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A Guide to Developing Science, Technology, Engineering, and Math in Expanded Learning Programs



*A Project of the California AfterSchool Network
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CONTENTS

3 INTRODUCTION

4 CHAPTER 1: Approach STEM Learning With Vision, Purpose and Intention.

Integrating science, technology, engineering and math and the strategies associated with these disciplines into your work will go a long way towards providing new opportunities for students to unleash their creativity, experience the thrill of discovery and become self-directed learners. This chapter explains what STEM learning is really all about and why it matters.

16 PRACTICE 2: Integrate Youth Development, Common Core and STEM Learning Strategies.

Whether students succeed or fail academically isn't just about the knowledge they acquire. It also depends on their social and emotional development, their enthusiasm for learning and their ability to communicate, collaborate, think critically and solve problems effectively. Integrating youth development, Common Core and STEM learning approaches into your program can make this happen. This chapter focuses on how to do this.

26 PRACTICE 3: Make Learning More Exciting, Engaging and Meaningful.

Programs that adopt STEM learning strategies consistently find that learning is exciting, engaging and meaningful when it's student-centered, active and collaborative – and that this happens through Project-based Learning. This chapter offers several proven ways to do this for students at all grade levels.

34 PRACTICE 4: Connect Project-Based Learning With Real-World Experiences.

High quality programs provide ways for students to identify and solve problems in their communities and apply what they learn in real-life settings. They tap into the resources and expertise of public agencies, nonprofit organizations, science centers, corporations and the education community. And, they build cross-sector collaborations that support student interest in STEM fields as pathways to college and future careers. This chapter explains how to do this.

44 PRACTICE 5: Secure Adequate, Sustainable Funding.

Quality counts, and quality costs. While there are many creative ways to embed STEM into your program and provide content-rich resources and experiences, for your program to achieve its potential you may have to secure additional funding to support your efforts. This chapter offers several ways to achieve your financial goals.



Introduction

This Guide is designed to help you, your staff and your program move to the next level by embedding STEM learning approaches and content-rich projects into your work. It's based on lessons learned by working with hundreds of Expanded Learning Programs throughout California at all stages of their development. It draws of the experience and expertise of the Afterschool Network's Power of Discovery: STEM² Initiative. It's informed by the work of multi-site programs that came together in a Professional Learning Community to develop exemplary practices. And, it draws on the most current research and field experience available.

You'll discover the power of Project-based Learning, and how to make it active, student-driven and engaging to students at all ages. You'll find out how students can be more excited and motivated and how learning can become more meaningful and real. You'll have the tools you'll need to integrate Youth Development, Common Core and STEM approaches in ways that are strategic, collaborative and intentional. You'll have a greater appreciation for the importance of giving children and young people opportunities to identify and solve problems in their

communities and beyond, and how you can do this at little or no additional cost. And, you'll be able to accelerate the process through which your program makes an even greater difference in the lives of students and their families and your community – and generate new and sustainable revenue to support your efforts over time.

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We wish you the best as you move into the next frontier!

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PRACTICE #1 Approach STEM Learning With Vision, Purpose And Intention

The purpose and potential of afterschool programs has changed dramatically over the past several years. No longer focused primarily on keeping students safe during the hours they're most at risk, they're helping them improve their academic performance, develop their social skills and acquire new knowledge. They're building authentic partnerships with families, schools and communities. And, increasingly, they're providing children and young people with new ways to master the skills they'll need to be successful in the 21st Century.

Integrating science, technology, engineering and math and the strategies associated with these disciplines into your work will go a long way towards making your program the place where this and much more happens. And, it will provide new opportunities for students to unleash their creativity, experience the thrill of discovery and become self-directed learners. This is what STEM learning is really all about and why it matters.

**Bringing a vision into
reality takes time and
embedding STEM into
your program doesn't
happen overnight
or by accident.
But when it happens,
it's life-changing!**

Create a Powerful Vision Of What Could Be

Creating a powerful vision is the first step. Unlike most vision statements, visions that really make a difference are clearly understood and easily remembered. They tell us where we want to go and why. They paint a picture of what could be, give us a deeper sense of purpose in our work and make it possible for us to create the future. Begin the process with your staff by asking questions like these:

- What would the future look like for your students if they could easily tap into their innate curiosity and discover new ways of doing things?
- What if they became first-rate problem solvers?
- What if they didn't have all the answers, but knew how to ask the right questions?
- What if they really valued collaboration and became leaders of high-performing teams?
- What if they were able to successfully navigate through our fast-paced, diverse and rapidly changing world?
- What if they believed they could accomplish anything they set out to do and had the skills to do it?

Imagine how you would feel if this became the new reality and you and your staff had played a major role in bringing it about. Going through this process will shift your attention away from the activities you're offering to the impact you're capable of having. It will channel your efforts in a new direction. And, it will inspire you to think differently about how you approach your work.

Take Advantage of What We Already Know

Bringing a vision into reality takes time and embedding STEM into your program doesn't happen overnight or by accident. You can accelerate the process by drawing on a growing body of knowledge about what STEM learning looks like in high quality Expanded Learning Programs.

It's active. It gives students hands-on, experiential ways to engage in scientific inquiry, engineering design, applied mathematics and the use of technology. It helps them develop and master their communication, critical thinking, problem-solving and collaboration skills. It allows them to take advantage of their natural creativity. And, it strengthens their ability to make thoughtful, informed decisions.

For example, students in an engineering class design model roller coasters and go through a trial and error process on their way to finding out what works and what doesn't. Every ten minutes or so, they're asked to stop and reflect on what they've learned and consider ways that they can improve on their ideas.

It's student-centered. It provides a vehicle through which students take on greater responsibility for their learning, value and appreciate intellectual inquiry and generate knowledge on their own. Staff become guides-by-their-side, providing ongoing opportunities for students to lead and drive the learning process. It shifts the emphasis in programs from teaching and instruction to inquiry and investigation.

It's collaborative. It offers ways for students to work together to solve challenging, authentic and increasingly complex problems. It creates a space for them to share their knowledge. It helps them learn to communicate respectfully, clearly and persuasively; to honor different points of view; and to value teamwork. And, it gives them an opportunity to see for themselves that they possess skills or talents that are vital to everyone's success.

Upper elementary school students design and construct usable furniture out of newspaper – a project that helps them understand the benefits of recycling and the relevance of engineering in a practical, exciting way. Each team member contributes his or her personal insights as they explore and adapt different techniques.

It's integrated and interdisciplinary. STEM learning links concepts in science, technology, engineering and math with other academic areas in ways that are real, relevant and meaningful to students. It provides ways for them to integrate their knowledge and transfer what they learn from one area to another.

Fourth graders combine each of the STEM disciplines with economics by creating a budget and purchasing items with play money to develop new products in their engineering class. Friendly competition between groups encourages them to work together to maximize the use of their funds and be strategic about their designs.



Students plan strategies, identify issues, find solutions to problems and carry their projects through to completion. They engage in a continuous process of asking questions and seeking answers on their own and with their peers. They learn the value of creativity and perseverance and the importance of sharing ideas to achieve common goals.

It's process-driven and outcome-based. It strengthens students' sense of personal efficacy and builds their self-confidence as they acquire and master new skills that are critical both in and out of school. It leads to a measurable increase in their engagement, interest, knowledge and appreciation for STEM concepts and processes and their ability to apply these in real-life settings. And, it allows them to develop a deeper and richer understanding of the content or skill being highlighted in the activities they're engaged in.



First and second grade students design a city with Lego Mindstorms, a packaged program that's widely used in Expanded Learning Programs. The eight-week project strengthens their ability to collaborate with each other, solve problems together, test a variety of engineering and lay-out possibilities and build a model city.

It's grounded in the present and focused on the future.

It increases students' excitement about learning. It helps prepare them to be successful in school, work and life. It offers them a variety of on- and off-site learning experiences that help them develop a greater understanding of the world around them and their role in it. It expands their horizons by directly connecting STEM-learning activities to potential college studies or career paths. And, it provides opportunities for them to see their future in ways they may have not yet imagined or thought possible.

An increasing number of middle and high school students have access to high tech equipment, including 3-D printers, that make it possible for them to apply what they're learning in real-world ways, including designing and selling actual products and sharing their ideas with and learning from experts in STEM fields.

Think Differently!

STEM isn't just for older students, it's for everyone. Introducing these disciplines to students at an early age is more important than you might think. By the time they're in fifth grade, 92% of boys and 97% of girls who don't already have an interest in science, technology, engineering or math probably never will. Many have already decided what they like and what they don't, and what they're good at and what they're not.

You and your staff can influence their decisions by helping them understand that STEM concepts and processes aren't always obvious, but they're everywhere. Capitalize on the opportunities your program has to expand and deepen students' knowledge and help them see the world in a more inter-connected way. This doesn't necessarily require adding new program components in specific STEM content areas, although this should happen. It's also about viewing what your program already offers from a different perspective.

STEP 1: Look at your current enrichment components through a STEM lens. It's almost impossible to imagine an activity or occupation that doesn't depend on some knowledge in one or more of the STEM disciplines. Math, science, technology and engineering aren't just academic subjects, they're building blocks and pathways to learning across disciplines.

Music and art wouldn't be possible without engineering and technology. Learning to read requires decoding. Cooking isn't simply about preparing food, it wouldn't happen without math and science. Excelling at sports requires being in good physical



condition (physiology), which depends on developing healthy eating habits (nutrition science) and becoming physically fit (kinesiology) – and it takes a lot of problem solving, decision making, communication and teamwork to make the right plays at the right times in the right ways.

STEP 2: Provide ways for students to go beyond doing to creating. Don't underestimate what youngsters already know or what they're interested in. Many are already very good at playing video games, using smart phones and tablets, surfing the internet and communicating on Instagram, Snap Chat or other popular social media sites. And, despite what we might think about kids having short attention spans, we know that they're quite capable of being fully engaged in these activities for hours at a time.

As outstanding programs have learned, it makes sense to provide ways for students to build on what they already like and go from doing to creating. Upper elementary, middle and high school students are quite capable of working together to develop a video game or a website or a music production when they're motivated to create products that are interesting and useful to them and to their peers.

Use a Project-Based Learning Approach

The way you design your program will have huge influence on how quickly and effectively you can integrate STEM learning strategies. There's overwhelming evidence that one-off or intermittently offered STEM activities have little if any relationship to increasing students' interest or knowledge, building their skills or raising their confidence levels. While these activities may be exciting to students in the moment, they don't seem to matter much in the long-run.

Largely because of this, it's not surprising that Project-based Learning is the approach most commonly used in high-quality programs. Done well, it supports the principles and practices of STEM learning: It's student-centered and active, collaborative and inquiry-based, purposeful and intentional and integrated and meaningful. In short, the process allows students to work together to discover ways of doing new things by experimenting, asking questions, finding answers and creating knowledge on their own.

Students work together in Project WET to experiment with different soil compositions and land formations and learn what happens under a variety of conditions. Their hands-on, practical experiences make learning fun, exciting and engaging – and inspire them to think more about the variety of potential opportunities in STEM fields.

STEP 1: Create a schedule that works for you – and for your students.

Typically, Project-based Learning takes place over a six to eight week period, and sometimes longer depending on the grade level, with students participating for 45 minutes to an hour a day for four or five days a week. In a 35-week school year, this enables them to take part in four or five different projects, some of which are STEM-content rich and others that include STEM learning strategies but don't directly focus on science, technology, engineering or math content.

Other programs schedule Project-based Learning components two hours a day twice a week over a seven to eight week period. This offers students more time each day, with approximately the same number of hours over the total project time. This can be very effective for older students in upper elementary grades and middle and high school. And, it works very well for programs that contract with outside agencies to provide support one day a week, with the second day used to expand and deepen students' work.

Both schedules allow students to develop new interests and master new skills, acquire new knowledge and become more confident about what they can accomplish. It provides enough structure to move the learning process along and carry their projects through to completion and enough flexibility to allow students to work at their own pace.



Third grade students work with each other to edit final drafts of the professionally illustrated books they've written. By the end of the project, they become published authors and receive copies of their hard bound books, with their stories also available on the WRiTE BRAiN Books' national website.

STEP 2: Keep it simple! If you're just starting to develop Project-based Learning, make it easy for your staff. A common first-year strategy is to implement a basic version with a STEM-learning emphasis. You can do this by using packaged programs. Almost all of the high quality products on the market can be customized or combined to fit the timeframe you select. Although some of these are expensive, many are affordable. And, several can be purchased at minimal or no cost. Clever Crazes is a good example of a computer-based project that's available free of charge and can be facilitated by almost any staff member.

Students learn about the human body and relationships between nutrition, physical activity and their health in one of many Clever Crazes projects. Every month or so students earn gift cards and some receive Nike sports shoes as they reach higher levels of success. Sites also receive cash rewards, often amounting to hundreds of dollars or more. All of this is provided at no cost to programs.

It's also important to keep in mind that STEM learning strategies can and should be integrated into Project-based Learning content areas that don't directly focus on science, technology, engineering or math. For example, Write Brain Books provides an eight-week project which builds a variety of STEM learning skills including communication, collaboration, problem solving and critical thinking.

Using programs like these will help your staff move from offering independent activities to facilitating a longer learning process. It will make it easier for them to shift from daily lesson plans to a more fluid, student-centered approach. And, it will provide them with the content, resources and materials that they and their students will need. Once your staff becomes familiar with how this works, they'll be able to develop more projects on their own.

Be Intentional About Staffing

As you begin to focus more on integrating STEM into your program, it will be more important than ever to develop a competent, confident, enthusiastic staff. As many programs have already learned, there are several ways to do this successfully.

STEP 1: Take advantage of your staff's interests and passions. With the exception of content areas that require more specialized knowledge, most of your staff, and especially those working with elementary students, will do well if they have an interest in a particular area. For example, a staff member who likes gardening can develop a project that gives students hands-on experience in laying out garden plots, deciding what fruits and vegetables to grow in which seasons, determining how often they'll have to water, learning how to compost and learning about the nutrients in plants.

Similarly, a staff member who enjoys cooking can design a project where students learn the basics of good nutrition, discover how to prepare healthy meals and snacks, experiment with recipes and plan a culminating event that showcases what they've learned.

An amateur photographer on your staff might want to develop a project that enables students to become knowledgeable about cameras and photography and combine this with writing, editing and web-site development.

Sixth grade students use an expanded version of Outside the Lens to become more proficient at math, science and art through photography. Many of their works are displayed in school district offices and other public buildings.

STEP 2: Think about hiring or contracting with staff who have STEM content knowledge. Many programs actively recruit individuals who have a background in STEM content areas. These often include college students majoring in these disciplines, retirees who have worked in these areas or classroom instructors or teachers on special assignment.

Other programs contract with local organizations that offer unique Project-based Learning content and opportunities for students. Many of these, including University of California Cooperative Extension/4-H, local science centers and Mad Science have a long history of working exceptionally well with expanded learning programs.

STEP 3: Consider different staffing arrangements.

There are several ways to assign staff in their work with students, all of which have some merit. At the elementary



Students in cooking classes learn about the importance of developing healthy eating habits and shopping on a budget by exploring different aspects of nutrition, reading labels, planning and preparing snacks and visiting local supermarkets. In the process, they improve their math, science and language arts skills.

school level, staff members frequently stay with the same students at the same grade level for the entire afternoon over the course of the year. The advantage is that staff and students have greater opportunities to develop relationships, and this is a good thing in most cases. On the downside, it means that they will have to become skilled in a variety of Project-based Learning areas. This may be challenging, especially in projects with STEM-rich content.

An increasingly popular design is for staff members to work with different groups of students in one project area all year. For example, he or she might facilitate a project featuring robotics four times a year with different students in each session. The benefit is that staff members become experts in facilitating particular projects. Because of this, this format is typically used in middle and high school programs as well. Whatever you decide, be sure that you and your staff have considered several options in advance.

Combine Training, Coaching and Mentoring

Supporting your staff through the transition from offering independent activities to developing comprehensive Project-based STEM learning approaches matters in a big way. Even though you may be excited about moving to the next level, change is hard for most people. You can overcome this by make training, coaching and mentoring equally valuable centerpieces of professional development.

Remember that for your staff to be successful, they'll have to be very clear about three things: 1) What they should do, 2) how they should go about doing it, and 3) why it's important. While this might seem obvious, it's all too common for programs to focus on the first of these and overlook the other two. Don't let this happen. Keep in mind that your staff may know that their approaches should be student-centered and collaborative, but not understand how to make this happen or why it's so important. This wouldn't be surprising. It's also true for many experienced certificated teachers.

In high quality Expanded Learning Programs, staff development is given top priority. Beyond training, it includes coaching and mentoring. It provides staff with solid examples of approaches that work, and models these for them in their own classroom environments.

If your staff is doing well, let them know. If they're struggling, help them out. Some will be thrilled with the changes, but not everyone will adapt right away and not everyone will be successful from the outset. In most programs, it takes at least a few months, or sometimes even longer, for this to happen. But, it will.

Specific
Measurable
Achievable
Realistic
Timely

Set Meaningful Goals

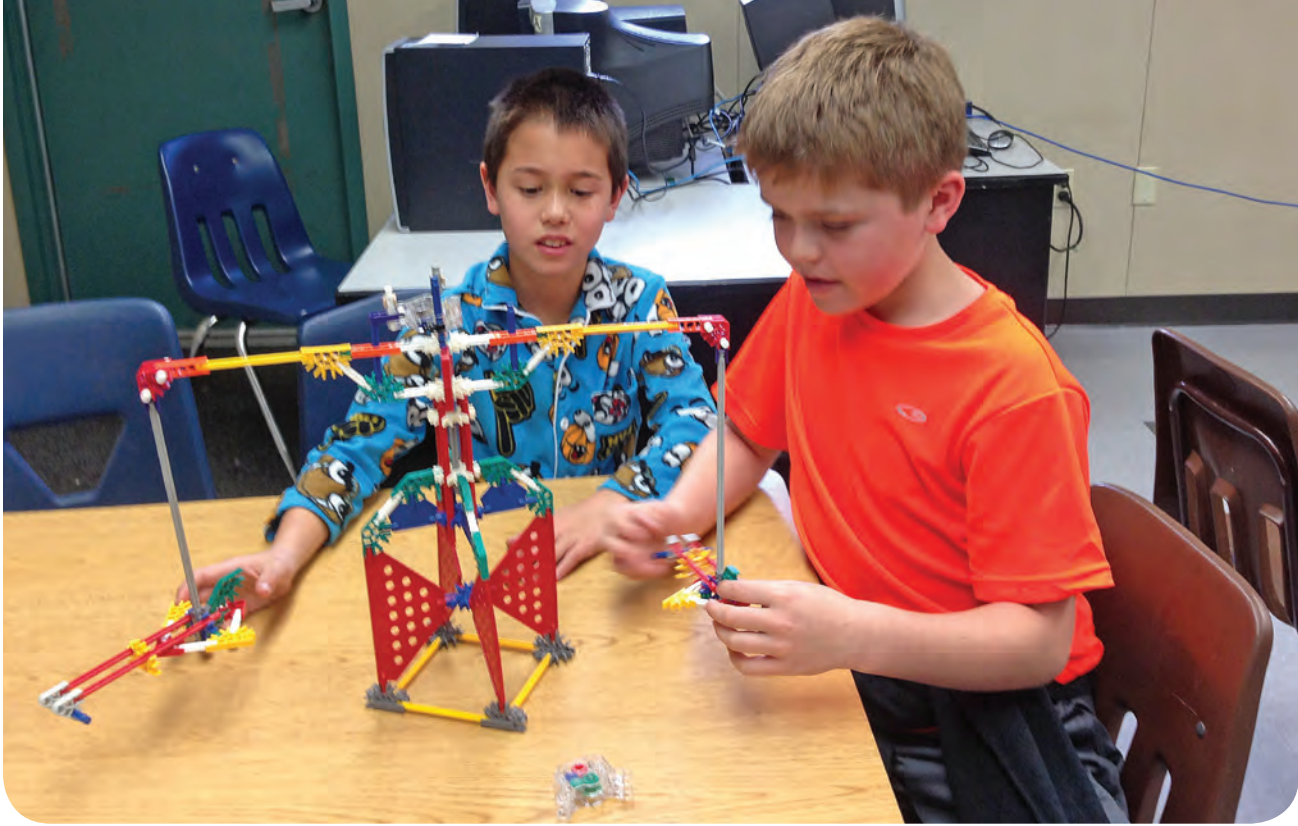
No matter where your program is at this stage of its development, what really matters is where you're going, how you plan to get there and what difference it will make when you arrive. This is what goal-setting is really about and why it's so critical. Keep these things in mind as you go through the goal-setting process:

STEP 1: You'll get what you expect – so think big! Set big goals and you'll set yourself, your staff and your program up for powerful results. Set small goals and it won't make much difference if you achieve them. If your goal is to change the structure of your program to a Project-based Learning format, do it everywhere, not just in STEM-specific content components.

STEP 2: Limit the number of goals you set. Having one or two big goals makes sense. Having more is counter-productive and crazing-making – and it dramatically reduces the likelihood that you'll achieve any of them. Take time to decide what goal or goals are likely to produce the best results when achieved and which should be eliminated.

STEP 3: Set yourself and your staff up for success. Do your best to ensure that your goals are realistic, concrete and meaningful, specific and measurable and can be accomplished with the resources you have within a given time period. Overlooking any of these can result in serious, but preventable, problems.

STEP 4: Don't try to go it alone. Remember that you can come up with goals on your own, but you can't achieve them on your own. People buy into what they help create. Engaging your staff in the goal-setting process will pay enormous dividends. Failing to do this can result in a lot of disappointment and frustration.



Although it's not uncommon for it to take up to a year to achieve the level of success you aspire to when you begin to use Project-Based Learning approaches, integrate STEM learning strategies, set goals and create and implement action plans, it's important to remember that you're laying the groundwork for results that are likely to exceed your expectations over time.

Create Action Plans

Once you've decided on one or two goals, you'll need to create action plans to achieve them. In addition to determining which staff members will be responsible for which projects, or what outside contractors or organizations will need to be included, it's important to develop establish a timeline, create Facilitator's Guides and order supplies and equipment well in advance.

STEP 1: Develop Facilitator's Guides. Work with your staff to develop appropriate learning objectives and timelines for the projects they'll be offering. Call them Facilitator's Guides, not lesson plans. Begin with the end in mind (a culminating event or project) and work backwards. Design the process in a way that lays out what should be accomplished sequentially, with attention given to what should take place by the end of each week over a six or eight week period. Limit the daily details to providing guidance. In almost all cases, the format will already be available in packaged programs.

STEP 2: Be sure to order materials early. If your staff develops projects on their own, it will require identifying the materials that will be needed so they can be purchased and delivered in advance. If projects include specialized equipment or materials, such as the camera-equipped drones that are increasingly used in middle and high school settings as part of community mapping projects, be sure that your staff has the opportunity to become familiar with how they should be assembled and how they work prior to the beginning of the project.

STEP 3: Don't be afraid to make adjustments. Even the best laid plans can encounter obstacles along the way. Just as you'll want students to experiment with what works and what doesn't, you should want this for your staff as well. Give them the freedom to do this and they'll become more engaged, enthusiastic and excited – and so will their students.

Measure, Manage And Assess Your Progress

Whether you're just starting out or you've already reached a high level of success in integrating Project-based Learning and STEM learning strategies into your program, the best way to ensure that you stay on target is to create a system that enables you to measure and manage your progress.

You and your staff may believe that what's taking place in your program is making a difference in students' lives, but it's not enough. At some point, you'll need solid evidence. If you're already working with an independent evaluator or conducting internal assessments on your own, great! If not, consider putting a process in place as soon as possible.

STEP 1: Assess what's happening in real time and over time. Progress indicators are commonly used to help programs establish baselines and measure and manage changes in program and student development (samples are provided at the end of each chapter). These are often also used as a framework for conducting formative evaluations to support continuous quality improvement. Others use summative evaluations to determine what has happened from one point in time to another, generally from the beginning to the end of the academic year. Combining these tools works best, but it's important to have at least one of them in place from the beginning.

STEP 2: Be sure that the data you're looking for is meaningful, not just collectable. Be intentional about the kind of data you gather and the way you use it to inform the decisions you make as you move ahead. This means aligning what you collect with your vision and goals to ensure that your action plans are having the impact you and your staff would like to see happen.

It's not enough to know that you've put Project-based Learning in place. You'll need to know whether doing this is really making a difference in how excited and engaged students are, how much they're learning and how well they are working together – and how successful your staff is at becoming facilitators of learning and guides-by-the-side.

Similarly, knowing how many students participated in STEM-related activities might be interesting, but it doesn't matter as much as what's changed for them, how much change occurred and what difference it made. What you really want to know is:

- Are students really excited, engaged and learning more?
- Are they becoming more interested in STEM?
- Are they developing and mastering new skills and acquiring more knowledge?
- Are they becoming more confident in their abilities?

Putting a system in place to allow you to have this information sets the stage for long-term success. It's an integral part of becoming more intentional in everything you do to integrate STEM learning into the programming you offer. And, it will make a huge difference in the outcomes for the students you work with every day!

PRACTICE #1: SAMPLE PROGRESS INDICATORS

Approach STEM Learning Vision, Purpose and Intention

The purpose of this tool is to help you establish a baseline, create action plans and track your progress in becoming exemplary in this Practice area. Reviewing these indicators with your staff and partners every month or so will enable you to move more quickly toward achieving your goals. Key:

1. We haven't addressed this yet, or are just beginning to work in this area
2. We've done some work in this area, but have a long way to go
3. We've made significant progress and are doing reasonably well
4. We've achieved a high level of success in this area
5. We are clearly outstanding in this area and everyone would agree

INDICATORS		1	2	3	4	5
VISION AND GOALS						
1	We have a powerful vision of the impact STEM learning can have on our students now and in the future					
2	Our vision is clear and easily understood					
3	Our vision is embraced by our staff, school and partners					
4	We engage our staff and partners in the goal setting process					
5	Our goals are concrete, meaningful and achievable					
STAFF DEVELOPMENT						
6	We provide ongoing STEM-learning training to our staff					
7	We provide ongoing coaching and mentoring to our staff					
8	Our staff understands how to integrate STEM into their work					
9	Our staff has access to the resources, materials and supplies they need to be successful in their work with students					
PROGRAMMING						
10	We provide students with a variety of opportunities to increase their knowledge in STEM-related areas					
11	We use a Project-based Learning approach in our program					
12	We provide students with ongoing opportunities to develop and strengthen the skills they will need in the 21 st Century					
13	The programming we offer is exciting, engaging and meaningful to students					
14	The programming we offer increases students' interest in and enthusiasm for STEM-related fields					
MEASURING AND MANAGING PROGRESS						
15	We collect and analyze data that enables us to track our progress					
16	We use the data we gather to inform our decisions and create our action plans					
17	We have a system in place that enables us to evaluate student outcomes					
18	We use our assessment tools to continually improve the quality of our program					

Integrating science,
technology, engineering
and math and the strategies
associated with these
disciplines into your work
will go a long way towards
making your program
the place where students
are excited, engaged and
motivated to learn!

PRACTICE #2 Integrate Youth Development, Common Core and STEM Learning Strategies

In the last few years we've begun to redefine education, re-examine how students learn and reconsider what it means to be well-educated. We know that whether students succeed or fail academically isn't just about the knowledge they gain. It also depends on their socio-emotional development and the habits they acquire. Those who do well in school, and in life, share several things in common:

- They're open to learning new things and respond to the world around them with wonder and excitement
- They're creative, imaginative and innovative
- They communicate clearly and precisely, listen to others with understanding and empathy and honor different points of view
- They work well with adults and their peers
- They're thoughtful, caring, compassionate and ethical
- They take time for reflection and apply past knowledge to new situations
- They're self-managed and socially responsible
- They're persistent and carry things through to completion

Acquiring these habits is a tall order for students – and it offers a great opportunity for you and your staff to make an even greater difference in their lives. In combination, positive youth development practices and Common Core standards provide a solid foundation upon which this can happen. Supporting these with STEM learning strategies will make a real difference in strengthening the quality of your program and the improving the outcomes for children and young people.



Make Youth Development Your First Priority

Students benefit most from Expanded Learning Programs when positive youth development principles and practices are deeply embedded into everything that takes place during program hours. It begins with ensuring that they feel physically and emotionally secure and have a strong sense of belonging and ownership over what happens.

It happens when relationships are supportive, positive and meaningful and students have ongoing opportunities to discover their own interests, talents and strengths; develop and master new skills; and build their self-esteem, self-confidence and self-efficacy. And, it's reinforced when they're in an environment that recognizes and honors fairness and integrity and personal and social responsibility.

STEP 1: Create and maintain a physically and emotionally safe environment. Most programs are clear about the importance of physical safety and make it their top priority, as they should. Fewer, however, give enough thought to the



emotional security. Part of the reason for this is that it's easier to prevent accidents and address physical confrontations than to deal with attitudes and behaviors that are less obvious but can be just as damaging. Both physical and emotional security are critical. Each deserves your attention.

STEP 2: Be sure to eliminate possible biases. Unfortunately, gender biases persist in STEM fields more than in most other areas. For example, although it's typically manifested in insidious and unintentional ways, boys are still commonly thought to be better at science, technology, engineering and math than girls. This can have a negative impact on how excited girls are about participating in STEM activities and whether they pursue these fields later on. Don't let this happen!

STEP 3: Encourage students of color to pursue an interest in STEM.

Although children of color frequently report that they like STEM activities, only a very small percentage say they're interested in becoming a scientist, engineer or mathematician or pursuing a career in technology. Not surprisingly, in 2014 fewer than 5% of racial and ethnic minority undergraduates received degrees in physical science and just 20% graduated with majors in life sciences.

Despite the fact that there are more jobs available now than ever, only a small fraction of students graduating with college degrees in STEM academic disciplines are Latino or African-American. Your program can change this by exposing them to new things and inspiring them to explore the opportunities available in these fields.

Many programs take advantage of the Engineering Adventures/Engineering Everywhere curricula. By directly tying units to different engineering fields, it opens up a world of possibilities for students who may have a limited vision of what STEM offers in terms of future careers.

Early experiences can discourage girls from pursuing their interest in STEM. This helps explain why only 12% of Silicon Valley positions are currently held by women. Be careful that the language your staff uses, the leadership opportunities they provide and the recognition they give are distributed equitably and fairly.



Highly successful programs have learned that when students work together on projects, they're engaged and excited, they cooperate with each other and they become self-managed. Discipline problems significantly decline or disappear. And staff rarely have to remind students to be more respectful or well-behaved.

STEP 4: Make personal and social responsibility a priority.

Like most schools, Expanded Learning Programs typically use classroom management techniques that focus on establishing rules and enforcing consequences for negative behavior. Although most use positive language (be respectful, be responsible and the like), many still do not. The problem is that negative phrases have serious limitations. There's a simple explanation. It's impossible to force anyone, whether a child, adolescent or adult, to act in a personally or socially responsible way. What does work is creating an environment and establishing relationships that encourage positive attitudes and behaviors and help students make good decisions on their own.

STEP 5: Create and maintain supportive relationships.

Supportive relationships are characterized by mutual trust and respect. They depend on students having positive role models and experiences that demonstrate fairness, integrity and ethical behavior. Integrating STEM learning strategies will accelerate this process – if your staff embraces these values. If they don't, they shouldn't be in your program.

Staff members in outstanding programs are clear about the impact they have on children and young people's lives. They're patient, caring and compassionate. They set a positive example. They recognize that their success depends on the success of the students they work with. And, they know that what they do and say can make all the difference in how students respond.

STEP 6: Help students develop and master new

skills. What often separates high quality programs from those that haven't yet achieved their potential is the extent to which they understand the importance of linking activities to outcomes. It's easy to get bogged down in what's happening every day and miss the larger issue of the impact it's having.

The most successful programs avoid this problem by establishing a set of desired outcomes before projects begin. It starts with asking a question: What skills, competencies and attitudes about learning do you want students to have developed by the time they complete the project they're engaged in?

The most valuable outcomes include and go beyond content knowledge to focusing on the extent to which students become more proficient in thinking critically, working collaboratively and solving problems creatively. Identifying the outcomes you and your staff believe are most important will help everyone become more intentional in how they approach their work, and how successful children and young people will be.

Think Common Core – and More!

The transition to Common Core during the school day is likely to mark the end of an era teacher-directed learning, memorization and testing, and the ushering in of approaches that are more student-centered, inquiry-based and integrated. This change can make a real difference in whether children and young people will thrive in an increasingly complex, competitive and global marketplace.

As you integrate STEM into your program, it makes a lot of sense to embrace Common Core as a philosophy, a learning strategy and a pathway to college and career readiness. In simple terms, this is about focusing on ends rather than means – on what students should know and be able to do at certain grade levels in a sequential manner and on what processes contribute best to this taking place.

Common Core gives teachers, and your staff, a lot of freedom to make learning more engaging, hands-on and appropriately challenging. It places a premium on helping students learn how to integrate and transfer knowledge from one area to another. And, it provides an unprecedented opportunity for you to build stronger, more authentic and mutually beneficial partnerships with schools by supporting their efforts to strengthen students' communication, critical thinking, collaboration and problem solving skills.

STEP 1: Provide ways for students to strengthen their communication skills. Becoming an effective communicator begins with learning to speak clearly, precisely and persuasively. For younger students, this means expanding their vocabularies so they have more words available to express their thoughts and feelings. Older students need to do this as well, and to learn to appreciate the nuances of language.

STEP 2: Integrate reading into Project-based Learning. Students need to be able to read not just for comprehension but for meaning within and across disciplines. They'll be better equipped to do this if what they read is connected with the projects they're doing. Include nonfiction and fiction, but don't overlook the value of science fiction. A visit to Mars by a team of astronauts may take place during your students' lifetimes and one of them might just be inspired to be among them. Don't forget that most of the technology we now take for granted wasn't in anyone's wildest dreams a generation ago.

Having autobiographies available also can go a long way towards inspiring students to seek out new knowledge. Doing this can potentially be life-changing. And your program can lead the way in making this happen.

Students in projects about the planets often explore what astronauts such as Sally Ride accomplished, with the added benefit that they have a better appreciation of how diverse life experiences can contribute to their success.



Fourth grade students ask their peers probing questions that require them to respond in increasingly greater detail and with a higher level of meaning. They hold themselves and each other accountable for contributing to the collaborative process in ways that are respectful, considerate and relevant.

STEP 3: Help students develop their writing skills. Within the Common Core framework, your students will be expected to become competent writers. Unfortunately, it's likely that very few of them have had opportunities to write in ways that not only convey meaning, but are persuasive, compelling and interesting. Even fewer have had many chances to plan, revise, edit and finalize drafts of their work, and receive feedback – except in ways that check for spelling, punctuation and grammar. You and your staff have a great opportunity to change this. Raise the bar, set high expectations and support them in becoming more proficient writers.

Learning to write well takes practice. Ask your staff to have students keep journals as they move from one phase of their projects to the next. Have them record what's working and what's not, why they're trying different things and what they're learning. Provide meaningful feedback.

Doing this is more important than you might think. In 2014 less than 10% of applicants to leading universities in the United States submitted high quality essays – and these were students with the highest grades and test scores among graduating high school seniors. Consider what this means for students in your program. Helping them strengthen this skill isn't a luxury. It's a requirement for closing the achievement gap.

STEP 4: Help students' strengthen their critical thinking skills. Be sure that your staff are clear that opportunities for critical thinking should be deeply embedded in everything students do. Lots of people talk about critical thinking, but very few understand what it really means. This may be true for the people you work with as well. If it is, start with a definition.

In a formal sense, critical thinking is about conceptualizing, applying, analyzing, synthesizing and evaluating information gathered from or generated by observation, experience, reflection, reasoning and/or communication as a guide to belief or action. Put simply, it's a process of thinking things through from beginning to end in a systematic, reasoned and thorough way, and reaching conclusions based on evidence.

Students engage in critical thinking processes ranging from using magnifying glasses to explore possible insects in their gardens to researching the kinds of bugs they find to discovering ways to deal with them in environmentally safe ways. Their approaches and decisions, are integrated, well thought-out and evidence-based.

To encourage critical thinking, have your staff ask open-ended questions rather than automatically giving answers to the questions students raise. Help students think critically by posing questions like these: “What ideas do you have?” Or “What do you think is happening here?” Ensure that your staff respects students' responses whether they view them as correct or not. Have them follow up and delve more deeply: “That's interesting. Tell me why you think that.” Ask them to use phrases like “I'd like to hear your thinking about this.” The more your staff models this, the better students will become at doing this with their peers.

STEP 5: Support students in becoming first-rate problem solvers.

Problem solving is a key component of Common Core and a critical 21st Century skill. Encourage your staff to help students think in new and different ways by developing hypotheses. Have them ask students questions like “How would you solve this problem?” Or “If you do this, what do you think will happen?” Or “Try predicting



what you think will occur next.” By allowing students to have the freedom to come up with ideas on their own, your staff is helping them hone their problem solving skills. Make it a practice of having them ask questions and letting students come up with the answers.

Become Familiar With Next Generation Science Standards

In addition to Common Core, high quality programs are increasingly using Next Generation Science Standards as a way to integrate life, physical and earth sciences with technology and engineering. Emphasis is placed on students learning what planning means, what constructing models looks like, what investigation requires and what analyzing and synthesizing data is about.

All of this is directly related to and supports students in meeting Common Core expectations and much more. By the time these students are in high school, they can undertake more complex engineering design projects related to major global, national or local issues such as climate change, population growth, recycling or alternative energy.

STEP 1: Build on what students already know how to do and like. Almost all children are engineers from the time they can build blocks, complete simple puzzles or connect Lego pieces. They delight in seeing how high they can build a tower, how well they can design a wooden train track or even how creatively they can make play houses or forts out of cardboard or other materials.

From the time they enter school, their interests can be expanded by having them create and test more complex designs and pay greater attention to points of failure and success so they can apply these process in a variety of situations and grow. Keeping this

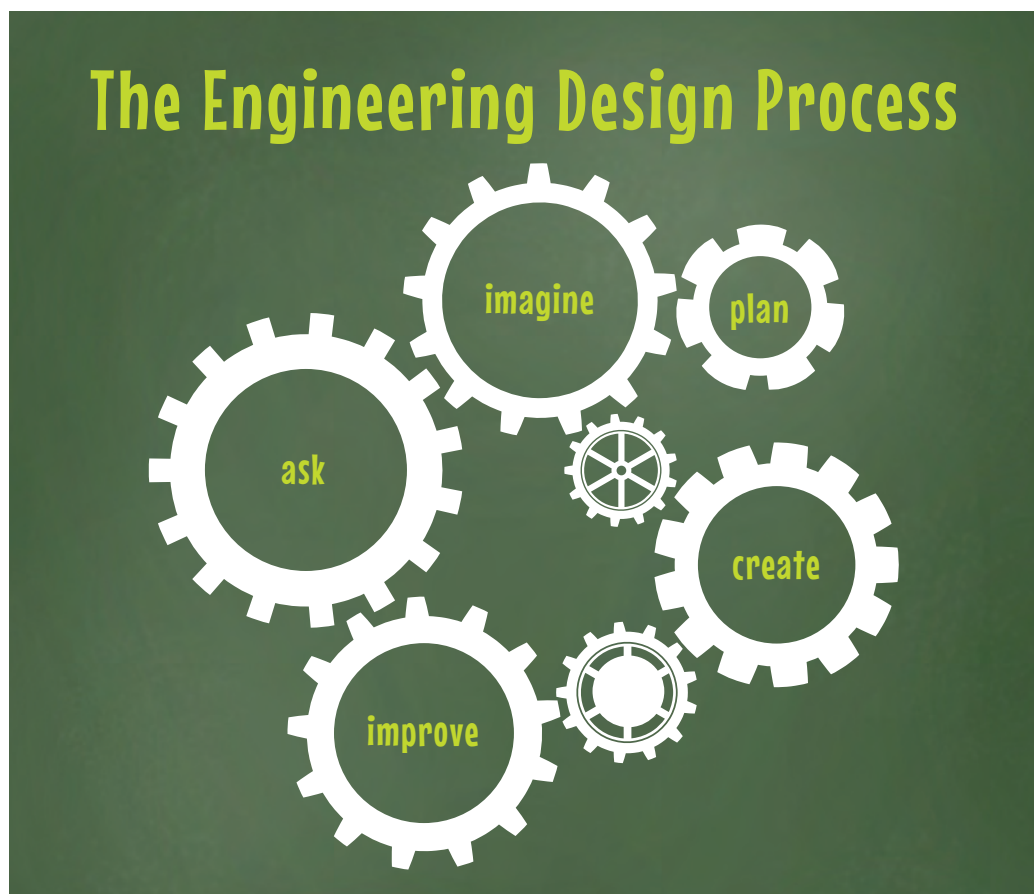
Students in STEM-learning programs have lots of opportunities to engage in engineering projects, such as designing parachutes. Through a process of trial and error, they ask their team members why certain things didn't work until they discover what does. This helps them create their own knowledge and value the experience.

spirit alive is especially important for students who are less likely to think of science or engineering as possible career choices, including girls and ethnic and racial minorities who often have traditionally been marginalized in science or math classrooms.

Youngsters who have opportunities every day to explore, create and build things with their own hands are not only happier, they're much more likely to retain the enthusiasm they have during the early years of their lives. They're also more likely to become interested in STEM fields and consider pursuing careers in these areas later on.

STEP 2: Use the Engineering Design Process as a guide. The engineering design process provides ways to work with K-12 students at their grade levels. Across ages, it begins with defining a problem to be solved as clearly as possible in terms of criteria for success, and recognizing the constraints or limits that may exist. It continues with generating a number of different possible solutions and then evaluating these to see which ones might work best.

It involves systematically testing and refining the process so that the final design is improved by trading off less important features for those that are more important. And, it results in students finding a solution or redefining the problem and generating new solutions to replace an idea that just isn't working.



By using the engineering design process as a way of asking questions and solving meaningful problems in projects that focus on local issues like recycling, community gardening or watershed planning, students deepen their science knowledge and come to view it and other subjects as relevant to their lives and futures.

Make Full Access to Technology Your Goal

With Common Core, students have to be competent enough with computers to take tests which are only offered in this way. If they can't input answers, responses and information in a timely, accurate and appropriate fashion, they simply won't be able to demonstrate what they've learned or what they know.

Given the limited amount of time students use computers or practice keyboarding during the school day, this is likely to be a real challenge for students in your program – and one you can help them overcome by including computer use in all or your projects and not just some.

STEP 1: Increase students' use of computers. If you've had a hard time getting approval to use the computer lab or share laptops or tablets with classroom teachers, it makes sense to make the case to the school day staff that it's in everyone's best interest to give your students access. The cost of the few problems that might occur through joint use is far less than the cost of students failing because they don't know how to input information or do it in an efficient, appropriate or confident way.

It's worth the effort to track how much time your students are actually spending on computers and comparing this with students who aren't in your program. The results are likely to provide you with compelling evidence that it matters. In the alternative, as the price of tablets, Chrome Books and other technology continues to come down, consider purchasing these.

STEP 2: Expand internet access. Until very recently the growth of knowledge was more or less linear and relatively slow. Now it's exponential and incredibly fast. Information currently doubles every 12 months and it will soon be every 12 hours. By the time your students reach middle age, it's possible that this will happen every 12 minutes. Increasingly, the only way to stay well-informed is through high-speed, wireless internet. Keeping up with the proliferation of knowledge is, and will continue to be, difficult at best.

For students who lack access to the latest equipment, resources and opportunities, it may be impossible. This will widen the achievement gap and much more if it doesn't change. Students living in more affluent families will have much greater access to information. Those in your program won't. This puts them at an extreme disadvantage and is likely to contribute in dramatic ways to even greater economic disparities in the future. Make it a priority to work with schools to ensure that students in your program have this access, or explore other possibilities that may be available. It matters!

STEP 3: Influence the ways students use technology. If you already have access to computers and internet, do everything you can to ensure that your students can use them as often as possible – for the right reasons in the right ways. Many of your students already have experience with technology and digital media. More than you might think are familiar with video gaming, using smart phones, texting and posting messages on social media sites.



Students can have greater access to computers and internet in a variety of ways. An increasing number of programs are now purchasing low-cost (under \$100) computers that students can assemble and program on their own. Many are using internet connected Chrome Books and have access to school site computer labs.

By the time they're in middle school, and often earlier, many know how to find just about anything on internet, are active streamers, have abandoned traditional radio stations for Spotify or Pandora, regularly share pictures on Snap Chat and exchange You Tube videos. What they know less about is how to use technology and digital media in ways that have long-term benefits to their educational experiences. Providing opportunities for students to acquire this knowledge can and should happen throughout the Project-based Learning process.

STEP 4: Help students make good choices about the use of technology.

Most schools and almost all Expanded Learning Programs prohibit students' use of smart phones. While this is understandable given the time children and young people spend texting their friends, checking social media, listening to music and making calls, it may be worth reconsidering whether these policies really make sense. It's likely that in the long-run they don't.

Keep in mind that while the percentage of low-income who have computers at home is comparatively small, the number with smart phones is large – and growing. If this is the case with your students, it's important for them to take advantage of this technology and learn to use it to further their knowledge in appropriate ways as frequently as possible.

Denying students the use of smart phones isn't the answer. It's part of the problem. The real issue is whether you and your staff are willing to take a tough stand on how, when and for what purpose they're used during your program. Make the rules about cell phone use clear to students, and enforce them, but don't prohibit their use in ways that encourage their appropriate and beneficial applications without considering the implications.

Next Steps

You and your staff have a unique opportunity to help children and young people achieve their potential by providing them with opportunities not only to learn new things, but to respond to the world around them in new ways by using their imagination and creativity. You have the chance to support what they are learning during the school hours and make a real difference in their ability to think interdependently, apply their knowledge to new situations and take responsible risks. And, you can support them in becoming great critical thinkers and problem solvers. Take advantage of this by making STEM learning a reality!

PRACTICE #2: SAMPLE PROGRESS INDICATORS

Integrate Youth Development, Common Core And Stem Learning

The purpose of this tool is to help you establish a baseline, create action plans and track your progress in becoming exemplary in this Practice area. Reviewing these indicators with your staff and partners every month or so will enable you to move more quickly toward achieving your goals. Key:

1. We haven't addressed this yet, or are just beginning to work in this area
2. We've done some work in this area, but have a long way to go
3. We've made significant progress and are doing reasonably well
4. We've achieved a high level of success in this area
5. We are clearly outstanding in this area and everyone would agree

INDICATORS		1	2	3	4	5
STAFF DEVELOPMENT						
1	Our staff understands how to create and maintain a physically safe learning environment					
2	Our staff understands how to create and maintain an emotionally safe learning environment					
3	Our staff understands what it means to be a facilitator of learning					
4	Our staff understands what youth development means					
5	Our staff is familiar with the basics of Common Core					
6	Our staff understands how to integrate Youth Development, Common Core and STEM learning into their daily work					
PROGRAMMING						
7	Our programming is student-centered and active					
8	Students work collaboratively in small groups					
9	Students have lots of opportunities to develop their communication skills					
10	Students have lots of opportunities to develop their critical thinking skills					
11	Students have lots of opportunities to develop their problem-solving skills					
12	Students have lots of opportunities to develop their computer skills					
STUDENT DEVELOPMENT						
13	Students feel physically and emotionally safe					
14	Students feel supported by staff members and their peers					
15	Students are actively engaged in Project-based Learning					
16	Students are developing and mastering new skills					
17	Students are able to solve increasingly complex problems					
18	Students are becoming more proficient at using technology					



PRACTICE #3 Make Learning Exciting, Engaging And Meaningful

Programs that have adopted STEM learning strategies have consistently found that learning is exciting, engaging and meaningful when it's student-centered, active and collaborative – and that this happens when students are given problems and asked to work together to come up with solutions and create knowledge on their own.

STEM Learning is about children and young people taking on more responsibility for their own learning and becoming enthusiastic, self-directed learners. They're able to express their creativity, explore and experiment with new concepts, try new things, apply what they're learning to real-world situations and develop and master new skills. And, they discover new ways to share and test their knowledge and ideas. Put simply, they learn by doing.

Make Student-Centered Learning Real

Understanding the difference between instructing, coaching and facilitating, and determining the amount of time your staff devotes to each, will have a direct impact on how effectively and quickly you'll be able to integrate STEM learning into your program. It begins by being sure that everyone knows what these terms really mean.

- Direct instruction is about adults delivering information and transferring knowledge to students. It's usually a one-way process and tends to discourage or limit meaningful dialogue.
- Coaching means being a guide-by-the-side or partner with students in the learning process by providing suggestions or helping them approach things in new or different ways. It doesn't mean telling students what to do or how to do it or solving problems for them.
- Facilitating is about asking open-ended questions, posing problems and guiding inquiry. It means letting students take charge of their own learning.

STEP 1: Keep direct instruction at a minimum. The challenge is to ensure that direct instruction isn't the dominant approach. The simplest way to know whether this is happening is by asking this question: Is your staff guiding the learning process or controlling it?

Although more time may be needed with very young students, in general no more than 10% should be spent teaching. This is likely to mean that at least some of your staff will have to move out of their comfort zones and change the way they see their roles, relationships and responsibilities in their work with students.

STEP 2: Increase the amount of time spent coaching.

Coaching means providing feedback, leading discussions and guiding practice. As coaches, your staff's role is to help students learn how to come up with creative ideas, take risks, make mistakes, overcome challenges, make decisions and learn how to solve most problems by working with their peers. Helping them through this process and providing suggestions when they're needed is what counts. It should involve about 10% of what's happening in Project-based Learning, with more for younger students and less for those who are older.

STEP 3: Make facilitation your primary strategy. Ultimately, as facilitators of learning, it's your staff's responsibility to support students through a process of discovery. It's their job to encourage their students' efforts and provide ongoing opportunities them to reflect on what's working and what's not.

When students drive the learning process, they're free to express their own creativity and explore new possibilities and ideas. They learn how to use their imaginations, plan what they will do, create new things, ask meaningful questions, and come up with ways to improve on what's happening. It's up to your staff to promote this process by asking more questions and letting students find more answers. In the most successful programs, staff spend 80% of their time doing this.

Students try a variety of approaches to creating the tallest tower they can out of toothpicks and marshmallows as part of their engineering class. They discover that sharing their resources and contributing their ideas is much more beneficial than working independently – and that their success depends on working well together. And they do this on their own!

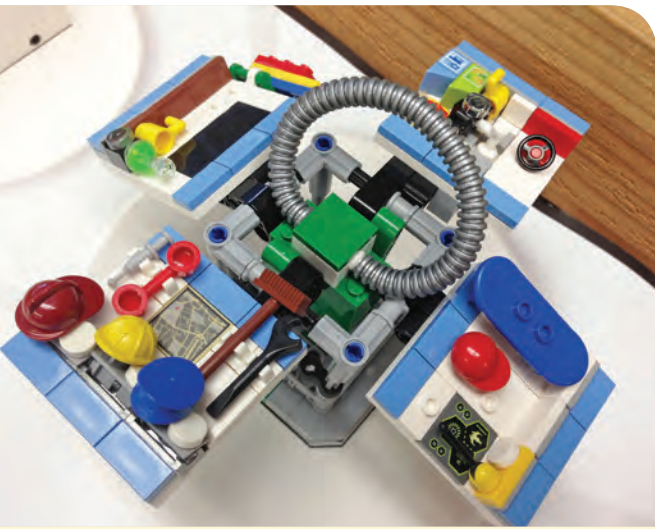


When staff members become effective coaches, they see themselves as guides-by-the side. They become adept at observing what's taking place and notice when students are experiencing challenges they don't seem to be able to overcome on their own. When this happens, they offer suggestions and model possibilities, but they let students make their own decisions about what they'll do.

Use Active Hands-On, Minds-On Approaches

Students learn by doing. For real learning to take place, it has to be active. It needs to focus on hands-on, minds-on experiences that are interesting to students, have real world applications and engage them physically, intellectually and emotionally. Done well, it involves all of their senses, not just one or two. It allows them to use their innate creativity, imagination and self-expression and develop and practice their leadership and collaboration skills. And, it makes it possible for them to learn how to go from doing to creating something of value.

STEP 1: Make sure projects are appropriately challenging. If you're working with younger students, offer a variety of projects that capture their interest and unleash their curiosity in areas they may not have been exposed to yet. Projects should be appropriately challenging. It's important to ensure to the extent possible that they aren't too difficult or easy for them. Fortunately, most package programs have already addressed these issues and can easily be adapted to your student population.



Children in primary elementary school grades build robots with LEGO Mindstorms and learn basic coding skills in programs like Bee Bots, Kodable and Code.org. And, they learn how to recycle and repurpose trash at school and in their homes – and much more!

Project-based Learning in upper elementary grades often includes building robots that move through obstacle courses and participating in local and regional competitions. Students in astronomy projects create three-dimensional solar systems and construct and test rocket designs. Life science classes allow them to conduct experiments and learn how video gaming affects the body, including heart rates, tolerance to pain, blood pressure and breathing. And, those in model car classes learn about distance, velocity and time equations and relationships by designing and testing the cars and race tracks they've built.

Many students in middle and high school programs create and produce music videos and documentary films. Several use 3-D printers in their entrepreneurship classes to design, manufacture and sell cell phone cases and other popular items. An increasing number use camera-enhanced drones to map what's available or missing in their neighborhoods and make recommendations at city council meetings. Several focus on using applied science strategies to create renewable energy projects such as constructing solar cooking systems – with the side benefit of learning how to do this at home.

STEP 2: Step aside and let students take on leadership roles. The most successful Expanded Learning Programs hold high expectations for students and are confident that they can meet and exceed them. They use direct instruction and coaching strategies to set the stage and then increasingly provide

opportunities for students to take on leadership roles in their groups and in their classes as a whole.

This can be done in a variety of ways. Some programs initially assign roles based on their insights into the readiness of students to take on leadership roles and progressively allow students to make their own decisions later. Others ask for volunteers or randomly select students to serve as leaders and support them in their efforts. No matter what approach you take, it's important for all of your students to have these opportunities.

STEP 3. Set your staff and students up for success. Every student and staff member is unique. They have different histories, experiences and aptitudes. Some have had lots opportunities to explore the world around them. Others have had very few. Some have innate talents that they've already been able to capitalize on. Others haven't. What they do have in common, however, is their potential to learn and grow.

Building on the past experiences and future dreams of both your staff and students can make a real difference in how engaged they'll be. Find out what these are. To the extent



possible, be sure that the projects your staff are responsible for facilitating are aligned with their own interests or passions. Take care that the experiences they provide are meaningful to your students, expand their horizons and deepen their understanding of the world around them.

STEP 4: Encourage inquiry, investigation and experimentation. One of the most valuable aspects of STEM learning is the emphasis it places on inquiry. In order to plan strategies, identify issues, find solutions to problems and carry projects through to completion, students have to engage in a continuous process of asking questions and seeking answers on their own. Inquiry-based learning is an essential part of critical thinking. It typically comes through a process of experimentation and discovery, of finding out what doesn't work and making adjustments along the way to finding solutions that do.

Elementary school students participate in an eight-week aquaponics project where they learn about the importance of alternative approaches to gardening. Even very young students begin to appreciate the interconnectedness of the world around them in new and exciting ways and are able to take responsibility for working with their peers to ensure the success of the project.

When students go through processes like these, they become much more motivated to try new things. They learn that it isn't the end of the world when something goes wrong or doesn't meet their expectations. They understand that mistakes happen and are tools for improvement. They learn that failing is a route to success, not a reflection of their own skills or capabilities. These are lessons that will serve them well in school and throughout their lifetimes.

STEP 5: Combine off-site experiences with on-site learning. The more opportunities students have to see how their projects connect with the real world, the better. It makes a difference when kindergartners learning about animals spend an afternoon at a zoo or farm. Or when fifth graders making model airplanes go to a local airport, watch planes take off and land and take turns sitting in a cockpit. Or when middle and high school students in media projects visit at a local radio or television station. Take advantage of these opportunities.

Kindergarten students not only learn how to meditate in their yoga classes, they also lead sessions at the beginning of each class in their six-week project. By the end of the session, they're are familiar with 18 different positions they can do on their own and often use meditation as a way to become more focused and self-managed – both of which are essential to their ability to learn and to relate well with others.



Partnerships can make a huge difference in being able to provide off-site opportunities. As part of the 4-H On the Wild Side project, students have exciting experiences that would never otherwise be possible. Taking advantage of these kinds of opportunities is well worth the effort and the cost. They can be life-changing!

If a Science Center is located in your area, arrange for a guided tour. Don't overlook the fact that many of the children and young people in your program haven't had opportunities to go much beyond the boundaries of their neighborhoods or cities. Do everything you can to make these experiences possible. It matters – a lot!

Students working on projects involving oceans are more likely to become interested in oceanography as a field if they have a chance to go to the beach. And, students in projects that focus on archeology or anthropology or art will learn much more if they to visit museums and galleries. Although field trips can be expensive, admission fees are often waived and transportation costs can usually be negotiated. It's worth it to do your best to make this happen.

Make Collaboration a Hallmark Of Your Program

Although there are exceptions, for generations everything from classroom seating arrangements to competition for grades to students raising their hands when they wanted to speak have characterized public education. Teachers taught and students were tested on what they recalled.

The result has been that many students, and especially those who attend low performing schools in high poverty neighborhoods, haven't developed the skills they'll need to succeed in the 21st Century or to enter a workforce that increasingly expects employees to function well as team members and team leaders.

STEP 1: Focus on students learning from each other. Your program can change this by having students to work together in small groups, with four or five students in each group. This will increase their appreciation for the importance of thinking interdependently. It will help them learn to communicate more clearly and precisely. It will encourage them to listen to each other with greater understanding and empathy. It will motivate them to explore and honor different points of view. And, it will help them learn to become members of high performing teams now and later on.

Collaboration is likely to be a new experience for many students, and it won't always be easy. Some will adapt right away. Some won't. Some will be eager to participate. Others may not be. It's alright. Ultimately, the goal is for every student to be actively and meaningfully engaged – and to feel confident that he or she is making a valuable contribution to the group. Be patient. It will happen.

STEP 2: Create group agreements. Begin by talking with students about what it means to work well together, with staff guiding them through a process of establishing group norms. Be sure the list is short and the language is positive. Highlight what should happen, not what shouldn't. This isn't about classroom management, it's about helping students learn to relate and communicate constructively, solve problems together, honor each other's ideas and respect everyone's contributions.

Once students have agreed to the list, have them write it down and post in where it's clearly visible to everyone. Give each student a copy so they can remind each other if the need arises. Make this a key component of your efforts to encourage personal and social responsibility. It will make a real difference in how quickly and effectively they learn to work together.

STEP 3: Keep the pace moving, but be flexible with the timing. One of the greatest benefits of Project-based Learning is that it provides enough time for students to acquire and apply much more knowledge than would be likely in other ways. To take full advantage of this, it's important to place a premium on flexibility – especially when students are first learning how to work collaboratively.

On the one hand, if you've established an eight-week session as your structure, students will need to complete their project within this timeframe. On the other, allowing them to take more time at some stages or continue what they're doing from one day to the next makes more sense than stopping their work prematurely as would be the case with independent, one-off activities.

This is why it's useful to create Facilitator's Guides that focus on what should be accomplished from week to week rather than day to day. This will significantly increase your prospects for success and help students gain a greater appreciation for the importance of meeting reasonable deadlines. Remember that some groups will move at a faster rate and others more slowly. It's up to your staff to monitor this and to be sure that every group will complete their projects by the end of the session, and still allow for differences in timing as the project moves from week to week.

STEP 4: Recognize and encourage students' progress. Students appreciate it when you and your staff recognize their successes and celebrate their achievements. This should happen in a way that is authentic and meaningful – and designed to inspire them to take pride in the process and their contributions to it. Use praise as a way of encouraging students to build on what they're learning and do even more by acknowledging their best efforts.

Follow up with questions that help students reflect not only on what went well but how they were able to overcome challenges. Asking them to be specific in their explanations will help them strengthen their communication skills and improve their understanding of the interconnectedness and sequencing of decisions and actions that ultimately worked. This will make a huge difference in their ability to do well with Common Core during the school day and with problem solving in their everyday experiences.

Celebrate With A Culminating Event

When Project-based Learning is student-centered, active, collaborative and embedded with STEM learning strategies, you and your staff will discover how much more students are capable of doing and learning than you might have thought possible. Culminating events aren't just ways



Students in gardening classes know the importance of establishing and maintaining a timeline that enables them to move from planting seeds to harvesting fruits and vegetables in time for their culminating event. It's up to staff to help them ensure that this happens.

to mark the completion of projects, they offer an exciting opportunity to recognize students' achievements – many of which may exceed your expectations and theirs!

Students should take the lead in planning, designing and carrying out these events, with your staff providing additional support when it may be needed, especially with younger children. Upper elementary, middle and high school students can do all or almost all of this on their own.

STEP 1: Begin with the end in mind. Just as Project-based Learning should begin with a clear concept of what you and your staff would like students to learn, preparation for culminating events should be done in the same way. This means knowing how the event should be structured and determining who should be invited to attend.

These events offer amazing opportunities to recognize students' achievements, engage their families and schools and make community members and leaders much more aware of the impact your program is having than they are likely to know. It's important to take advantage of this in as many ways as you can – even if you may want to begin small and work up to larger events later. Start by asking these kinds of questions:

- Will the event include all of the students in your program at the same time, or will different projects be celebrated on different days?
- Will it be held during program hours or in the evening or on the weekend?
- Will the Principal, teachers, staff and family members be invited?
- Should the media be asked to provide coverage for the local news?
- Are there community members, including current or potential funders, who should be included?

Your responses will impact the amount of time it will take to plan and hold the event, the cost and the extent to which you and your staff will need to be directly involved. Be sure to take all of these factors into consideration. Bring students into the process as much as you can. Once a decision has been made, it's up to students to have their projects ready and to be prepared to present them in whatever form they believe is best. They'll need time to do this, and they should begin thinking about it at least two weeks in advance even though their projects may not be done.

STEP 2: Make the event a springboard for moving to the next level. Done well, culminating events will serve three purposes. They'll recognize students' achievements and honor their accomplishments. They'll motivate them to do more and learn more. And they'll inspire them to take a greater interest in the areas in which they've been involved. In combination, this will set the stage for you and your staff to continue taking your program to the next level!



PRACTICE #3: SAMPLE PROGRESS INDICATORS

Make Learning Make Learning Exciting, Engaging And Meaningful

The purpose of this tool is to help you establish a baseline, create action plans and track your progress in becoming exemplary in this Practice area. Reviewing these indicators with your staff and partners every month or so will enable you to move more quickly toward achieving your goals. Key:

1. We haven't addressed this yet, or are just beginning to work in this area
2. We've done some work in this area, but have a long way to go
3. We've made significant progress and are doing reasonably well
4. We've achieved a high level of success in this area
5. We are clearly outstanding in this area and everyone would agree

INDICATORS		1	2	3	4	5
STAFF DEVELOPMENT						
1	Our staff understands how to ensure that learning is active					
2	Our staff understands how to ensure that learning is student-centered					
3	Our staff understands how to ensure that learning is collaborative					
4	Our staff understands the difference between direct instruction, coaching and facilitation					
5	Our staff spends about 80% of their time as facilitators					
6	Our staff recognizes their students' progress and accomplishments					
PROGRAMMING						
7	Our program focuses on hands-on, minds-on learning experiences					
8	Our program fully engages students through Project-based Learning					
9	Our program offers students a variety of ways to strengthen and master new skills					
10	Our program offers students a variety of ways to increase their knowledge					
11	Our program offers students a variety of ways to expand and deepen their understanding of the world around them					
STUDENT DEVELOPMENT						
12	Students are engaged in meaningful learning experiences					
13	Students have opportunities for off-site learning experiences					
14	Students are able to work well with each other in small groups					
15	Students have opportunities to develop their leadership skills					
16	Students plan and implement culminating events					

PRACTICE #4 Connect Project-Based Learning With Real-World Experiences

No matter how excited students are about STEM or how engaged they are in Project-based Learning, the process isn't complete until they understand how these experiences relate to their own lives, the world around them and their future. Programs often fall short of achieving their full potential because learning stops too soon or is too narrowly defined. You can prevent this by:

- Offering Project-based Learning experiences that allow students to identify and solve problems in their own schools, communities and neighborhoods;
- Providing opportunities for students to apply what they're learning in real-life settings;
- Tapping into the resources and expertise of public agencies, nonprofit organizations, science centers, corporations and the education community; and
- Building cross-sector collaborations that can support and sustain student interest in STEM fields as future careers.

In Community Summits, small group rotations allow programs and local stakeholders to communicate their interests, describe their resources, connect with each other and initiate new partnerships in a short period of time.

Make Cross-Sector Collaboration Your Long-Term Goal

A study recently commissioned by the Noyce Foundation focuses on the importance of cross-sector collaboration as a way to bring institutions and organizations together to provide learning opportunities for young people to become engaged, knowledgeable and skilled in STEM disciplines.

Designed to surround students with positive influences and opportunities, this approach provides ways to strategically develop community learning ecosystems that include schools, afterschool and summer programs, science centers and museums and informal experiences at home and other settings. Done well, it results in a constellation of partnerships that offer students invaluable resources and enable them to apply what they're learning in real-world settings. Make it your goal to contribute to making this happen in your community.

STEP 1: Learn from the experience of others. Through the work of the Power of Discovery: STEM² Initiative, communities that have begun this process are being championed by County Offices of Education in Sacramento, Alameda, Santa Clara, San Diego and Orange Counties and beyond. Their experiences are available on the California Afterschool Network website. It's important to learn from and work with them while you're launching your own collaborative efforts.

STEP 2: Hold a Community Summit. One of the most effective ways to begin the partnership-building process is to hold a one-day summit, sponsored by your program and other programs in your area. The purpose of this event is to bring

people together to identify and begin to share resources. The number of potential participants will depend on where you are located, but it's likely to be much larger than you might expect. In many cases, as many as 30 organizations are represented, and sometimes more.

County offices of education, school districts, science centers, tech companies, universities and organizations like the 4-H might be easily identified. Local governments, nature reserves, airports, medical centers, utility companies and television stations should also be included. Make the list of invitees as comprehensive as possible.

The power of this approach is in its structure. Small group rotations allow programs and community stakeholders to communicate their interests, describe their resources, connect with each other and initiate the partnership development process in a short period of time. Detailed information about how to do this effectively and inexpensively is available at www.afterschoolsolutions.org. In many cases, this event will help you form new partnerships in a fraction of the time and cost it would take in other ways.

Partner With The Education Community

County Offices of Education, school districts and colleges and universities should rank high on your list of potential partners. The world is changing more rapidly than ever. As new technologies emerge, students will need to learn how to use them quickly and appropriately. In an increasingly complex digital society, they'll have to acquire new skills and develop new ways of doing new things anywhere, anytime and anyplace.

This is a tall order and a huge challenge as students move into the 21st Century workplace. It's compounded by the fact that in the next 10 years there will be a million and a half jobs available in the computer sciences sector but only 400,000 college graduates will be qualified to work in them.

STEP 1: Draw on the expertise of County Offices of Education. Most County Offices of Education offer expertise in the science, technology, engineering and math fields and can provide you with access to the latest and often most valuable curricula and resources. They offer training and staff development for leadership and site level staff. And, they understand how to integrate Common Core into Expanded learning programs like yours. Make partnering with them a priority.

As Regional Innovation Service Providers (RISPS), four County Offices in California are especially well-positioned to provide support. Located in Sacramento, Santa Clara, Orange and San Diego counties, they have worked closely with the California Afterschool Network to develop innovative ways to support STEM learning in programs in their regions and are invaluable resources.

If your program is located in one of these areas and you haven't developed a relationship with them yet, do so as soon as possible. If not, don't hesitate to find out about what resources and support your County Office of Education provides. A complete list, with contact information, is provided on the California Afterschool Network website.



For America to be competitive in the global marketplace, students not only have to be interested in STEM disciplines, they'll have to be knowledgeable and skilled. They'll have to succeed in school. And, many more will have to complete college educations with major in these areas.

STEP 2: Strengthen relationships with school districts and schools. All Districts are committed to raising students' competency levels in math and language arts in specific and in other disciplines in general. Schools located in high poverty communities are especially concerned with the ability of students to perform well on Common Core tests, which require a combination of knowledge, critical thinking and problem solving – all of which your program will support through STEM and Project-based Learning.

Schools are facing a very real challenge with students' computer literacy skills, and the short time available to improve them. Those that have recognized the urgency of this already share school laptops with Expanded Learning Programs and provide open access to computer labs. If this hasn't happened yet, keep trying.

It's also critical to connect with faculty, including teachers on special assignment, who teach in STEM-related areas. Aligning with what students are learning during the school day makes sense, but it's also essential that your staff learns from teachers and they learn from your staff. Linking learning in school-day and afterschool environments is a key to ensuring student success and essential to continually improving program quality.

Be sure Principals and teachers know what projects students are working on and why it matters. Ask for their ideas and assistance, including curricula used during the school day and approaches to Common Core learning. Help them feel that they're part of a team that supports the success of children and young people from the time school starts until your program ends.

STEP 3: Partner with colleges and universities. There are many reasons to connect with colleges and universities in your area or beyond. To begin with, you may already recruit students who are attending these institutions to become staff members in your program. This is a great idea. And, it may be time to expand your target population if you've been focusing on students who are pursuing teaching or child development careers. Reach out to students in other majors as well, and especially those in STEM fields.

Open the door to collaboration with faculty members. They have a vested interest in attracting more students into their fields. And, most will be willing to provide opportunities for children and young people to observe a class, see what's happening in a lab or talk with their students about what they're learning in their projects. It can make a world of difference!



As you begin to integrate STEM into your program, it makes sense to hire students who are majoring in these disciplines. Many of these young adults are looking for part-time jobs. They can bring knowledge and expertise to project design and implementation and they can be great role models!



Collaborate With Science Centers, Museums and Galleries

A partnership with a science center or museum increases students' knowledge and gives them a better sense of what's happened in the past and possible in the future. It engages them in exploring innovations in science, technology, engineering and math and it helps them see the practical and potential applications of the projects they're working on.

STEP 1: Partner with science centers. If you're fortunate to have a science center in your community, great! If not, you may want to consider arranging an out of town field trip. Although transportation can be expensive, the experience can be life-changing. It may be possible to fund the trip through relatively small grants from local tech foundations, corporations or even individuals. Be sure to arrange for a tour and request vouchers for free or reduced-price admission.

STEP 2: Arrange visits to local museums. If you offer Project-based Learning in subject areas like archeology, history, geography, anthropology, music or art, partner with museums in your area or other major centers if they aren't available locally. There's a real difference between learning in a classroom and being able to actually see artifacts that are only a few feet or inches away.

If their focus is on world cultures, exposing students to cultural anthropology and archeology can make their projects relevant and real. A visit to a museum makes learning come alive, and helps them understand more about the interconnectedness of the past and present and the relevance of other societies to our own.

STEP 3: Connect with galleries. Don't overlook the value of developing relationships with businesses that can help students connect STEM learning to less obvious industries. Among these are fashion design centers and art institutes and galleries. Students benefit greatly from these experiences not just because they're interesting, but because they help them see relationships between STEM and enterprises that are less often thought of as being within the scope of these disciplines.

The Tech Museum of Innovation in the Silicon Valley partners with the Santa Clara County Office of Education to provide unique opportunities for students and staff in neighboring programs to participate in STEM training and exciting hands-on learning experiences that can be life-changing for students.

Build Relationships With The Public Sector

Many programs encourage students to become more active in their communities by including projects that address problems in their neighborhoods. Urban planning, housing, transportation, recycling and land and water use are often among these. You may want to do this, too. Because most of these issues fall under the purview of city and county governments, it's important to develop relationships with people in appropriate departments and agencies.



Students benefit in many ways by addressing local issues, including working and learning together to solve real problems. Having them take their findings, and their recommendations, to public agencies, city councils and other public entities is the next step – and it's critical.

STEP 1: Give students opportunities to help solve local problems. Students who participate in these kinds of projects typically map their neighborhoods, identify existing problems and work together to solve them. Not surprisingly, in transportation safety areas their ideas commonly include increasing the number of pedestrian crosswalks, constructing speed bumps, placing traffic lights at busy intersections or adding street lights.

Improve the quality of the experience by laying the groundwork in advance. Schedule a preliminary meeting to explain the work students are engaged in, the impact it's having on them and the value of giving them an opportunity to meet with decision makers in their community. Set a date and help prepare students to present their ideas.

Spending time with public officials will increase students' understanding of how the governmental process works. If their ideas are implemented, it will give them a sense of real accomplishment, and their motivation to do more will soar. If they aren't, it will still give them greater insight into what barriers might need to be overcome or what more they might have to do to make changes in their neighborhoods that they believe are important. Either way, it will be a positive learning experience.

STEP 3: Provide ways for students to address critical issues. Most issues that directly impact the lives of students and their families are local. Some, however, are more likely to

be addressed by state and federal departments or in collaboration with city and county governments. Natural disasters, such as earthquakes, floods, tornadoes, hurricanes and wildfires are among these.

Understanding what it means to be prepared for disasters or how to respond if they occur can make a real difference in the lives of students and their families and potentially be life-saving. This is one reason why more programs are offering projects in these areas. It also explains why developing partnerships with agencies that work in these areas matters.

Third grade students in disaster preparedness projects study earthquakes, flooding and other disasters and construct model houses that they believe will withstand these kinds of events. Partnering with state agencies is an important way to help them see the real-world applications of their work.

STEP 4: Partner with leading-edge agencies. Many communities have adopted green energy strategies and implemented these for the past several years. The increasing demand for alternative energy has generated new jobs, making it an attractive field for students to consider. Offering Project-based Learning experiences that partner with local, state and federal agencies provides a way for students to become more aware of next generation applications and possible future careers.

Build Relationships With Nonprofit Organizations

Depending on where your program is located, it's likely that there are nonprofit organizations that may have an interest in working with your students or providing additional resources as they develop their projects. Most communities have some sort of nonprofit resource center, and this can be a great starting point for identifying those that may be the best fit. Take time to explore these.

STEP 1: Find innovative ways to work with nonprofits. The size of nonprofit organizations can make a difference in the extent to which they're likely to be a good match with your program. There are many large-scale organizations and affiliates of statewide and national associations that are eager to take on this role and should be contacted.

Projects on waterways frequently include gathering samples from wetlands or rivers or estuaries to test them for environmental changes that may have an impact on plants, fish and bird migrations. Organizations like the Audubon Society can become ideal partners.

If your program includes middle and high school students, it may also be beneficial to get in touch with smaller or newly formed nonprofits that have specific needs and limited budgets.

Students in website design projects partner with organizations that need support developing marketing materials and can't afford to hire professionals. Providing them with samples of students' work is a starting point for building relationships.

STEP 2: Take recycling projects to the next level. Many students are interested in recycling and concerned about protecting and preserving the environment. Project-based Learning often includes opportunities for them to discover how to creatively repurpose plastic, metal and cardboard materials or take pictures that reflect environmental breakthroughs or challenges. Several of their ideas have practical applications and at least some can be used in community service.

Businesses, public agencies and nonprofit organizations often seek out new ways to link their work with the broader community and may be willing to display these kinds of projects. City halls, school district offices and libraries are obvious choices, and there are others as well.

Students construct furniture out of newspaper by using the engineering design process and trying different strategies until they succeed in making it sturdy enough to be used by both children and adults. Projects like this are often of interest to community groups.

Many local supermarkets, farmers markets and food banks provide fresh fruits and vegetables and other products for use in cooking classes and culminating events. This can generate significant cost savings for your program and lead to longer term partnerships, and in some cases direct funding.



Work With The Corporate and Business Sectors

Whether they're focused in specific STEM fields or not, most businesses share two things in common with your program. They're continually looking for creative ways to promote a positive image in your community and they're concerned about the quality of the future workforce. Don't overlook the fact that these are the same interests your program has. At least some of the Project-based Learning experiences your students may be participating in offer a way to initiate conversations that can develop into new, exciting and authentic partnerships with the private sector.

STEP 1: Connect with local businesses. Even small initial investments, such as in-kind contributions or meetings, can lead to longer-term relationships that make a difference to students, increase community awareness of the importance of your program and result in new funding streams. Take advantage of these possibilities!

STEP 2: Draw on high tech industry expertise. High tech companies, including those in telecommunication, software development, aerospace and manufacturing, are especially good candidates to become partners. Like you, they're interested in supporting and expanding career pathways and they clearly recognize the need to have a skilled future workforce.

The rapidly changing job market makes it more important than ever to find ways to develop these relationships as a way to motivate students to make majoring in STEM disciplines in college a goal. And, although it's no longer called vocational education or considered an alternative for struggling students, there's increasing interest in preparing students at all academic levels to consider career' education possibilities leading to technical jobs.

Giving your students opportunities to witness the design engineering process for themselves helps them understand how integral this is in high tech work environments. It typically makes their commitment to and enthusiasm for Project-based Learning more real, relevant and meaningful.

STEP 3: Don't miss less obvious possibilities. Many communities have businesses that are STEM-content rich but don't necessarily come to mind right away as potential partners. For example, private or city-administered airports can offer exceptional experiences for students in aeronautics projects ranging from model plane building to the physics of flight. If this is true in your area, make it a point to see if a flight school or airport personnel or a local pilots' or aircraft owners' association might arrange a visit.

Second grade students spend several weeks learning about aviation principles and building model planes. Their culminating event includes a visit to a local airport where they talk with private pilots, learn more about flying, sit in a cockpit and have a chance to display and demonstrate their work.

STEP 4: Take advantage of six degrees of separation.

The chances are very good that your staff and the families of students in your program are employed by businesses that can bring additional expertise to your students and their projects. In addition to those working in STEM-specific fields, don't overlook the value of connecting with people who work in the arts, entertainment or architectural design fields, or in construction, manufacturing or automotive repair.

Use Stem Projects To Promote Community Service

Partnerships come in a variety of forms and are valuable for a number of reasons. Providing students with opportunities to deepen their understanding of how STEM relates to their own lives, the interconnectedness of world around them and their future careers is critically important. Taking this one step further can have an even greater impact. You can do this by developing collaborations that make it possible to integrate community service into STEM-rich Project-based Learning experiences.

Creating opportunities for students to make a difference in their communities enables them to transfer what they're learning into real-world environments, gives them a sense of belonging, increases their sense of self-efficacy and helps them understand the importance of using their skills and knowledge to contribute to something beyond themselves. It matters.

STEP 1: Partner with medical and dental organizations. Many programs offer Project-based Learning in life science, such as biology, anatomy or physiology, or integrate these into other areas like sports, nutrition or health. If this is the case in your program, or you're thinking about including these in the future, consider adding opportunities for students to work with groups that provide free vision and Type 2 Diabetes screening or medical or dental services to low-income children in your community.

Students embed community service into their work by publicizing upcoming events in newsletters, designing flyers and learning more about the importance of preventative health care from doctors and nurses who provide free services to members of their communities.



Students in projects involving applied engineering benefit from talking with people who have experience in the construction field test their own ideas and models with them. It's quite likely that you can make these connections more easily than you think.



Students in gardening projects collaborate with local neighborhood associations, working side-by-side with residents as volunteers. Don't hesitate to ask if students can become involved in these kinds of activities. Everyone wins and it matters!

STEP 2: Connect with neighborhood associations. Not all neighborhoods have associations, but many do. They may be interested in or already working on projects like planting or maintaining community gardens. Ask students, parents and your staff whether these exist in your area and find out whether there's an opportunity to work together.

STEP 3: Reach out to older members of your community. Many of the community service activities that you may think of as being outside the scope of STEM Project-based Learning might surprise you if they're considered from a slightly different perspective. There's a lot students can do to make a difference in older people's lives and there's a great deal that they can personally gain from doing this.

Projects focusing on genealogy or local history include learning from seniors in assisted living centers who have spent most of their lives in their community. Their stories enrich students' projects and help older folks realize how important their experiences are and how valuable their contributions can be in helping youngsters increase their awareness how the past influences the present.

STEP 4: Give students opportunities to share what they're learning. Don't underestimate the impact that older students can have on younger children. Often, they become

more interested in STEM when they see how much students enjoy working in these areas. And, older students appreciate the chance to demonstrate what they're learning. Connecting these age groups can make a real difference in how motivated students are to learn more.

Eighth grade students in an engineering project test their zip line designs, with younger students eagerly looking on. Experiences like these benefit both age groups and shouldn't be overlooked. Providing ways for older students to take their projects to venues that include preschools or elementary schools can spark children's curiosity and increase their interest in science, technology, engineering and math.

PRACTICE #4: SAMPLE PROGRESS INDICATORS

Connect Project-Based Learning With Real-World Experiences

The purpose of this tool is to help you establish a baseline, create action plans and track your progress in becoming exemplary in this Practice area. Reviewing these indicators with your staff and partners every month or so will enable you to move more quickly toward achieving your goals. Key:

1. We haven't addressed this yet, or are just beginning to work in this area
2. We've done some work in this area, but have a long way to go
3. We've made significant progress and are doing reasonably well
4. We've achieved a high level of success in this area
5. We are clearly outstanding in this area and everyone would agree

INDICATORS		1	2	3	4	5
STAFF DEVELOPMENT						
1	Our staff understands the importance of providing students with real-world learning experiences					
2	Our staff understands the value of developing partnerships with community organizations and institutions					
3	Our staff is skilled at preparing students for meetings with public officials, nonprofit groups and others					
4	Our staff continually seeks out new opportunities to partner with local organizations and neighborhoods associations					
5	Our staff is familiar with local Science Centers, museums and galleries					
6	Our staff takes advantage of County Office Education and school district trainings and resources					
PROGRAMMING						
7	We partner with public agencies					
8	We collaborate with nonprofit organizations					
9	We work with corporations and businesses					
10	We partner with Science Centers and museums					
11	We partner with school districts and schools					
12	We collaborate with colleges and universities					
13	We embed community service opportunities in Project-based Learning					
STUDENT DEVELOPMENT						
12	Students are engaged in real-world learning experiences					
13	Students have opportunities to meet with people who work in STEM fields					
14	Students have opportunities to address problems in their neighborhoods and communities					
15	Students have opportunities to test their work in real settings					
16	Students are increasingly interested in STEM as a future career					

PRACTICE #5 Secure Adequate, Sustainable Funding

Quality counts, and quality costs. Taking time to develop a solid fund development plan that meets your interests and resonates with potential investors will make all the difference in how fast and how far you'll go in integrating STEM into your program. Doing this well will save you countless hours of frustration later on, help you avoid costly mistakes and greatly increase your chances for success.

Be clear about your priorities, your intentions, and your vision – and how much funding you'll need to achieve your goals.

Determine How Much Funding You'll Need

Start by assessing where your program is now and where you want to go in the next 18 months. Explore a variety of possibilities, from the changes that you believe will have to occur to the time it will take and the cost involved. Prioritize these according to your interests and needs, your short and long-term goals and the additional funding you anticipate will be needed.

STEP 1: Create a solid foundation. If you're in the beginning stage, moving from offering independent activities to Project-based Learning with a STEM-learning emphasis is likely to be your top priority – and it should be. There's growing evidence that this is the direction the field is going, and that both the public and private sector are funding and will continue to support.

There are a variety of ways to do this, several of which are described in this Guide. You can fast-track this process fairly inexpensively by looking at the enrichment and recreation activities you already offer through a STEM lens and developing a framework that takes place over a six to eight week period. Most of the funding you'll need to do this will be for staff development and might already be available in your current budget.

If you've been offering independent or intermittent activities that have increased students' enthusiasm for science, technology, engineering and/or math and can demonstrate this through data you've collected, you may be positioned to apply for STEM-related funding right away to expand these into a Project-based Learning format.

STEP 2: Consider using packaged programs. If you decide to integrate more STEM content during this phase, packaged programs like the ones identified in the first chapter are typically the best way to go. There are great products on the market, and many can be used effectively by your staff regardless of their content-area knowledge or past experience. Although the price tags vary considerably, expenses might be



off-set at least in part by working with County Offices of Education or Regional Innovation Service Providers to take advantage of their low-cost training and lending library resources. If you prefer to purchase these yourself, do some comparison shopping to find the materials that best fit your needs, are grade-level appropriate and can be obtained at the most favorable prices.

STEP 3: Weigh the advantages of hiring outside contractors. It's possible that you might decide to contract with individuals or organizations with expertise in STEM-related areas. Although this can be expensive, fees may be negotiable depending on the length of the contract and the level of commitment you and they are willing to make. And, because they typically provide the, supplies and equipment needed, your costs can be reduced.

The added benefit is that if contracts are for one or two days a week for eight weeks or so, your staff can partner with experts to develop their own skills. It's worth contacting local organizations to inquire about how their involvement might be mutually beneficial and cost-effective.

STEP 4: Establish a plan for developing promising practices. If you already have a Project-based Learning structure in place, you're well-positioned to integrate the practices in this Guide. Your plan might include embedding Youth Development, Common Core and STEM-learning approaches more strategically by working with educators and experts in the field. Or, you might decide that providing more training, coaching and on-site support would be the best use of your time and money. Since the cost of doing either is in staff time and wages, it should be fairly easy to calculate.

Another choice might be to develop new partnerships to help students identify and solve problems in their communities and apply what they're learning in real-life settings. Although the initial expenses are likely to be minimal, transportation and



others costs can drive the amount up and should be taken into account.

You also might want to invest more in evaluation to measure and manage your progress, help you navigate from one phase of development to the next and provide the information you'll need for continual quality improvement. If so, you'll want to determine the comparative cost of doing this internally or hiring an independent evaluator. Either way, although it can be expensive, it can pay huge dividends in your ability to secure funding in the future.

Set Funding Goals And Establish Priorities

Once you've developed a plan and have a reasonable estimate of how much funding you'll need to carry it out, the next step is to determine where and how to find the money. Although it's tempting to apply for funding right away, in the long run it's much more important to begin with a clear picture of what you want your financial portfolio to look like as it develops over the next few years.

STEP 1: Keep your long-term goal in mind. The most successful Expanded Learning Programs understand the importance of securing funding that's balanced, diversified and sustainable. The same principle should apply as you approach the work you'll be doing to make STEM a more integral part of your program. A combination of public and private funding from federal, state and local sources creates a solid foundation for sustainability. Make it your long-term goal to create multiple funding streams as you begin to identify possible investors.

Although your ultimate objective should be to establish a broad portfolio, it makes sense to target those that you already have relationships with first. This might include school districts, private and nonprofit foundations, corporations and local businesses.

Many of the programs we've worked with have found these to be good sources of initial support for their STEM work and have used these investments to leverage larger, more balanced funding later on. Take time to explore whether this might be possible

for you as well. Don't overlook the ways you might partner with districts or other organizations to apply for grants when you have interests in common. Although this might not bring a lot of money into your program in the short-term, it can have huge benefits down the line.

STEP 2: Do a cost/benefit analysis. Your experience in fund development, your success rate in securing grants and your organization's capacity for grant writing are important considerations to take into account before you decide which funding sources make the most sense. To the extent possible, you'll want to generate at least some new revenue early on and expand on this as soon as possible. This requires you to approach your work strategically.

All grant writing takes time and typically calls for a reasonably high level of expertise. While this doesn't mean you have to hire a grant writer, it does mean that you have to have the resources and support systems to make it happen. Equally importantly, no matter what grants you're applying for, you'll be up against stiff competition. Anything you can do to increase the odds that you'll be successful matters. A cost-benefit assessment can help you decide what may be in your favor and what may not be. It begins by looking at the upside and downside of particular kinds of grants.

There are three upsides that make federal grants attractive: 1) The amount of funding, which can be hundreds of thousands of dollars or more; 2) the duration of awards, which can be up to three years or longer; and 3) the national attention your program will receive if it's funded, which can open doors to other funders. On the downside, these grants are difficult to manage, labor-intensive, highly competitive and often require a significant number of high-level partners with solid backgrounds in the proposal area.

Although everyone's experience is different, most programs have found that writing for federal grants is a complex, challenging and exceptionally time-consuming process. For these reasons, they often wait until they're sure they have the history, resources, expertise and partners to have a chance to be successful. And, although state funding is likely to become more available in the next few years, it's currently limited.

It's not surprising that most organizations that are beginning to integrate STEM into their programming focus on securing money from private foundations. In almost all cases, even at the national, regional and statewide levels, these applications are easier to write and, when funded, the money is almost always available sooner.

STEP 3: Pay attention to funder's reputations. It's important to keep in mind that there are fundamental differences between funders that should be considered. Some foundations are easy to work with, and others are more demanding. Some grants are well worth the time it takes to write and manage, others aren't. Some funders have a great track record. Some have been less successful in funding projects that have really made a difference. Some have preferences for particular areas or regions or types of organizations. Others don't. While it's not always possible to know these things, it's worth it to find out as much as you can.

STEP 4: Target mid-level grants. It's also important to be sure you have the infrastructure you need to support grant management. Large grants of \$100,000 or more are appealing because of the dollars they can bring into your organization, but you'll be asked to write detailed reports, stay in contact with Program Officers, identify challenges, assess your progress during the grant period and more. Be sure your program has the capacity to do this before you apply. While this is not meant

to discourage you, remember that the extent to which you meet and exceed funders' expectations will have a direct influence on your ability to secure additional support in the future.

Mid-level grants are commonly available for STEM-related projects and in many ways are the most attractive. Most average between \$25,000 and \$75,000. Many private foundations, corporations and public interest organizations offer grants in this range and are worth exploring. Writing a boiler plate proposal, as will be explained later, can make it relatively simple to apply to multiple funders in this category. Even if your success rate falls short of what you'd like, you still may be able secure enough funding to make a real difference in taking your program to the next level.

Small grants (those under \$15,000) can be very important even though they're typically limited in scope. Community foundations and local businesses are good potential sources. Keep in mind, however, that they can actually cost your program more than they're worth in the time spent writing and managing them. Carefully consider the cost/benefit ratio before you apply.

In-kind contributions are useful when it comes to specific projects and can be secured with much less effort. Many businesses are willing to provide these as part of their community investment and marketing strategies. They should only be used as enhancements to your program or to off-set the costs of particular purchases which you intend to make anyway.

Prepare Before You Act

Successful grant writing requires advanced preparation. It takes time to identify potential funders that are aligned with your objectives – and it matters! Spend your time wisely. It makes a huge difference whether you apply to foundations that share your interests, or are on the margin or don't care at all about what you are asking for. Get as much information as you can before you begin an application process.

STEP 1: Focus on alignment. Your first job is to determine whether a potential grant maker's priorities match yours. Most foundations post awards and examples of the grants they have recently funded on their websites. Find out what they will be funding in the next several months, and what they won't.

Funding priorities change. Don't rely on what might be outdated information. Program Officers appreciate applicants who pay attention to what their Requests for Proposals (RFPs) are asking for, and all too many applicants don't. Read the funding guidelines carefully.

Find out which foundations have given awards that you believe are similar to what you're looking for, both in terms of content and amount. This may seem obvious, but mistakes are commonly made. If you have any doubts, contact them directly. The fastest way to get your proposal into the rejection pile is to ask for something that a funder is no longer interested in.

At the same time, be sure to resist the temptation to apply for funding that isn't really aligned with your interests. Be clear about your priorities, your intentions, your goals and your vision. No matter how much money you might get, it's too big a price to pay if it takes you off on a tangent that keeps you from pursuing what really matters to you. It will undermine the integrity and credibility of your program and can lead to disastrous consequences down the line.



STEP 2: Develop relationships with Program Officers. It's worth it to contact foundations with any questions you may have even if you believe there is strong alignment. Most Program Officers will be willing to talk with you in greater detail about what they're looking for and let you know if they think your proposal would be a good match or not. A few may be willing to send you a more extensive list of the organizations their foundations have supported.

Even a brief phone conversation or short meeting can make a real difference in helping you focus on particular aspects of your proposal or highlight areas that you may not have thought were critical to the decision making process. And, it can give you an advantage over your competitors when your proposal comes up for review.

STEP 3: Ask current grantees for their advice. The more knowledge you have, the better off you'll be. The best source of information is very likely to come from organizations that have been awarded grants from funders you're considering. Although not everyone will be willing to help you, in our experience at least some will. This can be critical in determining which grants to write for and which should be taken off your list. And, it will give you inside information on what funders are really looking for.

STEP 4: Construct a calendar. Once you've developed a list of potential funders, create a calendar that clearly identifies when proposals are due and what's expected in each. Pay attention to funding cycles. Some foundations have specific deadlines for submitting applications. Others accept proposals throughout the year. Some will let you submit full proposals. Others ask for Letters of Inquiry before inviting full applications. Some will inform you of their decisions fairly quickly. Others may take several months. Knowing this will help you approach your work more intentionally.

Keep your calendar updated. Stay on top of new grant opportunities by subscribing to GrantWatch.com or similar publications. Look for announcements on the Afterschool Alliance's website and the California Afterschool Network's web-based newsletters. Check back with high priority foundations at least once a month.

Create A Boiler Plate

Some funders accept a *Common Application Form* (a single proposal that can be reviewed by a number of grant makers to help grant seekers save time and streamline the application process). Most don't. However, although there are different forms and formats for each application you'll submit, you're likely to be asked for the same kinds of information. A typical application is likely to include nine sections:

- A cover sheet
- An abstract
- A needs assessment
- A statement of goals and objectives
- A narrative
- An evaluation methodology
- A sustainability plan
- A budget and budget narrative
- Background and qualifications

You can improve your chances of success by writing a boiler plate proposal that addresses the most important of these and can be tailored to specific Requests for Applications as they come up. Even if you contract with a professional grant writer or there is someone internally who has this responsibility, it's important for you and your leadership team to go through this process yourself.

It will help you in many ways, not the least of which is coming to a deeper understanding of what you intend to do, why it's important, what impact it will have and how much it will cost. And, it can make a huge difference in whether the actual grant writer really understands what you have in mind and can convey it in a clear and convincing way.

Use your fund development plan as a framework for what will become your narrative, which is usually the longest part of most grant proposals. Refer to this section in a few of the grant applications you may be interested in applying for and write a preliminary draft. Finalize it after you've completed each sections below.

STEP 1: Draft a generic abstract.

The abstract is often the single most important part of a proposal. It's the first real content a reader will see, so make it count! As a succinct introduction or proposal summary, it's critical that this be powerful, compelling and intriguing – and clearly aligned with the funder's interests. Spend less time writing about what you will do, and more on the impact you expect to have in the areas that matter the most to them.

A surprisingly high number of reviewers form a judgment about whether they should recommend funding based on the first two or three paragraphs they read. That's why it's so important to be clear and concise about what you want to accomplish, how you intend to do it and how much it will cost. Use language that captures the reader's attention and provides a strong sense of direction. Get the reviewer excited about what's coming up. Create a great first impression. In a highly competitive process, this matters more than you might think!

STEP 2: Make your needs assessment convincing and credible.

Every funding application includes a section asking you to identify the specific issue, situation, opportunity or problem your proposal addresses and the population it targets. Define your scope. Back your statements up with solid research, examples and data.

If the population you're addressing includes a high percentage of low-income Latino and/or African-American students, focus on data that shows how under-represented these groups are in STEM careers and how important it is that they're exposed to these disciplines early on.

If possible, tie this to a larger context by showing connections with regional, statewide or national issues. If it makes sense and is part of your longer range plan, explain how what you intend to do can be replicated on a larger scale. Create a sense of urgency that distinguishes your proposal from others.

STEP 3: Be sure your goals are specific, concrete and realistic.

There's a fine line between over-reaching and under-selling. It's important to draw this line when you identify your goals and objectives. Most reviewers read hundreds of proposals every year. They know what's real and what's not, what can be accomplished during a given timeframe and what can't. And, they have a reasonably good idea of whether what you say you will do can be done with the amount of money you're requesting.

Be clear about what your objectives are, what you want to accomplish, what impact you will have on the target population and why it matters. Avoid making general statements. Focus on exactly how the money will be used, the difference it will make and why it's so important to both their foundation's priorities and your organization's goals.

STEP 4: Don't minimize the importance of evaluation.

All too many grant applicants underestimate the importance of adequately addressing the issue of evaluation. It's not uncommon for funding to be denied because too little time is spent on this section, even when the overall proposal is strong. Be sure to focus on the plan you have for meeting performance objectives and the ways you will demonstrate *measurable* outcomes that will clearly show how many students have benefited and what has really changed as a result of the work you've done.

Most funders don't require an independent evaluation, but if they do you'll be asked to identify the person or organization who will conduct it and include their credentials, background, experience and familiarity with your program. It's a good idea to consider this in advance and include the cost as a budget line item of your draft budget if you decide to include him or her in your proposal. If you'll be doing the evaluation internally, clearly explain how you will go about it; why your approach is appropriate, relevant and meaningful; and who will be responsible.

STEP 5: Be specific about your plan for sustainability.

No funder wants to see the return on their investment go away when the grant period ends. They all want the work they've funded to continue to have an impact in areas that matter to them. This is part of their legacy. It should be yours as well.

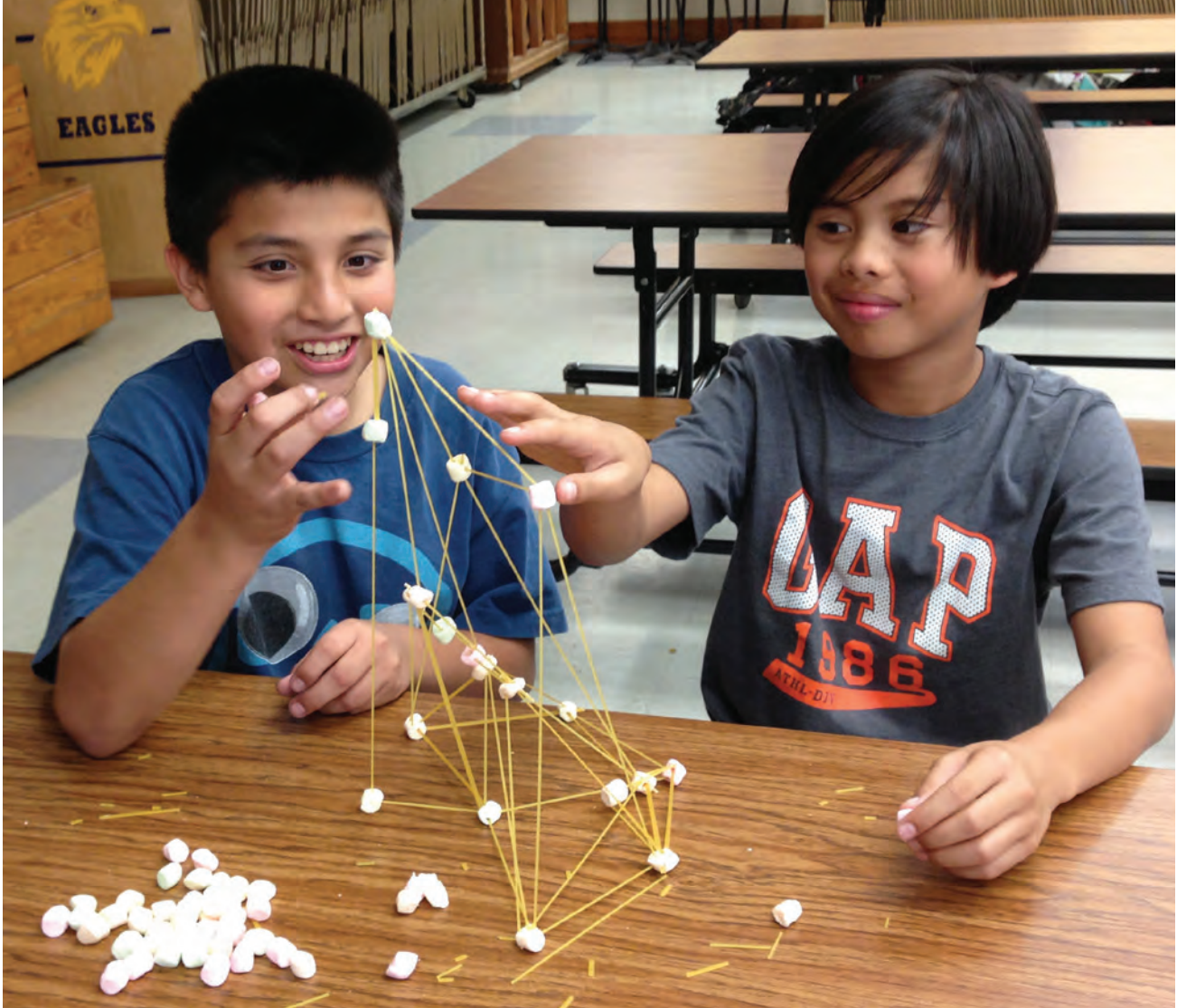
It's up to you to be very clear about how you're preparing for this to happen. It's not enough to say that you'll find other funding later on. Depending on what you're asking for, this can be relatively straightforward or very complex. Take time to think it through and establish a concrete plan in advance.

STEP 6: Create a realistic, detailed budget.

It's tempting to structure budgets based on the maximum amounts that will be funded by a specific grant or to come in just under that amount. While this obviously makes sense, keep in mind that reviewers will know whether the figures are real or whether they're inflated or underestimated. If you really need the highest amount available, say so. If not, it's perfectly acceptable, and prudent, to apply for less if it's within the parameters of the grant guidelines.

Be sure that your budget narrative includes detailed explanations for each line item if this is required, and that these have been carefully and accurately calculated. Don't forget to check the math. It's not uncommon for mistakes to be made and it can seriously damage your chances of success.

If you're able to fund part of the project through sources other than the money you're asking for in your proposal, be specific about how much it is and where it's coming from, and be sure to provide documentation. Some funders will require a match, and you'll have to meet it. Even if they don't, it's often beneficial to include one if you can. Even if it's only 20 percent or so of the entire funding you'll need to support your work, and you're requesting 80 percent, it will show that you've given a great deal of thought to what you want to do and are committed to investing in it yourself.



NEXT STEPS

Once you've gone through the process of establishing your goals, determining how much money it will take to achieve them, surveying the landscape, prioritizing potential funding sources and writing a generic boiler plate, you'll be well-prepared to put your plan in place.

As you do this, stay focused. Always keep in mind that embedding science, technology, engineering and math into your work will strengthen the quality of your program and make a huge difference in students' lives. Move ahead as quickly and as intentionally as you can. Begin the journey and create the future!

PRACTICE #5: SAMPLE PROGRESS INDICATORS

Secure Adequate, Sustainable Funding

The purpose of this tool is to help you establish a baseline, create action plans and track your progress in becoming exemplary in this Practice area. Reviewing these indicators with your staff and partners every month or so will enable you to move more quickly toward achieving your goals. Key:

1. We haven't addressed this yet, or are just beginning to work in this area
2. We've done some work in this area, but have a long way to go
3. We've made significant progress and are doing reasonably well
4. We've achieved a high level of success in this area
5. We are clearly outstanding in this area and everyone would agree

INDICATORS		1	2	3	4	5
1	We have a solid 18-month fund development plan in place					
2	We are clear about our goals and objectives as they relate to embedding STEM into our program					
3	We have established a detailed projected budget					
4	We have assessed the cost-effectiveness of applying to different funders for different amounts of funding					
5	We have a system in place to identify funders that have interests that are clearly aligned with ours					
6	We have established relationships with prospective funders					
7	We have created a fund development calendar					
8	We regularly review new grant opportunities as they are posted					
9	We have written a boiler plate draft proposal					
10	We understand the importance of securing long-term balanced, diversified and sustainable funding					

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