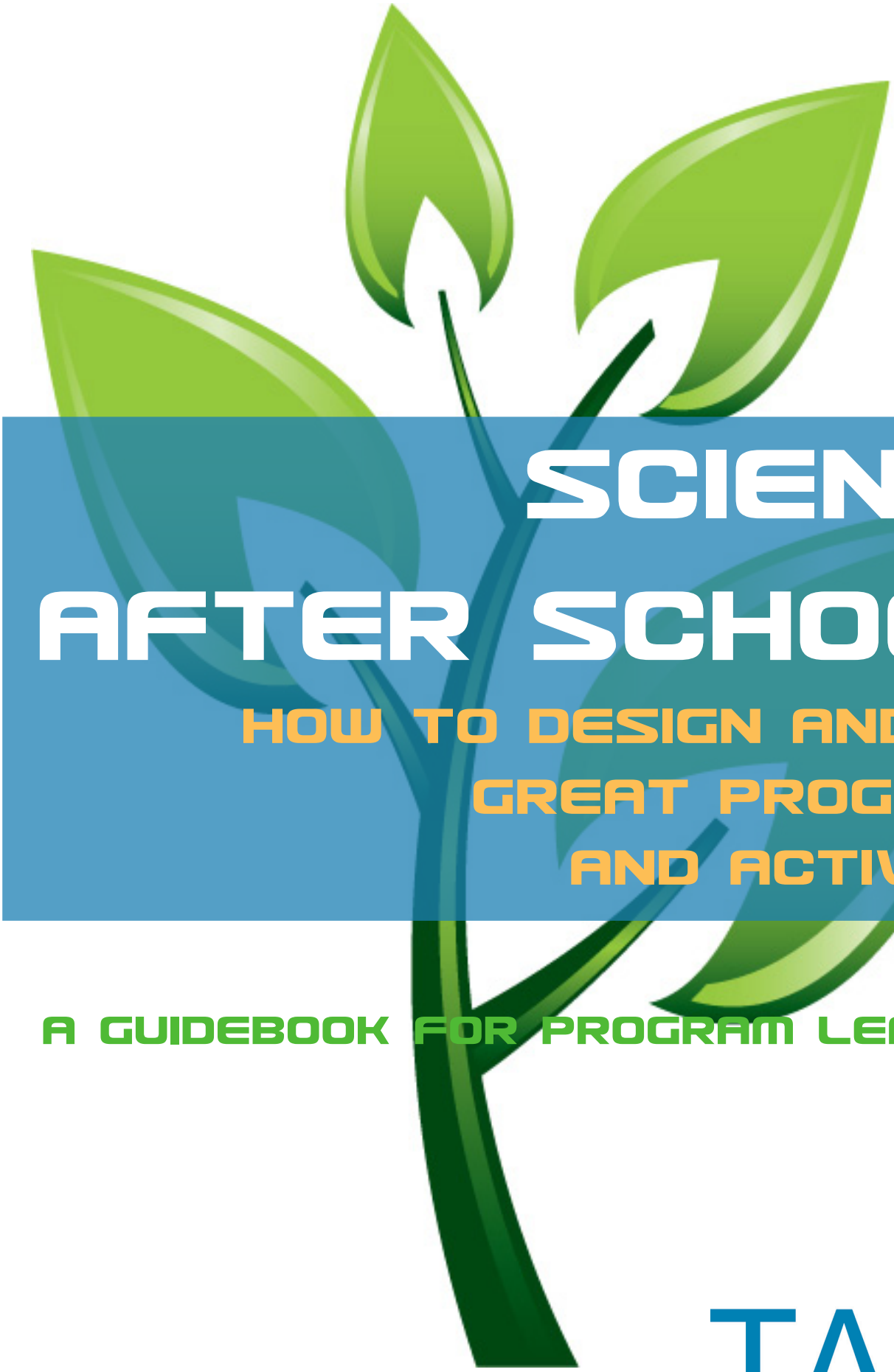

SCIENCE AFTER SCHOOL:

HOW TO DESIGN AND RUN GREAT PROGRAMS AND ACTIVITIES

A GUIDEBOOK FOR PROGRAM LEADERS

TASC
THE AFTER-SCHOOL CORPORATION

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INTRODUCTION

USING THIS GUIDEBOOK

Welcome to this guidebook, brought to you by The After-School Corporation (TASC) and our Frontiers in Urban Science Education Program (FUSE).

FUSE is TASC's initiative to help more after-school, summer and expanded learning time programs 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[1] 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 programs 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 science programs. Contact your local after-school intermediary (that might be a city or state network), science museum, university, or the Coalition for Science After School (CSAS). Links to many of these may be found through the websites of CSAS (http://www.afterschoolscience.org/), the Afterschool Alliance (http://www.afterschoolalliance.org) or Connect a Million Minds (http://www.connectamillionminds.com/).

Turn to the back of this book for more resources.

1 Our use of the word "science" in this document is inclusive of science, technology, engineering and mathematics.

THE CASE FOR SCIENCE 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 kids 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.[1] 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 schools and communities. Recent studies indicate minimal time is devoted to science in school settings.[2]

The good news is that more than 8.4 million children in the United States participate in after-school programs for as much as three to four hours a day. After-school programs provide a unique opportunity 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 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

1 U.S. Department of Labor, Bureau of Labor Statistics. 2000. Occupational Outlook Handbook, 2002-03 edition. Washington, DC: GPO. Table 3

2 McMurrer (2007); Dorph et. al (2007)

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 are interested in including science 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 instructors.[3]

These barriers can be overcome. There are many excellent curricula 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 everyday supplies that you may already have, or can easily purchase at a grocery store.

Finally, the lack of science background among your program staff is actually 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.

3 Coalition for Science After School (2007)

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.

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 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 the Internet. Often this approach does not result in high quality learning opportunities.

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 after-school settings are often designed for maximum flexibility and can be easily tailored to your needs. See the Resources section for websites that offer information about specific curricula.

WHAT ARE THE FEATURES OF HIGH QUALITY CONTENT?

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 science programs by selecting materials that include:

1) Learning that is hands-on & inquiry-based

Kids love to get "hands-on" with activities that include physical and sensory exploration. The ideal curriculum helps kids derive meaning during and through hands-on exploration by mixing in questions, discussions and writing.

The National Science Education Standards as well as many state science standards consider inquiry as fundamental to the STEM learning process. Inquiry is defined as "an approach to learning that involves a process of exploring the natural or material world, and that leads to asking questions, making discoveries, and testing those discoveries in the search for new understanding." Inquiry-based, hands-on STEM learning 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. Program leaders should select content that is suited for single sessions, and that 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*[1] can provide rich, extended opportunities for science exploration.

3) Limited & specific goals

After-school 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 process skills—such as how to test a scientific theory—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[2] 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 kids 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.

5) Activities that fit within instructors' comfort zones

After-school instructors 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 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.

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 to cut up a curriculum designed for 2-3 hour periods. This could result in poor implementation and less than optimal experiences for kids. You can find good options that fit your needs and constraints.

1 See http://www.bie.org/ for more information about project-based learning.
2 Jolly, E., Campbell, P., and Perlman, L. (2004)

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) and by training your own 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?

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 their learning. These might include open-ended questions, having kids explain their work, or sharing journals.

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. But if they did not consider the unique needs of after-school 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 important, you should use materials that excite you and your staff. Everyone should see science as a positive addition to the program 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[1] describe the after-school 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[2] have found that many after-school educators may have negative attitudes towards 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 change those attitudes.

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 science learning begins with play and moves toward disciplined practice, that it's youth-centered and a lot of fun. 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.[3]

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 STEM engagement is connected to youth development. Trainings should expose staff to key resources, introduce some science content, emphasize science processes 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 on the next page (adapted from a report from the Coalition for Science After School[4]) 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.

1 Yohalem & Pittman (2006)
2 Freeman, Dorph, & Chi (2009)
3 Walker, Wahl, & Rivas (2005)

4 Freeman, Dorph, & Chi (2009)

PROGRAM STAFFING AND STAFF DEVELOPMENT STRATEGY

WHICH STRATEGY IS RIGHT FOR YOUR ORGANIZATION?

Strategy	Who uses this strategy?	How does the strategy work?	How to support this strategy?
A. External STEM program provider	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	An outside provider (such as a school-day teacher or a museum) provides STEM activities directly to students.	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.
B. Internal staff development	Programs that do not want to commit significant resources to staff development for STEM or cannot find a partner to help with staff development	Program leaders provide staff development.	National Partnership for After-school Science free online guide, SEDL guides (see Resources section for details)
C. Materials-based staff development	Programs willing to commit to a single set of materials and to the requirements of the materials-provider	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.	Use materials specifically designed for after-school, such as those listed in the Science After School Consumers Guide (see Resources section for details).
D. Partnerships with STEM providers	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	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.	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.
E. STEM educators as coaches	Programs that have a STEM educator available and are willing to use that individual's skills as a coach of multiple other staff members	A STEM educator coaches other program staff members who, in turn, work directly with the youth.	Ensure that coaching is consistent with program goals. Resources listed above for Strategy B will also support coaching.

STRATEGY 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 learning if they see that it is not just a "special event."

STRATEGY 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.

STRATEGY 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 the materials. You can defer costs by providing feedback.

STRATEGY 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.

STRATEGY E
USE SCIENCE EDUCATORS AS COACHES

Many after-school programs have a school-day teacher who provides 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. This should instead be viewed as an opportunity. The teacher should help after-school staff members integrate science processes and thinking skills into all activities.

A NOTE ABOUT SAFETY

- 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 the 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 some 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.
- Instructors should be certain to review safety rules with students for each session.

"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

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 program mission or a significant emphasis. Others offer science as one of many activity choices. Some programs 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 program goals, partners or the interests and needs of your kids. 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 the Great Science for Girls website: http://www.greatscienceforgirls.org/

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?

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 that 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.

Evaluation efforts can be designed to help you learn about: community needs (a.k.a. front end evaluation or needs assessment); how a program 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).

For more information about conducting evaluations, see the resources on page 16.

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 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 on page 20.

SUPPORTING YOUR PROGRAM

FINDING PARTNERS

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—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.

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 a long-term partnership 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.php

- Association of Zoos and Aquariums
http://www.aza.org/FindZooAquarium/

- American Public Gardens Association
http://publicgardens.org/gardens

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.

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

There are other government-funded research organizations around the country that may provide opportunities and resources. NASA has ten Education Centers throughout the country, and offers a range of education resources, including several specifically designed for after-school.[1] Sea Grant is a nationwide network administered by NOAA that supports coastal communities with research and education.[2] 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/.

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 of these employers 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

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

- Science Teacher Associations
http://www.nsta.org/about/collaboration/chapters/default.aspx#chapterlist

- Math Teacher Associations
http://www.nctm.org/about/affiliates/directory.aspx?id=512

- Technology Teacher Associations
http://www.iteaconnect.org/Resources/stateassociations.htm

1 Go to http://education.nasa.gov for resources, and contact your nearest center for potential partnerships or services

2 Go to http://www.seagrant.noaa.gov/ for more information

RESOURCES

This section includes resources known at the time this handbook was published. Please consult the CSAS website on a regular basis for updated resources and links.

GENERAL INFORMATION AND SUPPORT

- **The Coalition for Science After School**

This site contains many resources for after-school programs, among them databases of activities specifically designed and/or field-tested for after-school environments and staff development resources. You'll also find lists of potential funders.
http://afterschoolscience.org/

- **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

- **Great Science for Girls**

Developed by the Educational Equity Center at the Academy for Educational Development with funding from the National Science Foundation, the GSG website provides information about curricula, professional development, family involvement, examples of best practices and a listserv for practitioners.
http://www.greatscienceforgirls.org/

- **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/educate-innovate

INSTRUCTIONAL MATERIALS

- **The Science After School Consumers Guide**

This website contains reviews of hands-on science content for after-school programs. Each resource is reviewed by two experts—one after-school expert and one science expert. Materials include semester and year-long curricula, instructor guides consisting of many related activities and Web sites that offer content appropriate for after-school programs. Users can sort entries by title, subject, grade level, target audience and cost.
http://www.sedl.org/afterschool/guide/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

STAFF DEVELOPMENT

- **Guide to Professional Development of Out-of-School Science Activity Leaders**

This guide was developed by the National Partnerships for AfterSchool Science (NPASS). It includes a series of activities that will help you lead staff development on scientific inquiry methods.
http://cse.edc.org/products/npassprofdevguide/

- **National 4-H**

Provides professional development tools and opportunities for staff and volunteers.
http://4-h.org/resources/staff.html

- **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/cpl/afterschool.html

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. The CSAS website (www.afterschoolscience.org) also provides a contact list of evaluators who specialize in after-school programs.

- **Assessment Tools in Informal Science**

Database of tools to measure performance of informal and out-of-school STEM programs.
http://www.pearweb.org/atis/

- **Informal Science**

Website to share informal science project impacts and evaluation findings.
http://informalscience.org

- **National Girls Collaborative Project**

Links to evaluation resources and tools to advance gender equity in STEM.
http://www.psctlt.org/ngcp/resources/eval_assessment.cfm

FOR FAMILIES

- **Family Science and Family Math**

These are resources specifically 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 set up these activities on a family night at your program.
Family Math: http://www.lawrencehallofscience.org/equals/
Family Science: http://familyscience.org

- **The National After School Science Directory**

This site houses thousands of STEM opportunities, submitted by science centers, museums, schools and other youth-serving organizations.
http://afterschoolscience.org/directory/

- **Discover Your Summer Guide**

Help families find science-related summer programs using this guide from Project Exploration.
http://www.projectexploration.org/dys.htm

FOR COMMUNITY LEADERS

- **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/

INQUIRY-BASED LEARNING

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

http://www.sedl.org/afterschool/toolkits/science/pr_investigating.html
http://www.sedl.org/afterschool/toolkits/science/pr_exploring.html, and/or
http://www.sedl.org/afterschool/guide/science/

- For short videos that demonstrate how engaging inquiry-based STEM learning can be, go to:

http://www.tascorp.org/section/resources/articles/science_2010

- You can also learn more from the Exploratorium's Institute for Inquiry:

http://www.exploratorium.edu/ifi/resources/

SCIENTIFIC SUPPLIES

There are many scientific suppliers, and their catalogs have lots of interesting materials. Remember, however, that much wonderful science can be done without special supplies. The largest science education suppliers include:

- Carolina Biological Supply: http://www.carolina.com/
- Delta Education: http://delta-education.com/
- Edmunds Scientific: http://scientificsonline.com/
- Acorn Naturalists: http://www.acornnaturalists.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 (SUCH AS 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 under-represented 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.

TO A PARENT

This letter could be sent to the parents and guardians of your students. Whenever possible, you should follow up with notes about each activity that you do. You may want to make changes depending on the purpose of the letter.

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.

TO A POTENTIAL PARTNERS

This letter could be sent to local science centers, businesses, universities, etc.

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.

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ABOUT TASC

The After-School Corporation created Frontiers in Urban Science Exploration (FUSE) to stimulate a culture shift that leads to greater opportunities for kids to experience informal science education after school, as well as in school and during summers. The TASC science team developed FUSE over three years and shared materials and findings to assist in the preparation of this resource guide.

TASC is a nonprofit organization dedicated to giving all kids opportunities to grow through after-school and summer programs that support, educate and inspire them.

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