Make Do Share

Sustainable STEM Programming

for and with Youth in Public Libraries

About the Project

The "Make Do Share" project was made possible in part by the Institute of Museum and Library Services IMLS number LG-80-15-0085-15. The Institute of Museum and Library Services is the primary source of federal support for the nation's 123,000 libraries and 35,000 museums. The mission of IMLS is to inspire libraries and museums to advance innovation, lifelong learning, and cultural and civic engagement. Its grant-making, policy development and research help libraries and museums deliver valuable services that make it possible for communities and individuals to thrive. To learn more, visit www.imls.gov and follow IMLS on Facebook and Twitter. The views, findings, conclusions or recommendations expressed in this publication do not necessarily represent those of the Institute of Museum and Library Services.

About Kitsap Regional Library

Kitsap Regional Library "inspires our community to dream more, learn more, do more and be more," serving Kitsap County's 258,000 residents through nine locations, a digital library, bookmobile and outreach services for our homebound patrons.

The Library has more than 400,000 physical items in its collection, bolstered by online access, free access to dozens of online research tool and downloadable e-books, audiobooks and music.

Our communities include unincorporated rural and semi-rural areas with limited transit, two Native American tribal lands, a Seattle bedroom community, a naval base, waterfront villages and a working class city where two-thirds of students receive free or reduced lunch. The model we have created is uniquely suited to support libraries, librarians and youth in diverse environments.

Our annual goals are derived from our Vision 2020 Strategic Plan.

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Our Guides

These guides are intended to serve as a springboard for public libraries of all types to either begin building STEM programs or to enhance existing efforts

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Context for the role that libraries can play in supporting STEM learning

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Make Do Share

Why STEM and Libraries?

Why STEM and Libraries?

"I don't have any dreams."

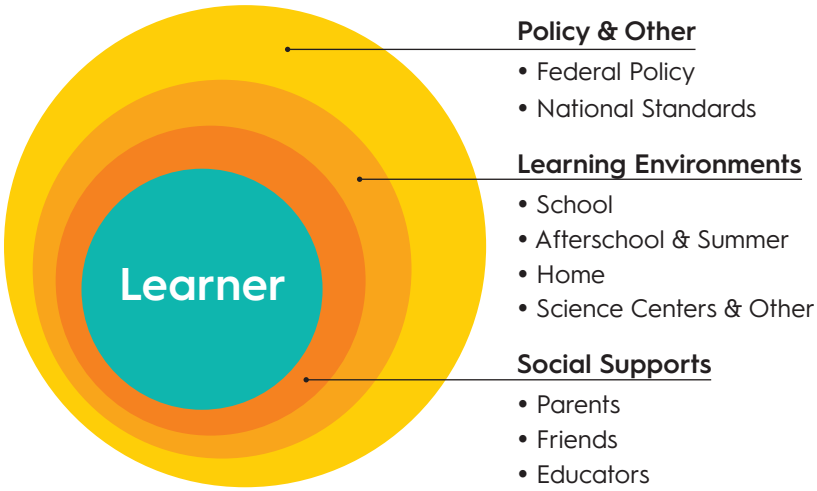
Charles was a struggling teen trying to turn his life around when he said these words. He enrolled in job training at The Coffee Oasis, a service organization for homeless and at-risk youth. But without any dreams or goals for himself, he was not making progress.

Then Charles discovered BiblioTEC, Kitsap Regional Library's innovative STEM learning program for at-risk youth. "Suddenly a light bulb went off in this young man's head," marveled his case manager, Ken Walls. "A passion emerged. Charles' talent for the technical became apparent. This is truly a success story."

Charles is now enrolled in community college studying engineering, a future he could not have imagined just months earlier. Because of library-led connected STEM learning and a powerful community partnership, Charles "found a dream."

Make Do Share is an IMLS grant-funded project led by Kitsap Regional Library. Building on the proven success of BiblioTEC, an initiative funded through the Paul G Allen Foundation, this project provides an adaptable framework to encourage and support public library staff in a variety of settings to design and implement meaningful STEM programming for and with youth. The intention of Make Do Share is to live beyond the focus on a specific programming idea – robots or game creation – or equipment tutorials – how to use a Makey Makey or Snap Circuits. Instead, we focus on the concepts, resources and best practices that have helped our system and staff move forward with a learner-centered STEM ecosystem in each of our nine locations. At the core of this ecosystem is a recognition that STEM learning can happen anywhere, involving a variety of stakeholders and institutions. The goal is to develop and grow effective school and community partnerships and build an environment where staff honor and leverage youth voice. We believe that Make Do Share will not only achieve impact in 2016, but will continue to help youth gain the skills they need for success in life well into the future

Ecosystem of Learning



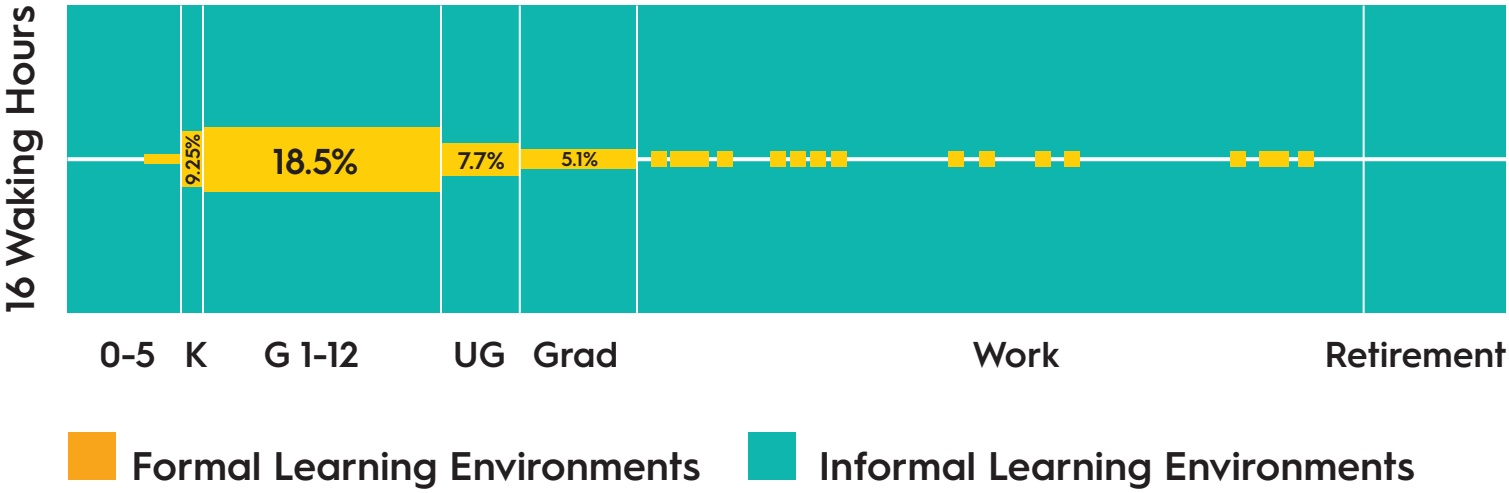
Why STEM?

The national conversation around the need for increased STEM education has grown in volume and nuance in recent years with good reason. According to the U.S. Department of Commerce[2], growth in STEM-related careers has grown at a rate three times faster than non-STEM careers. That pace is not expected to slow as almost all of the 30 fastest growing jobs projected from 2008-2018 will require a STEM-related skill.[3] In this environment, it's important to highlight the fact that with globalization, technology and a knowledge-based economy, the lines have blurred on where and how STEM related skills might be utilized. STEM related skills and tenants are increasingly seen outside of the traditional STEM fields. Further, tenets of quality STEM education, such as collaboration, problem solving and critical thinking, are likely to serve youth as the career landscape continues to shift and evolve.

Despite the great opportunity for youth to engage in the STEM field, performance by American students in math and science remains mediocre as compared to their

1 Krishnamurthi, Anita. STEM Learning across Settings: Cultivating Learning Ecosystems. Digital image. Afterschool Snack. Afterschool Alliance, 18 Feb. 2014. Web. 10 Jan. 2016.
2 STEM: Good Jobs Now and for the Future, U.S. Dept. of Commerce, Economics and Statistics Administration, 2011.
3 The 30 fastest growing occupation 2008-18, U.S. Bureau of Labor Statistics, 2010.

Lifelong & Lifewide Learning



global counterparts. PISA results from 2012 placed the U.S. an unimpressive 35th out of 64 countries in math and 27th in science.[4] Not surprisingly, many American students are also underprepared for college level math and science courses. In 2011, only 45 percent of U.S. high school graduates were ready for college work in math; 30 percent were ready in science.[5]

Why STEM in Libraries?

As key community stakeholders, libraries play a role in collective efforts to address local challenges. As states like Washington struggle to fill over 45,000 STEM jobs in the coming years,[6] schools, nonprofits and businesses need to merge efforts in order to support youth and local economies.

Libraries are locally embedded institutions of learning with dedicated staff providing free access to classes and events and are well-positioned to support informal learning. Library staff have the skills to support acquisition of literacy skills — information, digital, media and so on. Additionally, libraries reach a broad, diverse and underserved population.

Students in grades K-12 spend an astounding 81.5 percent of their waking hours outside of school. The importance of meaningful outcomes in an afterschool setting cannot be overstated.[7]

Without the demands of testing or rigid curriculum, library environments allow youth to engage in interest and passion based learning and to explore a variety of topics in a low-stakes, hands-on setting. Integrating STEM and STEM relevant skill building into that equation will help kids and teens attain the skills they need to be successful in school, careers and life.

4 Fleishman, H.L., Hopstock, P.J., Pelczar, M.P. and Shelley, B.E. (2010) Highlights from PISA 2009: Performance of U.S. 15-Year-Old Students in Reading, Mathematics and Science Literacy in an International Context (NCES 2011-004). Washington, D.C.: National Center for Education Statistics, U.S. Department of Education. Retrieved Oct. 7, 2011, Courtesy of Change the Equation.
5 The Condition of College & Career Readiness. Iowa City, IA: ACT, Inc., 2011
6 Great Jobs Within Our Reach: Solving the Problem of Washington State's Growing Job Skills Gap. The Boston Consultancy Group and the Washington Roundtable. March 2013.
7 LIFE Center (2005). "The LIFE Center's Lifelong and Lifewide Diagram." This diagram was originally conceived by Reed Stevens and John Bransford to represent the range of learning environments being studied at the Learning in Informal and Formal Environments (LIFE) Center (http://life-slc.org). Graphic design, documentation and calculations were conducted by Reed Stevens, with key assistance from Anne Stevens (graphic design) and Nathan Parham (calculations).

Make Do Share

STEM Library Roadmap

Introduction

Whether you are a seasoned STEM programmer or brand new to it, it can be easier to put the bulk of your energy towards tools, like 3D printers and Makey Makeys, instead of focusing on ways to help youth critically think and problem-solve through the use of those tools. We live in an era where rapid changes in technology have created new and innovative ways to learn, socialize, teach and play. As places for discovery, libraries are often expected to meet the demand set by youth to explore the latest "big thing." The pressure to provide specific STEM related tools can come from the community as schools adapt to new curriculum and parents struggle to keep up with digital tools.

Even if you know a program is in high demand, it's important not to lose sight of all the activities required to create successful service. These happen outside of hosting a well-attended program and allow you to leverage youth engagement, maximize participant and community expertise, as well as help you achieve sustainability as the "next" big thing gives way to the "next, next" big thing. Even a great one-time event filled to the brim with educational content can be improved by taking the time to reflect upon how learned skills and knowledge might be leveraged in future events, how community partners could contribute and how relationships might be maximized.

How do you actually do this? According to the National Research Council's "Identifying and Supporting Productive STEM Programs in Out-of-School Settings" (National Research Council, U.S.; Feder, M.A., National Research Council, U.S.; & National Research Council, U.S., 2015), activities related to the development and support of a productive program may include:

- Understanding the local conditions for community programs that support STEM learning: Building a map and bridging the gaps
- Designing programs to achieve access, equity, continuity and coherence: Connecting young people to opportunities to learn
- Supporting the use of creative and responsive approaches to evaluate the success of programs at the individual, program and community levels: Support innovative evaluation approaches
- Increasing the professionalization of out-of-school program leaders and staff: Providing professional development
- Strengthening the STEM learning infrastructure: Building an infrastructure that will last
- Invest in research to improve our understanding of STEM learning in out-of-school programs: Explore how STEM learning ecosystems work

This Roadmap will provide you with context, activities and suggested resources that will support your institution's progress in each of these recommended areas. Because sustainability is at the forefront of our approach, we recommend that youth-program facilitators collaborate with colleagues, managers, administrators and community stakeholders as appropriate. Roadmap planning may at times require organizational or community goal setting, new ways of thinking about and scheduling staff and creative problem solving about how to collectively serve the needs of your community. It truly takes a village so please don't go it alone.

If the purpose of the Playbook is to share a programming framework and specific STEM program ingredients, the intention of the Roadmap is to help you build an organized and functional kitchen where you'll be able to create something beautiful with those ingredients. Think of each section as a big picture concept that you can prioritize for yourself or your library, dig into, reflect upon and revisit as needed. Like any good kitchen, it might get a little messy sometimes, but isn't that how the most delicious meals are made?

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STEM Library Roadmap

Discover Your Community

Limited staff capacity is a fact of life in many libraries. Engaging in a community discovery process or needs assessment will allow you to collect evidence and make informed decisions about the most strategic ways to implement STEM programming in your community, even with a limited amount of time. This can be a useful activity for experienced programmers wishing to fine-tune their offerings, as well as those just getting their feet wet.

As you begin, make a point to test your assumptions. Through this process, spend time connecting with those you don't see or interact with on a regular basis. Discover and map groups and key stakeholders that may exist in your service area — e.g. a STEM related business group, an active parent network, retired STEM professionals, etc. Potential activities may include:

- Analyzing public census and local school district data. Are there specific demographics to engage? Who are the stakeholders?
- Talking to the community and finding out what they see as the biggest needs for youth. Make sure you listen and don't spend time simply talking about what you can offer. Talk to teachers, store owners, police and fire department staff, parents and caregivers, out-of-school time providers, youth development stakeholders, etc.
- Taking a colleague on a community drive. Before you go, develop a list of what you are trying to learn from the experience. Are you looking to see how many different venues there are for youth to take part in out-of-school time activities? Do you want to take note of where out-of-school time organizations are housed and how that relates to the transportation needs of youth? Do you want to look for the different types of organizations and facilities there are for families to participate in out-of-school time activities? Go with a series of learning objectives. Then, with your colleague, reflect on what you noticed and how that has an impact on what STEM initiatives you might plan for youth and families.
- Initiating a community mapping project. Community mapping can be an outgrowth of the community drive. In this instance, the map (which doesn't need to be a map specifically) is a way to collect basic information about all of the organizations and services available to youth and families that you might work with to develop and implement STEM learning opportunities for youth and families.
- Initiating a social mapping project. A social map gives you the chance to learn from community members — families — where they spend time and why. For example, you might show community members a list of "social" spots in the community with everything from coffee shops to movie theaters to out-of-school time facilities. Ask people to talk about where they spend their time, why, etc.

Resources for Further Learning

- Annie E. Casey Foundation. Kids Count Data Center. Web. 10 Jan 2016. **http://datacenter.kidscount.org/**
- Ready by 21. Program Landscape Mapping Packet. Web 10 Jan 2016. **http://www.readyby21.org/resources/program-landscape-mapping-packet**
- U.S. Department of Education. Data and Research. Web. 10 Jan 2016. **http://www2.ed.gov/rschstat/landing.jhtml?src=image**
- Work Group for Community Health and Development. "Assessing Community Needs and Resources Toolbox" Community Toolbox. University of Kansas. Web. 10 Jan 2016. **http://ctb.ku.edu/en/assessing-community-needs-and-resources**

Do worksheet

Community Discovery Record

Remember, your community is changing all the time which means that the community discovery process should be ongoing and not a one and done effort. Use this template to keep track of what you do and learn during the community discovery process.

Technique of discovery and what you hope to learn	Date started	What you learned	Next steps based on learning

Sample Social Mapping Template

Community Social and Recreational Locales

Location	Spend time there?	How often?
Example: YWCA	☐ Yes ☐ No	☐ Daily ☐ Weekly ☐ Weekends ☐ Monthly ☐ Other
	☐ Yes ☐ No	☐ Daily ☐ Weekly ☐ Weekends ☐ Monthly ☐ Other
	☐ Yes ☐ No	☐ Daily ☐ Weekly ☐ Weekends ☐ Monthly ☐ Other
	☐ Yes ☐ No	☐ Daily ☐ Weekly ☐ Weekends ☐ Monthly ☐ Other
	☐ Yes ☐ No	☐ Daily ☐ Weekly ☐ Weekends ☐ Monthly ☐ Other
	☐ Yes ☐ No	☐ Daily ☐ Weekly ☐ Weekends ☐ Monthly ☐ Other

Do worksheet

Sample Community Stakeholder Questions

- Why is STEM important to you?
- How does your organization support STEM learning? (examples: staffing structure, specific interventions, trainings, funding)
- How does your organization support 21st century skill building?
- What are some of your greatest successes and achievements?
- What are some of your greatest challenges or obstacles?
- What should the youth librarians in your area know about school or community STEM activities?
- How can the Library support or build upon the work that you do? i.e. specific areas of programming focus, projects, etc.
- Knowing your students, what potential barriers or challenges do you see for STEM or connected programming in the informal/afterschool space?
- What strengths or assets do you see for your students contributing to or participating in informal/afterschool STEM learning?
- What support system do you have to do STEM work? Trainings? Peer meetings, etc?
- What should we know about the state of STEM/21st century learning in our community as we move forward?
- Are there district or school level contacts we should be aware who may be interested in contributing in an advisory or volunteer capacity?

Sample Youth Focus Groups Guide

Opening: *Thanks for taking the time to talk with me this afternoon. I'm working with the library and want to learn a bit about how you spend your time when not in school. The information you provide will help the library develop classes and events at nearby libraries, schools and community organization sites. Anything you say will be confidential and I expect that this conversation will take about 45 minutes — at most an hour.*

1. Icebreaker

2. Tell me something about what you did over the summer.

a. What did you spend most of your time doing?

b. What did you participate in that you thought was the best thing you did all summer? Why?

c. What did you participate in that you thought was the worst thing you did all summer? Why?

3. During the school year, when you aren't in school, what do you tend to like to spend time doing?

a. Why do you like that?

b. What gets in the way of your doing that?

4. Is there something that you wish you could spend time on in the summer or during the school year when not in school that you don't get to do much or at all?

a. Why would you like to do that?

b. What gets in the way of doing that?

5. What's your interest in learning about, planning and/or helping out with programs on topics like coding, Minecraft, anime, photography, filmmaking, etc.?

6. What's your interest in gaining more skills and knowledge about being a leader, planning projects, working as part of a team, thinking through new ideas (critical thinking), etc.?

7. What has an impact on your decision about whether or not you are going to participate in something? Prompts might include what your friends say, how you learn about it, where it is, time of day, etc.

8. What are you looking most forward to for the next few months? (School or non-school related are OK.)

Closing: *Thanks again for talking with me today. It's been really helpful. Any final thoughts or questions?*

Focus on Relationships with Youth & Families

For out-of-school STEM initiatives to succeed it's essential to build strong relationships with youth. Although the STEM Library Playbook includes a number of specific examples to support relationship building, general considerations when engaging with youth include:

- Creating a comfortable, welcoming enviroment
- Learning names of youth as quickly as possible which is a sign of respect
- Promoting trying things out, risk-taking and trial and error
- Showing that you too make mistakes and sometimes have to try something more than once in order to succeed
- Demonstrating that you know you aren't perfect will help youth feel it's OK that they aren't perfect
- Integrating youth voice into initiatives by giving youth of all ages the chance to come up with ideas
- Respecting the youths skills and abilities by giving them a chance to mentor others
- Learning from youth by asking them to show you how to do something and get their advice on how to make things work better
- Understanding their passions and interests by having conversations that allow you to learn beyond what they are involved in during the program
- Expecting the best from all youth participating in library programs

Depending on community needs, you may wish to target your STEM programs to a specific youth demographic. Whether parents and caregivers actually attend your events, establishing relationships with the whole family is key. When engaging families strive to:

- Build trust and respect by being honest and clear with families if a particular age group is best suited to a program
- Get to know the names of parents and caregivers of participants, even if they are just there to drop off
- Communicate the goals of the program and touch base on the progress and contributions that his or her youth has made
- Make sure that any interactive components with small or large groups include adults as well as youth when adults are in attendance (for example, adults and youth should be involved in community building and reflection activities)
- Get to know the interests and expertise of adults in attendance to give them the opportunity to engage with youth around that expertise
- Prepare interns and volunteers for inclusive family events by helping them think and plan on how they can work with both adults and youth successfully. It's possible that the teens and young adults will not feel as comfortable coaching and mentoring adults, so give them opportunities to talk about it and practice.

Share

An Example of Youth & Family Engagement

At the beginning of the program have everyone sit together in a circle and talk about what you're going to be working on that day. Talk with the youth and families about the ground rules you need to set. For example, talk with them about the best way to share materials and make sure that everyone agrees. You might say something like:

"There are a lot of different materials we're going to be using today. What do you think we can do to make sure everyone has access to what they need?"

Once you have some ideas, ask everyone to vote on what they think will be the most successful.

Resources for Further Learning

- Akiva, Tom and McGovern, Gina. Building Community Guidebook. Ypsilanti, Michigan: David P Weikart Center for Youth Program Quality, a division of the Forum for Youth Investment, 2011. Print.
- MIT Media Lab. Family Creative Learning Facilitation Guide. Web. Jan. 10, 2016. **http://family.media.mit.edu/**
- Ramaswami, Ravi, et al. Ask Listen Encourage Guidebook. Ypsilanti, Michigan: David P Weikart Center for Youth Program Quality, a division of the Forum for Youth Investment, 2011. Print.
- SEARCH Institute. Parent Further. Web. 10 Jan 2016. **http://www.parentfurther.com/**

Develop Community Connections

Developing strong community relationships will not only positively impact your STEM program planning process. They will also increase your capacity and potential impact. Consider:

- Connecting with out-of-school time providers who work with youth and families and listen to what their needs are. Find out what they would love to provide youth and families and think about ways your STEM programs can support those wishes. Learn what they do well and think about how you might incorporate that knowledge or expertise.
- Connecting with social service agencies and listening to what their needs are. Get their perspective on where the gaps in service to youth and families are and think about ways STEM programs can help to fill in those gaps.
- Connecting with business leaders and post-secondary institutions and listening to what their needs are. Find out what opportunities and challenges exist in your community for youth as they enter the workforce or college.
- Being seen as an involved member of the community by attending community events and meetings where parents and youth workers are. Get to know people at those meetings. Do this on a regular basis. One-time focus on community involvement isn't enough.
- Working with teens and young adults to help build community connections. Find out what teens think are good ideas for learning about what youth and families need. Teens and young adults can do the fact-finding with and for you.
- Finding out from a variety of community stakeholders what the best time and place for STEM programs might be. Make sure to focus not on the competition of the programs and services but on the ways in which you can support and complement each other.

For templates and guides created by Kitsap Regional Library to assess staff, youth and community STEM connections please see Appendices in the Playbook.

Creating a STEM Ecosystem Through Collective Impact

Collective impact is a framework that gained prominence in 2011 after an article, "Collective Impact: Creating Large Scale Social Change," appeared in the Stanford Social Innovation Review (SSIR). The article brought to light the idea that in many communities organizations are working towards the same goal but don't necessarily work together to reach that goal. These organizations would be more likely to reach these goals and have long-term and widespread impact if they worked together.

The authors of the SSIR article listed five conditions for collective success:

- Collective Agenda: Focuses on a shared vision and common understanding of the problem
- Shared Measurement Systems: Collecting data and measuring results together
- Mutually Reinforcing Activities: A joint plan of action
- Continuous Communication: Trusting, consistent and ongoing communication
- Backbone Support Organizations: A separate organization coordinating and managing the process

In recent years, this concept has been researched and adapted to specifically address STEM education for what has become known as STEM ecosystems. According to stemecosystems.org, an initiative of the STEM Funders Network, "Ecosystems are complex and messy, and not necessarily linear. The goal of ecosystem cultivation is not to design the same STEM experience for all young people—but to maximize, grow and connect STEM learning opportunities so all young people have access to robust and connected learning experiences along pathways that are individualized according to their own interests."

Although STEM ecosystems can require institutional and cross-sector commitment in order to be successful, the concept of co-ownership is powerful, even on a very local scale. As you work with community members and organizations, keep in mind the importance of working together to more effectively meet goals and support youth and families. Think about how you can build relationships in order to begin developing, or continue developing, the five conditions for success.

Resources for Further Learning

- Ready by 21. Building Blocks for Effective Change: Broader Partnerships, Bigger Goals, Better Data and Bolder Actions. Web. Jan. 10, 2016. **http://www.readyby21.org/toolkits**
- Remake Learning. "The Learning Network." Remake Learning Playbook. Web. Jan. 10, 2016. **http://remakelearning.org/playbook**
- STEM Ecosystems. Key Resources. Web. Jan. 10, 2016. **http://stemecosystems.org/key-resources/**

Plan for Impact

DML Research Hub's tweet references an article titled "Teaching Tech to Teachers" that also includes a quote from a teacher who says "What they are developing is the skills that they are going to need in their jobs and that is team work, interpersonal learning [and] co-operative planning." This acknowledges an important mindset about integrating technology in learning experiences, because the tools—robots, coding, 3D printers, etc. —will undoubtedly change. The real focus must be on the skills youth need to learn no matter what tools are used.

Outcomes are the skills and learning that result from a structured, well-planned program and are shown as a change in skill, behavior, attitude or belief. By clearly defining your intended outcomes as the primary step in your planning process, your reach will be broader, achieving a greater impact and increased focus. As an example, consider the following scenarios:

- **Library A** hosts a robotics program. Staff layout equipment and step-by-step instructions and help youth build a robot.
- **Library B** hosts a multi-session STEM program. Staff ask youth to design a robot to address a particular problem or issue that exists in their life. After presenting their ideas and getting feedback from the group, youth research the basics of the library's existing robotics equipment and as a group, decide how it might be used to address one of the afore mentioned problems. Participants discuss the actions required to build the robot, identify who is in charge of each aspect and work together on their creation. Once the robot is built, they test its ability to solve the intended problem and iterate the activity as necessary.

Clearly, it's easier to plan program A, but are the possible impacts the same? The outcome for program A is that participants will build a robot. Although this provides youth with an opportunity to access technology, this program doesn't connect learning to school or youth interests, encourage meaningful peer learning, or make connections between STEM and real-life problem solving. You will have spent time gaining content knowledge in order to lead the program, but without additional equipment or training, the program doesn't really lend itself to additional learning.

The outcome for program B is that participants will engage in inquiry based learning to address a real-life problem. They will develop 21st century skills like project management, perseverance and creativity as they develop a rich understanding of a relevant technology. You will have spent time gaining content knowledge which you will be able to further leverage as participants develop additional projects in future sessions. Since participants are likely interested and engaged in the topic due to the personal connections that have been made, you can now spend time working towards related outcomes like connecting robotics to potential career pathways by working with adults in the community with expertise in that field.

The STEM Library Playbook was developed with three overarching outcomes identified in the Afterschool Alliance's Defining Youth Outcomes for STEM Learning in Afterschool:

1. Developing an interest in STEM and STEM learning activities
2. Developing a capacity to productively engage in STEM learning activities
3. Coming to value the goals of STEM and STEM learning activities

The full framework, as presented in the above report can be found in Roadmap appendix A. You may want to scaffold your outcomes over time to move from initial interest in STEM, to more complex activities. To do this, consider creating a "Theory of Change," described in appendix B.

Support STEM Interest

Building on youth interest and passions can be a key strength of public library programs for youth. As operators of a space beyond school and formal afterschool programs, libraries allow youth to explore ideas without the

constraints of cost, time or predetermined curricula. Leveraging youth interest in STEM programs creates an opportunity to reach youth who may not see themselves in STEM. It's well documented that women and minorities score lower in STEM subjects in school and are underrepresented in the STEM field. Libraries can play a role in changing that.

Continuously engaging in community discovery, as well as nurturing strong relationships with youth and families, will give you a strong sense of local interests and how they might be developed in a program environment. Beyond that, creating an environment where youth have the opportunity to have voice and ownership in programs is also essential. This can be done in a variety of ways by intentionally structuring or scaffolding programs to maximize youth ownership and incorporating youth interns and volunteers. Design thinking and project based learning (described briefly on page 18) work well for maximizing youth voice and interest.

Finally, as you encourage STEM interest, strive to be cognizant of the language and encouragement that you use when you engage in STEM programming with youth, as well as the way that you model STEM engagement. Help youth embrace a "growth mindset" that helps them see that curiosity, engagement and perseverance are just as — or more — important than innate talents.

Foster STEM Skill Building

An understanding of the need to discover, ask questions and test assumptions through inquiry-based learning is fundamental to any STEM endeavor. This is where you, despite background expertise, can model learning and even co-learn with youth. Because STEM is a concept based on cross-curricular approaches to real-world applications, development of 21st century skills will support the development needed for successful navigation of that interdisciplinary paradigm. Depending on local conditions, age, audience and program type, the number and type of skills you integrate into your planning will vary. Consider what's appropriate for your conditions and adjust from there.

Encourage STEM Connections & Pathways

This final impact area is where you will have the opportunity to utilize elements of all of the Roadmap activities undertaken so far. By this point:

- Program participants will have gained an interest in STEM and built STEM relevant skills and knowledge. Through the process of questioning and discovering, they will connect STEM learning to everyday environments and will become curious about possible future pathways.
- Through the design, implementation and iteration of out-of-school STEM activities, you will have an understanding of your community. Whether you have begun to create a STEM ecosystem or not, you will have identified key community stakeholders including educators, out-of-school providers, parents, STEM experts, or business people.

From here, you can begin to:

- **Leverage Community Connections** — In order to make STEM learning relevant to youth, connecting concepts and projects to the local environment or solving local problems is essential. Stay connected to local trends and topics through ongoing community discovery and relationship building.
- **Connect Youth to Specific Expertise** — As participants begin to regularly attend or ask questions through longer project based programs, connect them to stakeholders in the community to deepen their learning. This might include in-library guest appearances, joint programs with partner organizations or off-site field trips. When bringing in new stakeholders, always orient them in your program's structure and goals and overall learning objectives.
- **Bring in Caring Mentors —** Mentors provide youth with opportunities to connect with and learn from caring community stakeholders. Whether engaging peer or adult mentors, set clear expectations about the mentor's role and responsibilities, including both short-term and long-term goals for the position.

Make notes

Inquiry-Based Learning	Project-Based Learning	Design Thinking
Youth have opportunity to answer questions in order to learn about the topic being addressed	As a part of their learning, youth focus on solving a problem	Youth integrate both inquiry and problem-based learning in order to learn about an issue, design a solution, prototype, and test their work
For example: As youth develop an anime podcast they answer questions about what makes a good listening experience and what they need in order to create that experience	For example: As youth develop an anime podcast they set out the tasks required in order to complete their podcast and assign roles and timelines	For example: As youth develop an anime podcast they talk to listeners to find out what they would like in a podcast, produce a sample, have listeners give feedback, and revise their work based on that feedback

Achieving Impact Through Facilitation

When you plan and facilitate a program or series which supports any one of the above outcomes, consider how the structure might support learning and engagement. Design thinking, project-based learning and inquiry-based learning are facilitation techniques which you should be aware of as you begin to plan programs using the STEM Library Playbook.

Resources for Further Learning

- Akiva, Tom and McGovern, Gina. Cooperative Learning Guidebook. Ypsilanti, Michigan: David P. Weikart Center for Youth Program Quality, a division of the Forum for Youth Investment, 2011. Print.
- Akiva, Tom, et al. Youth Voice Guidebook. Ypsilanti, Michigan: David P Weikart Center for Youth Program Quality, a division of the Forum for Youth Investment, 2011. Print.
- Buck Institute for Education. Project-Based Learning Resources. Web. March 15, 2016. **http://bie.org/resources**
- Exploratorium Institute for Inquiry. Facilitators Guides. Web. Jan. 20, 2016. **http://www.exploratorium.edu/education/ifi/workshops/facilitators-guides**
- Ideo. Design Thinking for Libraries. Web. Jan. 20, 2016. **http://designthinkingforlibraries.com/**
- MindsetOnline. The Mindset. Web. March 15, 2016. **http://mindsetonline.com/whatisit/themindsets/index.html**
- Stanford University Institute of Design. d.School Virtual Crash Course in Design Thinking. Web. March 15, 2016. **http://dschool.stanford.edu/dgift/**

Assess & Reflect

Assessment of out-of-school STEM programming will help you track participant outcomes that you've set, improve program quality and monitor activities to strengthen your local STEM ecosystem. There are a variety of existing tools (see the resources for links to these) to use or adapt as needed to suit your working environment. Even if you aren't able to integrate anything overly formal, the practice of taking the time to check

and reflect will improve over time and lead to a more successful initiative. Below are examples of possible resources for tracking individual outcomes, program quality and the success of your local STEM ecosystem.

Individual Outcomes

Tracking outcomes may differ depending on the type of programs that you're providing. For example, in a one-time program, simple observation of whether participants learned a skill or exhibited the intended behavior (e.g. excitement about a STEM topic) may suffice. If you've scaled your outcomes to progress over a longer period in a series or regularly occurring type situation, a pre and post survey to track deeper developments over time would be more appropriate.

The STEM Library Playbook includes several examples for determining success in individual outcomes.

Program Quality

Out-of-school STEM programmers not only need to have clearly identified outcomes, they should also continuously adapt to the needs of kids, teens and families in attendance and create a welcoming and engaging environment.

The STEM Library Playbook includes several examples that help in assessing and thinking about program quality outcomes.

Community Ecosystem

As with any living organism, a STEM ecosystem needs to be fed and nurtured in order to remain relevant and viable. You might start with individual activities such as periodic community discovery activities and informal check-ins with local providers and stakeholders, working towards organized meetings, joint outcome creation and shared goal setting.

The STEM Library Playbook includes several examples that relate to the care and feeding of a community ecosystem.

Resources for Further Learning

- David P Weikart Center for Youth Program Quality. STEM Youth Program Quality Assessment. Web. Jan 20, 2016. **http://cypq.org/downloadpqa**
- Program in Education, Afterschool and Resiliency (PEAR). Common Instrument. Web. Jan. 20, 2016. **http://www.pearweb.org/tools/commoninstrument.html**
- STEM Ecosystems. Resources. Web. March 15, 2016. **http://www.pearweb.org/tools/commoninstrument.html**

Engage in Professional Learning

Making time for your own learning is essential to out-of-school STEM programming. Although it can be a challenge, carving out the time to reflect on strengths and weaknesses, dig into specific content knowledge and stay abreast of educational trends and new technology will ensure that your offerings remain relevant and impactful.

As you empower youth and families to achieve outcomes related to STEM and discover the joy of continuous learning, you'll also develop your own capacity as a library leader. As a result of engaging in this work you will:

- Better understand the role of the library in developing STEM-based programs
- Increase your ability to facilitate STEM-based programs
- Increase your ability to help youth facilitate their own learning
  - Understand how to integrate digital tools with facilitated learning experiences
- Strengthen your skills in supporting youth's acquisition of 21st century learning and digital media skills
- Gain skills in program design
- Gain skills in assessing learning
- Strengthen your ability to assist youth in seeing how they can connect STEM to their day-to-day lives
- Strengthen your ability to assist youth in an interest in pursuing a STEM related career

Do worksheet

Continuous Learning Plan

A continuous learning plan will help you figure out what skills you need to succeed in working with youth on STEM and 21st century skills. As you work with your plan, reflect on the work you do and review and revise your professional learning goals along the way. Start by asking yourself these question:

How comfortable am I facilitating multi-part STEM-based learning series for tweens and/or teens? Select all that apply. I need:

- ☐ A better understanding of how to develop lesson plans
- ☐ Help developing tweens and/or teens multi-session STEM classes and events
- ☐ Help facilitating a STEM-based activity
- ☐ Help learning how to craft outcomes
- ☐ A better understanding of accessing activities and make changes along the way
- ☐ A better understanding of how to assess success at the end of a session and revising based on what worked and didn't work
- ☐ Information on how to help tweens and/or teens reflect on learning
- ☐ A better understanding of how to connect an activity to STEM-based ideas
- ☐ Help connecting to others in the community who can support STEM activities
- ☐ Other _____

What environments and formats do I prefer when learning? Select all that apply:

- ☐ Hands-on
- ☐ Physical texts
- ☐ Digital texts
- ☐ By myself
- ☐ Collaboratively
- ☐ Short, 15-minute time spurts
- ☐ Dedicating one or more hours at a time
- ☐ Noisy environments
- ☐ Quiet environments
- ☐ Other _____

Take a look at your answers. Think about what they tell you about your preferred learning styles. As you assess your program for individual outcomes, reflection activities during and at the end of each program event can prove very useful. There are many ways to have youth reflect on their learning. Here are just three ideas:

- If youth create a product, they can take a photo and caption it with information about the project and process.
- Throughout the program, ask youth to pause and talk about what they like and don't like about what they're doing. What would they like to be able to do that they can't at the moment?
- Have youth interview each other about the program and then report what each said about what they worked on and what they learned.

As you create a continuous learning plan using the template on the next page, think about how your learning styles inform how you will achieve the goals you outline.

Desired outcome	**How will I get there?**	**How did I get there?**	**Reflection - How did I use this?**	**What's next?**
Example: I want to better understand design thinking and be able to start integrating it into programs so that youth have the chance to gain skills related to empathy, critical thinking, planning and decision-making.	☐ Take a webinar ☐ Take a class ☐ Read articles, websites, etc. ☐ Talk to colleagues ☐ Ask to be mentored ☐ Other (describe)	☐ Take a webinar ☐ Take class ☐ Read articles, websites, etc. ☐ Talk to colleagues ☐ Ask to be mentored ☐ Other (describe)	I facilitated Explore programs with much iteration and collaboration between participants. I need to continue to work on time management in these programs and helping youth feel comfortable with design thinking.	I want to talk to more of my colleagues and others to find out how they are successfully integrating design thinking into their programs. I'd also like to take another class to learn more specifics.

Appendix A: Youth Outcomes

Afterschool Alliance's Defining Youth Outcomes for STEM Learning in Afterschool[1] has identified a common framework for afterschool STEM providers. Because this tool was specifically created with an informal science environment in mind, it provides public libraries with a realistic and appropriate starting point to consider as they begin STEM programming or make strategic plans.

Outcomes Through STEM afterschool programs, children and youth …	**Indicators** You know or can see that children and youth demonstrate …	**Subindicators** If you had appropriate tools, you could document the following types of evidence …
Develop an interest in STEM and STEM learning activities. "I like to do this."	Active participation in STEM learning opportunities	• Active engagement and focus in STEM learning activities (Examples of evidence: persisting in a task or program; sharing knowledge and ideas; expressing enthusiasm, joy, etc.) • Pursuit of other out-of-school-time STEM learning opportunities (Examples of evidence: enrolling in programs; attending programs regularly; reporting performing STEM-related activities at home) • Pursuit of school STEM learning opportunities (Examples of evidence: participating more actively in school STEM activities; enrolling in courses; selecting special programs or schools; improving academic achievement)
	Curiosity about STEM topics, concepts or practices	• Active inquiries into STEM topics, concepts or practices (Examples of evidence: exploring ideas verbally or physically; questioning, hypothesizing, testing) • Active information-seeking about mechanical or natural phenomena or objects (Examples of evidence: conducting internet searches for more information; getting books/journals about STEM; watching TV programs on science, etc.)
Develop a capacity to productively engage in STEM learning activities. "I can do this."	Ability to productively engage in STEM processes of investigation	• Demonstration of STEM knowledge (Examples of evidence: demonstrating increase in knowledge in specific content areas; making connections with everyday world; using scientific terminology) • Demonstration of STEM skills (Examples of evidence: formulating questions; testing, exploring, predicting, observing, collecting and analyzing data) • Demonstration of an understanding of STEM methods of investigation (Examples of evidence: demonstrating understanding of the nature of science; using evidence-based reasoning and argumentation; demonstrating engineering design practices)

Outcomes Through STEM afterschool programs, children and youth ...	Indicators You know or can see that children and youth demonstrate ...	Subindicators If you had appropriate tools, you could document the following types of evidence ...
	Ability to exercise STEM-relevant life and career skills	• Demonstration of mastery of technologies and tools that can assist in STEM investigations (Examples of evidence: developing capacity to use measurement and other scientific instruments; running computer programs for data analysis; developing effective methods to communicate findings) • Demonstration of ability to work in teams to conduct STEM investigations (Examples of evidence: communicating effectively with team members; collaborating effectively with team members; demonstrating leadership on the team) • Demonstration of applied problem-solving abilities to conduct STEM investigations
Come to value the goals of STEM and STEM learning activities. "This is important to me."	Understanding of value of STEM in society	• Demonstration of an understanding of relevance of STEM to everyday life, including personal life (Examples of evidence: referencing examples of STEM in everyday life: everyday problems) • Demonstration of knowledge of important civic, global and local problems that can be addressed by STEM (Examples of evidence: contributing to projects that address a community need; developing awareness of how STEM is implicated in larger societal issues) • Demonstration of awareness of opportunities to contribute to society through STEM (Examples of evidence: engaging in a service-learning project)
	Awareness of STEM professions	• Development of an understanding of the variety of STEM careers related to different fields of study (Examples of evidence: gaining knowledge about relevant professions; gaining knowledge of where such jobs and careers exist) • Demonstration of knowledge of how to pursue STEM careers (Examples of evidence: acquiring knowledge of what courses are needed to prepare for or pursue STEM degrees; declaring STEM interests or majors) • Demonstration of awareness that STEM is accessible to all (Examples of evidence: expressing a desire to meet role models; declaring STEM interests and majors; desiring to become a role model to pave the way for others)

1 Afterschool Alliance. Defining Youth Outcomes for STEM Learning in Afterschool. Web. Jan. 20, 2016. **www.afterschoolalliance.org/STEM_Outcomes_2013.pdf**

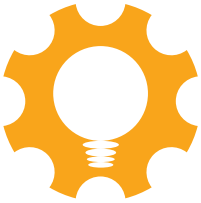
Appendix B

21st Century Skills

Make
Cognitive

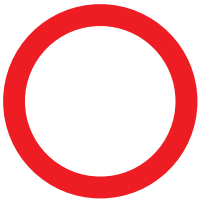
Knowledge
Content Knowledge
Research Skills

Critical Thinking
Decision-making
Problem-solving



Creativity
Innovation
Conceptualization

Do
Intrapersonal



Intellectual Openness
Adaptability
Continuous Learning

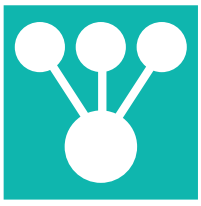
Work Ethic
Self-direction
Initiative

Self-evaluation
Self-accessment
Self-reflection

Share
Interpersonal

Communication
Oral/Written Communication
Empathy

Collaboration
Teamwork
Coordination



Leadership
Self-presentation
Social Influence

Adapted from National Research Council. (2012) *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century.* Web. Jan 20, 2016. **http://www.nap.edu/catalog/13398/education-for-life-and-work-developing-tranferable-knowledge-and-skills.**

Appendix C: Theory of Change

It's helpful to consider library programs in the context of both long and short-term outcomes. As we have seen, the learning of one content area like robotics might lend itself to a variety of programs over a sustained period of time.

Creating a theory of change, or a chart of how activities might scaffold to achieve initial, mid and long-term outcomes can be a helpful process when developing a new program or initiative. Keep in mind that you might create chains that have overlapping outcomes and/or activity steps.

For example, perhaps your community discovery process has led you to understand that your local school district has just changed its graduation requirements to include a digital portfolio of their school work, projects and volunteer activities. You've also talked to teens on school visits and through observations at local afterschool organizations that Instagram has been gaining popularity. You might create a theory of change that evolves like the example shown on the chart, right:

Talked with the local art museum educator's department and community college graphic design department to make local connections, talk through equipment needs for digital art programs, and have a better understanding of community capacity in the arts and online design. So that ...

I'd be better equipped to host a Teen Artists program that integrates digital media. So that ...

I could support a community of teens with similar interests to work together on a digital arts and media project. So that ...

They would develop STEM relevant 21st century skills like initiative, self-regulation, collaboration, and adaptability while pursuing a passion. So that ...

I could leverage a passion based project to engage teens who don't identify with STEM to build digital media skills that are directly transferable to the context of their graduation requirement.

As you develop your own out-of-school STEM programs, take the time to sketch out your own theory of change using the below template:

Make Do Share

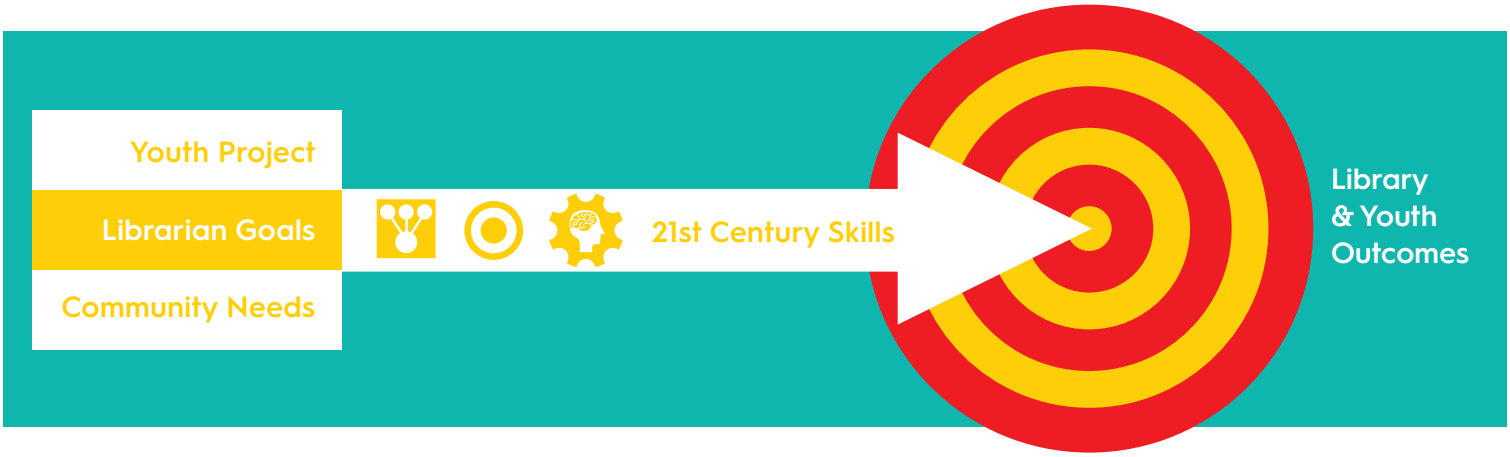
Practice

Practice

Outcomes

At its core, Practice is a one-on-one mentoring program where youth build on their personal interests and assets while developing a project that supports the library's STEM learning environment. With the support of library staff, youth will:

1. Increase awareness of 21st century skills
2. Demonstrate an ability to apply 21st century skills
3. Develop an understanding of how those skills translate to personal college and career readiness goals



Overview

To reiterate a continuing theme in this Guide, becoming a sustainable STEM library is not a one-and-done activity. As you develop relationships and adapt to your community's needs, your initiatives inevitably evolve. Bringing youth into the planning and design of programs benefits both parties: youth develop essential 21st century skills; your library deepens its relationships in the community and gains authenticity through their voice. Think of Practice as the bridge between the Road Map and Playbook sections of this Guide.

Kitsap Regional Library provides youth, ages 16-24, with a formal 100-hour internship that supports our STEM learning initiative. This framework can easily be adapted to engage youth volunteers, but we believe that providing youth with stipends or paid positions adds intentionality and demonstrates organizational commitment to college and career readiness.

Project Co-Design

Co-designing a project with youth is not all that dissimilar from a regular program planning process. You'll be creating a community, engaging in learning and reflection and discussing the skills youth are working on. The most important thing to remember is to slow down. It takes time to build safe relationships and to learn how youth strengths fit library and community needs. That's ok. The end game for this work is about building up and enriching your STEM library ecosystem, not just adding programs.

During the "Make" phase youth develop a relationship with staff and the library. This may include activities such as observing programs on-site or in the community, learning about Road Map activities, co-facilitating or listening in on focus groups or discussing self-assessments.

"Do" takes place when youth begin to feel knowledgeable about the work of the library and have an idea of where their ideas fit in. It's important to provide youth with plenty of guidance and structure through this process in order to make sure their project is sustainable and can be meaningfully supported by staff and the organization. You'll also

Scenarios

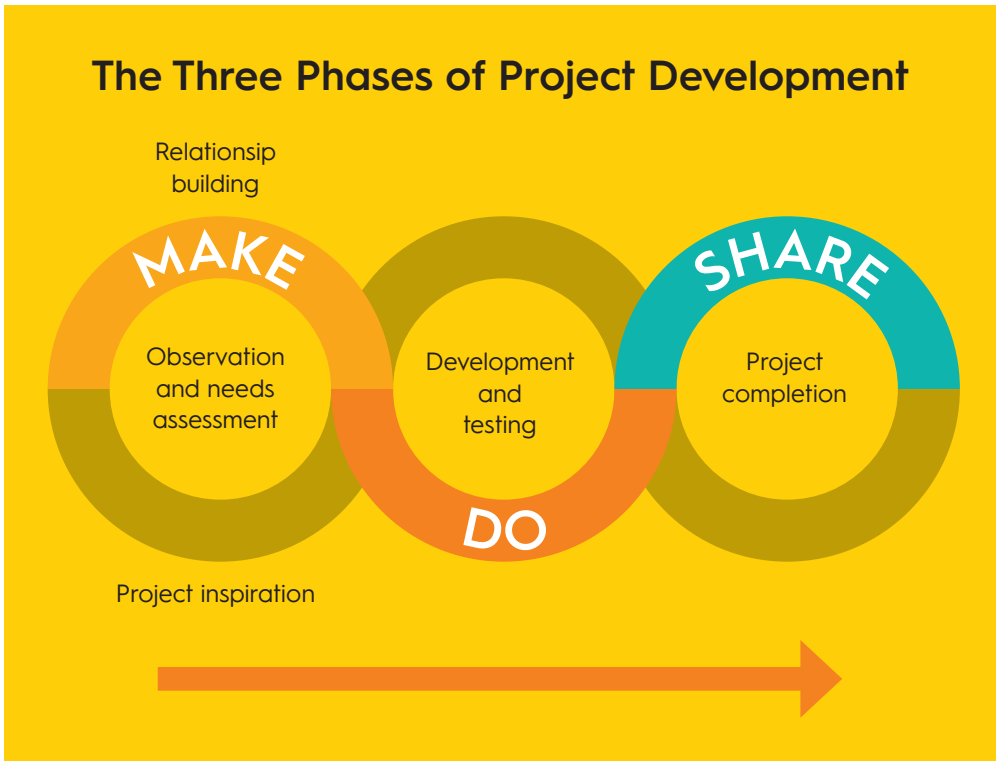
As you can see in the scenarios, not only are library staff and youth working together to create a final product, they also become co-learners. Both are employing 21st century skills to assess needs, design a plan and revise that plan based on lessons learned and feedback. In the process, library staff help youth make connections between hands-on experiences and their future college and career goals, while library staff continue to enrich their community-based, sustainable STEM efforts.

Youth and STEM program planning implementation are a natural fit, but don't overlook the value of engaging with the bigger picture concepts like those discussed in the Road Map as well. Below are scenarios demonstrating just a few possible projects. Keep in mind that the possibilities are as varied as the youth you serve:

Youth No. 1 is highly involved in extracurricular activities at her school and church. She is extremely extroverted and has the pulse on who's who and what's going on. The library staff mentor working with her feels she has a good handle on data about the community, but wants to dig further into the resources that are available to teens. Together, they discuss and implement a mapping activity for their region, outlining the services, spaces and organizations. Because the intern is well connected, she leverages her networks for feedback. From there, they are able to identify assets and gaps which help the mentor think about what programs to offer, how to market them and what possible partners she might engage.

Youth No. 2 is unsure of what to do, but through conversations with his library mentor he discovers he really enjoys working with kids. The mentor he's working with is hoping to build an audience for STEM learning through interest-based programs. Together, they facilitate interest groups with tweens at a local middle school. Superhero films and graphic novels come up repeatedly during the course of the groups. With the mentor, the youth designs a 3-D design and printing series where youth are able to create, design and print a superhero. The youth helps the mentor observe and collect data measuring success of their intended outcome of helping youth gain an interest in STEM topics and makes recommendations for future programs.

Youth No. 3 is preparing for a career in aerospace engineering. She competes, and has achieved national recognition in, robotics competitions. Because of her keen interest in STEM, she has a broad network of friends, mentors and teachers. The library mentor has been looking for ways to interest families in STEM learning. With input from library families, the youth and mentor design a family summer STEM series. The youth invites peers to participate as well as local teachers and business people. With the mentor they provide basic training to program supporters on the goals of the program and simple ways to help parents coach their kids through STEM concepts.



want to remind youth that although the inspiration and design process can be the most satisfying, iteration of original plans based on additional knowledge and feedback is important. Begin to talk about and model continuous improvement early in the relationship, so that it doesn't seem reactionary or negatively inspired later on.

Although this can certainly happen on a smaller scale throughout, the "Share" phase is all about supporting that third outcome, helping youth transfer the experiences and skills that they've built during this process to their own college and career goals. Ask them to reflect on and document what they've accomplished ways that are meaningful to them. Kitsap Regional Library has developed digital badges where youth can document "evidence" or their skills, but this can just as easily be done through a writing assignment and discussion. From there, help them walk through how this work supports their goals and ask how you can help them connect to next steps.

Preparing for Youth

It's important to recognize Practice as a program because it necessitates preparation and management, just as a storytime or teen advisory board meeting would. to create a supportive environment throughout the process, you will need to share your planning as well as coach, troubleshoot, remove barriers and facilitate connections for the youth that you are working with. Build in time and capacity for this, in addition to one-on-one time you'll spend working with your youth.

Best Practices

One area that can be difficult when working with youth in leadership positions is the balance between accountability — showing up on time, following policies and procedures and so on — and enabling them to take the lead and bring their voice in the work that they do. Some ways to manage this include:

- Clearly communicate expectations, policies and procedures

- Be willing to repeat what you have said, It may take repetition for youth to understand and remember
- Let youth know what is or isn't flexible and when final approval may depend on other staff members or departments
- Be ready to listen
- Treat youth with respect
- Be positive and let youth know when they do a good job
- Try new things and work through challenges together
- Spend time on reflection activities, discussing as a team what is going well and what isn't
- Spend time reflecting on the work that you're doing as a coach and mentor.

What's going well? What could be improved upon? What else would you like to learn to grow in this role and who or what could you learn it from?

- Consider how you might model your own 21st century skills; show how continuous learning is a professional responsibility will build their understanding and confidence

Resources for Furthur Learning

- Center for Promise. "Don't Quit on Me: What Young People Who Left School Say About the Power of Relationships." Web. April 19, 2017. **http://gradnation.americaspromise.org/report/dont-quit-me**
- Jekielek, Susan; Moore, Kristin A.; Hair, Elizabeth C. "Mentoring Programs and Youth Development: A Synthesis." Washington D.C. Child Trends, 2002. Web: **http://files.eric.ed.gov/fulltext/ED465457.pdf**
- Manza, Gail, and Susan K. Patrick. "The Mentor's Field Guide: Answers You Need to Help Kids Succeed." Minneapolis, MN: SEARCH Institute, 2012. Print.
- Probst, Kristie. "Mentoring for Meaningful Results: Asset-Building Tips, Tools, and Activities for Youth and Adults." Minneapolis, MN: SEARCH Institute, 2006. Print.
- David P Weikart Center for Youth Program Qualoty, a division of the Forum for Youth Investment. "Youth Work Methods" series. Ypsilanti, Michigan, 2011. Print.

Make notes

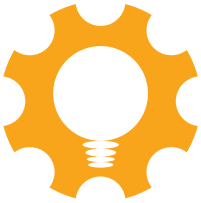
Appendix A

21st Century Skills

Make
Cognitive

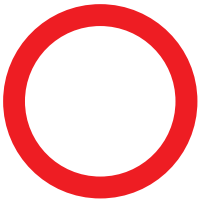
Knowledge
Content Knowledge
Research Skills

Critical Thinking
Decision-making
Problem-solving



Creativity
Innovation
Conceptualization

Do
Intrapersonal



Intellectual Openness
Adaptability
Continuous Learning

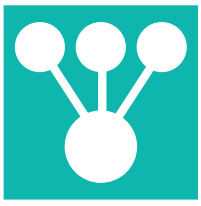
Work Ethic
Self-direction
Initiative

Self-evaluation
Self-accessment
Self-reflection

Share
Interpersonal

Communication
Oral/Written Communication
Empathy

Collaboration
Teamwork
Coordination



Leadership
Self-presentation
Social Influence

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Appendix B: Criteria for 21st Century Skills in Action

Knowledge: Content Knowledge, Research Skills

- Identify relevant content knowledge
- Apply knowledge to context of learning environment
- Define clear information needs
- Developing a method of collecting relevant information
- Access and evaluate information efficiently

Critical Thinking: Decision-making, Problem-solving

- Identify and summarize the problem at issue
- Identify and assess the quality of supporting data/evidence
- Develop plan to solve issue
- Analyze information to solve the problem

Creativity: Innovative, Problem-solving

- Use a wide range of idea creation techniques
- Introduce originality and inventive ideas into work and understand the real world limits to adapting new ideas
- Develop, implement and communicate new ideas
- Be open and responsive to new and diverse perspectives; incorporate group input and feedback into ideas

Intellectual Openness: Adaptability, Continuous Learning

- Adapt to varied roles, job responsibilities, schedules and contexts
- Work effectively in a climate of ambiguity and changing priorities
- Incorporate feedback effectively
- Deal positively with praise, setbacks and criticism
- Understand, negotiate and balance diverse views and beliefs to reach workable solutions, particularly in multi-cultural environments

Work Ethic: Self-direction, Initiative

- Set goals with tangible and intangible success criteria
- Balance short-term and long-term goals
- Utilize time and manage workload efficiently
- Monitor, define, prioritize and complete tasks without direct oversight
- Demonstrate initiative to advance skill levels and commitment to lifelong learning

Self-evaluation

- Ability to articulate effectiveness of learning plan
- Assess execution of meeting goals and management of workload
- Reflect critically on completion of workload to inform future progress

Communication: Oral/Written, Empathy

- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Utilize multiple media and technologies and know how to judge their effectiveness as well as assess their impact
- Communicate effectively in diverse environments

Collaboration: Teamwork, Collaboration

- Demonstrate ability to work effectively and respectfully with diverse teams
- Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
- Assume shared responsibility for collaborative work and value the individual contributions made by each team member

Leadership: Self-presentation, Social Influence

- Understand how skills translate to personal college and career readiness goals.
- Demonstrate how skills connect to community goals and needs.

Appendix C: Sample Position Posting Announcement

Employment Opportunity

Make Do Share Intern

Library Location

Announcement Number

Make Do Share Internship

Youth voice is something that the Library takes to heart. We know that when teens and young adults have the opportunity to plan, implement and give feedback on our programs, our programs just get better. OK, way better. That's part of the reason why we've created this new career-connected learning opportunity.

Are you a teen or young adult looking for a chance to prepare for life after school through hands-on, project-based learning? This internship will help you develop job skills, connect those skills to college or career goals, and build a network of caring adults.

Ready to apply? Here's what you should know:

What is Make Do Share?

Make Do Share is a project funded by the Institute of Museum and Libraries to increase interest-driven STEM programming in our libraries. Instead of focusing just on STEM programming ideas (like game design) or equipment tutorials (like how to use a robot), this project focuses on the skills you need to design and learn together. These are the transferrable skills everyone needs to be successful in the 21st century job world.

What are the benefits for Interns?

Participating interns will focus on three main goals:

- Increase awareness of 21st century skills
- Demonstrate an ability to apply 21st century skills through the development of a project
- Develop an understanding of how these skills translate to personal college and career readiness goals

How do you achieve these goals?

To learn these skills and develop your project, you will work hand-in-hand with a librarian throughout your internship. This will be a collaboration- you bring your college and career interests to the table, and the librarian supports you in incorporating your interests into something that helps the Library and the community it serves. This might mean that you develop a program, create a resource or just bring fresh ideas to support planning.

You'll begin your internship by learning about your Library and how it connects to community needs. You'll see how a the Library develops programs and have a chance to get to know library staff, partners and program participants.

This is not school. There are no tests. There are no grades. This internship is about learning and sharing that learning as a mentor and connecting this learning to your career ambitions.

How long do the Internships last?

The internship is 100 hours. We typically schedule interns for five hours per week over a five month period.

Do you need to be a STEM expert to apply?

Absolutely not! Although you'll be helping with STEM programs, there are many ways to contribute and endless possibilities for program types. Successful interns will be interested in gaining education and career skills and being a mentor to youth participating in Library programs.

Who can apply?

Applicants must be 16-25 years of age. Please see below for application Instructions.

Benefits & Salary

The position is not benefits eligible.

Compensation: $11.18 per hour

Application Instructions

To apply for this position, you will need to submit a complete employment application by visiting our website at **KRL.org** and select "Employment" located at the bottom of the page. This position will remain open until January 23, 2017. Should you need an accommodation and/or assistance with the application process please email jobs@krl.org

Appendix D: Sample Intern/ Volunteer Interview Questions

1. What interested you most about this position?
2. How have your past experiences prepared you for this position and in what ways?
3. A passion for learning is a core value for our Library. Tell us about something that you are passionate about and some of the ways that you learn about or develop that passion.
4. An important component of this position is providing support and mentorship to participating youth. Tell us how you would go about developing trust and relationships with others.
5. How would your teachers and/or supervisor describe you?
6. How would your friends describe you?
7. Our programs often integrate new technologies and equipment and things don't always go according to plan. Please describe a time when you've been faced with a last minute problem that impacted other people. Talk us through your decision making process as well as the steps you took to resolve the issue.
8. One of our core values is that we are Open to All. Please describe a situation where you've worked closely with a person or team that was very different from you.
9. We believe that anyone can be a leader. Please describe a time when you've demonstrated leadership either at home, school or in the community.
10. Where do you see yourself in five years, and how does this internship support that goal?

Appendix E: Pre-Post Survey

On a scale of 1 to 5, please describe your confidence level in the following activities. I can:

1. Think about the best resources to answer a question or figure out a need.
   1 2 3 4 5
2. Analyze issues and break solutions down into manageable steps.
   1 2 3 4 5
3. Adapt my ideas to diverse perspectives or contexts.
   1 2 3 4 5
4. Seek out and leverage feedback.
   1 2 3 4 5
5. Learn how to take initiative and take responsibility for getting things done.
   1 2 3 4 5
6. Determine how to effectively reflect upon my work in order to move forward.
   1 2 3 4 5
7. Build skills which help me to communicate in a variety of settings.
   1 2 3 4 5
8. Work respectfully within a team and with individuals who are different than me.
   1 2 3 4 5
9. Communicate my skills and experience in ways which are meaningful to me.
   1 2 3 4 5
10. Understand how my skills can meaningfully contribute to an informal STEM learning environment.
    1 2 3 4 5

Appendix F: Youth Project Planning

Introduction

Hiya, Intern! If you're ready to fill out this form you and your mentor will have stocked up plenty of quality time to talk about:

- 21st century skills and what they look like in action
- Your college and career goals
- Your strengths and interests
- The work that he or she is doing and how that connects to community needs
- How all of these things might connect together to help inform your project

Feeling pretty good about all of that? Let's get planning!

Project Overview

Please briefly describe your project idea and how it supports the library's STEM learning goals and community needs.

Project Details

Next, walk through the details related to your project using the SMART goals framework. Be sure to include your mentor in this process and to use him or her as a resource to guide this process.

Specific: What outcome are you hoping to achieve and with what audience? Outcomes are the change in skill, awareness, behavior or attitude that someone will have as a result of your project. Intended audience may be program participants, parents, library staff or partners.

Measurable: How will you know if you've achieved your outcome?

Attainable: Do you have the resources to implement this effort? Are there constraints that you might need to figure out? Describe the people, resources or equipment that you might need to accomplish your goals.

Realistic: Will you be able to accomplish this project in the remaining time that you have in your internship process? Is this project able to be sustained after you leave?

Time Based: Build a timeline for what needs to happen when in order for you to complete your project.

Feedback

Congratulations, you've made it through the hard part. Next, select two or three people at the Library to give you feedback on your plan. These may include program participants, partners or library staff members.

Iteration

How does the feedback you received help you think about what you might do differently? Edit your original plan with any changes.

Approval

Present your final project plan to library staff. Discuss and incorporate final changes.

Implement

Go forth with your awesome plan and see what happens.

Reflection

Talk with your mentor about what you learned. Talk through the skills that you developed throughout the process and how those might connect to your college and career goals.

Celebrate

Take pride in what you've accomplished and how what you've done has helped the Library and the community. Grab your mentor for a favorite reward, you've earned it.

Appendix G: Exit Interview Questions

1. What was your favorite part of this experience?
2. What was your least favorite part of this experience?
3. What advice would you give to future interns or volunteers?
4. What could your mentor or the organization do differently to help youth interns and volunteers?
5. Do you feel that this experience will help you be successful in college or a future career? Why or why not?
6. Would you recommend this experience to family or friends? Why or why not?

Make Do Share

STEM Library Playbook

Introduction

Much like a coach's playbook, the STEM Library Playbook will help you decide what to do in specific situations. This playbook is divided into four programming types: Excite, Explore, Engage and Practice. For each you'll find different plays just right for that type of program. For example, if you are planning on hosting an Excite program, look at the Excite section of the playbook and find a list of outcomes, the best community building activities to start with, notes on how to facilitate an Excite program and options for a closing reflection.

The goal of this playbook is to provide you with opportunities to mix and match "plays" for different settings, skills, youth interests, outcomes and audience size. Make it your own by putting pieces together that fit the youth, families and community partners you work with. For some program types we've developed sample "Play Packages" you can review and use as you get started with STEM programming.

Keep in mind that this document does not provide specific curriculum for each program you facilitate with youth. It does, however, provide a facilitation framework for successful STEM programming with and for youth.

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STEM Library Playbook

A Focus on Facilitation

The focus on ideas that support learning reflects the important role library staff play in facilitating youth learning through STEM questioning and trial and error. A facilitator's role is not to tell youth exactly how to do something or to give them the answer to a challenge or problem they are trying to solve, instead guide youth through a process so they can come to their own understanding of how something works. This allows facilitators to co-learn and even connect youth to library materials as they look up information to help them solve a STEM-based challenge.

As a facilitator, keep in mind that it's acceptable for youth to take time on their projects and, sometimes doing the same thing over and over again with just one slight tweak, can lead to expanded learning opportunities. Don't think you need to constantly be moving on to what's next. Give them time to process and think things through.

The facilitation and inquiry-based framework also gives youth the chance to learn through trial and error. Taking risks and failing in order to gain 21st century skills and STEM learning is a good thing. This is why the ideas in this Playbook and the facilitation techniques included are centered on trial and error and risk-taking.

Programming Framework

Inspired by the work of the Digital Youth Network, this programming model is designed to encourage youth to achieve positive outcomes related to STEM Learning. The three overarching outcomes that we have identified have been culled from Defining Youth Outcomes for STEM Learning in Afterschool, a study and report from the Afterschool Alliance. From initial awareness of interest in STEM and developing relevant skills, to connecting STEM to everyday life and building leadership capacity and increasing awareness of STEM pathways, outcomes and program types build upon themselves to create a holistic STEM learning environment. Relevant outcomes and indicators are described in each program type below and referenced in full (including sub-indicators) in Appendix A of the Roadmap.

Engaging Youth in STEM

A Note About Practice

Excite, Explore and Engage develop a STEM environment through tiered outcomes that reinforce the programming framework. Practice is something that happens throughout the process. It is the method by which youth are involved in co-developing a STEM programming environment. Practice is important to any learning process and this model is no exception. For example, a coach does not select plays for a game until he or she has had plenty of practice with a team to develop a plan that matches their skills. Similarly, as a program developer, you must get a sense of the skills and interest of the youth you are co-designing the program with before you can truly start building a STEM model that connects to your community. Though Practice is the final section of this document, it can and should be applied throughout the model building process.

- Develop an **interest** in STEM learning
- Active participation
- Curiosity

- Develop a **capacity to engage** in STEM learning
- Productively engage in processes of investigation
- Exercise STEM-relevant life and career skills

- Come to **value** STEM goals
- Understand value of STEM in society
- Awareness of STEM professions

Excite Programming

Overview

Excite programming is more open-ended and informal than the other categories of STEM programming. There are opportunities, even within this informal construct, to facilitate with youth through individual and group learning. As the Excite program gets started, the facilitator and/or teen interns or volunteers provide an overview of what youth will have access to and use then get things started with a community building activity. Throughout the program create opportunities for collaboration, sharing and celebration and close the event with reflection.

Room Setup

As you plan for your Excite program, make sure to consider the best way to set up the room in which the event will take place. You'll want to:

- Think about the placement of materials in order to provide opportunities for collaboration
- Consider whether or not youth will want to stand up, sit down or have a variety of options
- Ask yourself, "How will the space be used? Do you want youth to have the opportunity to spread out and feel expansive and have the opportunity to be messy in order to create, collaborate and innovate?"
- Consider how youth can move around the room to look at each other's work and also celebrate their own creations
- Ask yourself, "How can this be setup so that youth feel welcome and comfortable? If I were a youth in this room, what would I see and notice and how would I feel?"
- Keep in mind one aspect of the program is to facilitate socialization. The room should make it possible for youth to connect and talk about what they are working on and generally socialize.

Outcomes & Indicators

As you develop Excite programs keep these outcomes in mind. Which outcomes will you focus on? Consider how each session will help youth achieve each outcome.

Outcomes Through STEM afterschool programs, children and youth ...	**Indicators** You know or can see that children and youth demonstrate ...
Develop an interest in STEM and STEM-learning activities. "I like to do this."	Active participation in STEM learning opportunities
	Curiosity about STEM topics, concepts or practices

Full chart on Page 22-23

Excite PopUps in the Community

There are times when you will take materials to a community event and setup an Excite program. In this case, you won't engage youth in the same way as a Excite program hosted in the library or at a community partner site. You still want to consider the setup of the program materials and how your space will be used. Here are some tips for community PopUp environments:

- Include challenge cards as a way to give youth something to focus on while they are visiting the PopUp. (See Appendix D)
- Consider scaffolding youth learning with different stations. For example, if your focus is on circuits, you can have different stations starting with the basics of circuits while adding to their knowledge at the next station.
- Make sure you have the necessary number of staff, teen interns or volunteers to be able to actively engage youth as they work through challenges.
- Ask youth to talk about what they worked on and what they liked and didn't like.

Plays

The following sections outline individual plays that serve as the pieces for assembling an Excite Program. In the Appendix of this section, you'll find Excite Planning Resources and Package Templates to help you visualize and design your program. Remember, you can create your own play packages and mix and match activities for your audience's needs. As you read the sections below, think about how you want to put together the plays for your program.

Welcome

A welcome is your opportunity to set the expectations for the session. Take time to introduce yourself, other facilitators and talk a little bit about what you will be working on.

Community Builder

For Excite programming, start with a short community building activity. As this is a program where youth are less likely to know each other and see a different audience from week to week, it's good to make this fairly simple. These community building activities are a great way for youth to start to feel comfortable with each other. (Don't forget: facilitators should also participate in the activity.)

Introduction to Materials

Start the session with an overview of the materials available and what youth can accomplish with them. Show them examples of what they might create and give them a chance to ask questions. Even if you have youth working in different groups with different materials, it's a good idea to start everyone together as a way to show all that's possible and so that everyone can hear the questions and answers.

Challenges

As youth get started with the materials give them a challenge. If everyone is working with the same materials, you can use the same challenge for everyone, whether they are working individually or in small groups. Hand out the challenge on sheets of paper or write it on a whiteboard or flipchart paper. Have the youth read the challenge aloud and give them a chance to ask questions. Adults, teen interns, teen volunteers and volunteers (facilitators) can answer questions.

If youth are working with different materials have a challenge setup for each. Hand these out, give them a chance to read them aloud to the full group and ask questions.

Let youth know that the challenge is a way to get started with the materials and that once they have completed the challenge, they will have a chance to build on what they created and try their own ideas.

As the youth work, facilitators should walk around, assist and encourage. As facilitators move around the room ask youth to:

- Explain what they are doing and why
- Talk about what they are having trouble with
- Talk about what's most challenging
- Talk about what they are finding easy to do
- Discuss what was surprising and why
- Talk about what was interesting and why
- Say what they would like to work on next and why
- Explain how this connects to something in their life, something they learned in school or something going on in their community and/or the world

As facilitators have conversations with youth they should make sure to help them articulate their learning by talking about STEM concepts and asking them to connect these concepts to their real-life experiences.

Check In with Groups

Every 30 minutes or so, it's a good idea to have youth take some time as a group to talk about what they are working on. This is an opportunity to reflect on what's happening, show off what's been accomplished, talk about STEM concepts and learn from each other and showcase thier work.

Continue to Try Things Out

As youth finish the initial challenge give them the chance to:

- Expand on the challenge by adding to what they started or asking them for their own ideas for adding to what they did so far.

Share

Sample Welcome

Hi everyone, in today's program, we are going to be working with *<insert topic/technology/etc.>* You will be able to *<insert samples of what the youth will be able to work on>*. The whole idea of this program is to give you time to try things out, see what you can do and get some ideas about how *<insert topic/technology/etc.>* works. So, don't worry about getting it right all the time. Have fun and see what happens. We've got some people who can help along the way so ask me or *<point out other facilitators in the room — teens, etc.>* to help — or to take a look at what you've been working on and show what you've created.

Feel free to work in groups and ask each other for ideas and help. At different times during the program, I'll give you a chance to show off to the group what you've been working on and ask questions or for suggestions. This is a great way to learn together and get ideas from each other about what's possible.

Before you get started, I want to give everyone a chance to get to know each other. I'm going to get us started with a short group introduction activity.

- Try a new challenge that facilitators provide
- Teach someone else in the group how to complete the challenge
- Create a new challenge for facilitators to try
- Try something entirely different and talk with someone about what they did

If you discover some youth are more skilled than others, encourage them to help their peers or challenge them to try something a bit more advanced and show others how they did what they did. By doing so, you'll find all skill levels are challenged and both the novice and the expert are fully engaged.

Excite Reflection

The size of the group will have an impact on how much time is required for reflection. Make sure you have at least 10 minutes at the end of the program for youth (either individually or as a full group) to think about and articulate what they learned during the session. Each reflection activity can help you to assess learning outcomes. Think about the following outcomes ideas:

How Reflection Fits with Excite Outcomes Assessment

In Excite programs you want to learn how the youth are learning about STEM and gaining comfort with STEM ideas. Don't forget the outcomes and consider:

- **STEM ideas** — Does reflection show an expanded knowledge of STEM ideas and vocabulary? How do they use STEM terms and phrases when they reflect on the activity? Do their projects show an understanding of STEM ideas? Do images they create as a part of reflection show an understanding of STEM? Do they talk about how to take what they did and use it in a different setting?
- **Comfort** — Are they comfortable talking about what they did during the program? Do they show they are engaged with the materials and ideas? What do you notice in their body language?
- **Interest in STEM** — What do you notice in their language, excitement and engagement? Were they engaged in what they did during the program? What do you notice about how they talk about learning more?

Share

Community Builder Activities

Stand Up/Sit Down Start sitting in a circle on the floor. Ask the youth a question and have them stand up or sit down depending on the answer. Give the youth a chance to talk about why they stood up or sat down for the different questions asked.	**Examples** • If you learned something new in school today stand up • If you eat ice cream at least once a week stand up • If you have a pet sit down • If you have a sibling stand up • If you have been on a ferry stand up • If you want to learn how to build rockets stand up • If you would like to live in a world with robots all around stand up
If ... Before the session starts write out a series of questions on index cards. Sit in a circle with the cards in the middle. Each person selects a card and answer the question.	• If you could go anywhere in the world, where would it be? • If you were able to have any kind of animal as a pet, what would it be?
Would You Rather ... Ask youth to answer a set of "would you rather" questions. Give the youth the chance to talk a bit about their answers and why they think they and their peers answered the way they did.	• Would you rather go on vacation to a hot or cold place? • Would you rather eat pizza or a hamburger? • Would you rather have a dog or a cat? • Would you rather learn about how cars work or how airplanes work? • Would you rather build websites or robots? • Would you rather have a 3D printed piece of chocolate or a model car? • Would you rather be stuck in a thunderstorm or a hail storm? • Would you rather record music or record video?

Do worksheet

Room Setup

Play Package

Program description:

Outcomes:

Indicators:

Supplies:

Plays	Your Play	Youth Roles	Notes	Time
Welcome				
Community Builder				
Introduction to Materials				
Challenge 1				
Check in with Groups				
Challenge 2				
Showcase				
Reflection				

Reflection Outcomes	Notes

Moving from Excite to Explore

As youth and families participate in Excite programs, you will learn more about what they would like to work with in more depth. The information you collect from opening activities, discussions around the room and reflection can help in this process. Don't miss the chance to ask youth to help decide what comes next by gathering their ideas and discovering ways to keep track of them and even have consensus building activities. You might:

- Ask youth to rate their favorite activities during a single Excite session (or for those youth that participate in many Excite sessions across several events.)
- Put up paper on the wall of the room where Excite is held. As youth work on projects in the Excite sessions have them write on the paper the activities they are most interested in. This can be an ongoing activity for every Excite session.
- Engage youth in conversation about what they like best in the Excite sessions and what they would like to learn more about. Give them a chance to explain their decisions and ideas.

Share

Reflection Activities

Reflection by both youth and facilitators is an important aspect of a successful learning experiences. It allows youth to articulate the learning and consider what more can be learned.

One Word	At the end of the session bring everyone back together and ask the youth to describe their learning experience with one word. If the youth would like, have them use a visual instead of text. For example, they could take a photo that describes their experience, create a drawing, create a GIF, and so on.
Exit Ticket	At the end of the session give youth a piece of paper with one to three questions already on it. Ask the youth to answer the questions and hand in the paper before they leave. Sample questions include: • What's the best part of today's program? • What would you like to learn more about? • What kinds of things can you do at home or school that connect to what you did today in the program? Don't forget that you can connect these questions specifically to the activity of the day.
Photo Op	At the end of the session have youth take photos of the room that best represents what they learned during the session. They can do this individually or in small groups.
Showcase	Throughout the Excite program, youth will be showing what they created. As a final reflection, you can ask youth to show the work they ended up with and have them talk about what they like, don't like, what they would change, etc.

Make notes

Appendix A: Excite Play Packages

Below find samples of how to put Plays together for an Excite program. Note: All times are estimates.

LittleBits Excite Program (about 2 hours)

Plays	Your Play
Welcome	5 minutes
Community Builder	Stand Up — 10 minutes
Introduction	20 minutes
Challenge 1	Build a flashlight with LittleBits — 20 minutes
Check in	Youth show off their creations, talking about what they like and don't like about what they built so far — 15 minutes
Challenge 2	Modifying creations — 20 minutes
Showcase	Youth show what they modified and talk about what they did differently and why — 15 minutes
Reflection	Photo Op — 15 minutes

Snap Circut Excite Program (about 1 hour, 55 minutes)

Plays	Your Play
Welcome	5 minutes
Community Builder	Would you rather — 10 minutes
Introduction	15 minutes
Challenge 1	Build a Snap Circuit rover that shoots discs 10 feet — 20 minutes
Check in	Ask what has surprised them so far — 15 minutes
Challenge 2	Youth create their own challenges for others in the group — 20 minutes
Showcase	Try each other's challenges — 15 minutes
Reflection	One Word — 15 minutes

Station -Based Excite Program (about 2 hours, 5 minutes)

Plays	Your Play
Welcome	5 minutes
Community Builder	If ... — 10 minutes
Introduction	20 minutes
Challenge 1	Youth select what materials they want to work with — 5 minutes Pick one thing you can do with the materials and be ready to share with others — 20 minutes
Check in	Youth showcase what they discovered — 15 minutes
Challenge 2	Youth can either move on to another station or continue where they are. Youth build on what they've discovered so far by adding something new. — 20 minutes
Showcase	Youth show and discuss what they've each learned and worked on — 15 minutes
Reflection	Exit Ticket— 15 minutes

Appendix B: Developing an Excite Program

Learn

When pre-planning, remember to think about your STEM community and youth voice.

- Who is your audience?
- What are their interests?
- How can you connect these interests to your STEM programming?
- Is anyone else doing this type of programming in your community?

Plan

Outcomes and indicators

- What are the program outcomes?
- What are some outcome indicators?

Youth voice

- How will you incorporate youth interest into the program?
- What are some ways for you to expand youth interest during this STEM program?

Content and material needs

- List program supply and material needs.
- List any information or knowledge required to properly facilitate the program.
- List any local resources or community members that can assist with program content.

Reflect

Take time to reflect on your program. Ask yourself:

- Did you reach program outcomes?
- Did you select the right plays?
- What would you change?
- Ask co-facilitators for feedback.
- How can you develop this topic into next step STEM programming?

Appendix C: Working with Challenges

The Playbook relies on integrating challenges into many of the programs and events for youth and families. The Q&A below helps answer questions about how to best facilitate challenges.

Why Are We Using Challenges?

Challenges are a great way to give program participants a focus while also giving youth the chance to put their own spin on using the tools and technologies. Some youth and families may not feel comfortable simply "playing" with materials. Challenges help guarantee that everyone is involved and learning.

What Happens If Someone Can't Complete a Challenge?

It's perfectly fine for facilitators to help youth complete a challenge. Facilitators can either work with small groups or one-on-one, helping youth troubleshoot and figure out the answer.

What If Some Youth Figure Out the Challenge More Quickly Than Others?

Ask those youth to help others. You can do this either by having the youth work with an individual or small groups. Or, have the youth show to the full group what he/she did to complete the challenge, explain what the steps were and then help other youth as they complete the challenge.

What If Some Youth Don't Want to Work on the Challenge?

Talk with the youth and find out why they aren't interested in working on the challenge. If you think he or she is concerned about being able to actually complete the challenge help them to get started with the challenge by starting with some successful experiences. Give the youth a chance to work with someone else — for example a teen intern or volunteer. If the youth still doesn't want to work on the challenge ask him or her to be your assistant. Have him or her help you by talking with other youth, looking at how others are doing, setting things up and so on.

What If All Youth Complete a Challenge Before the End of the Program?

Make sure to give all youth involved an opportunity to talk about what they completed and how they completed the challenge. Have them also talk about what they found challenging, what they liked and what they didn't like. You can also have youth challenge each other to complete other challenges using the same tools. Or, ask the youth:

- What would you do next with what you created so far?
- Would you like to complete the same challenge but starting a different way?
- Would you like to create a challenge for others in the program to complete?

Appendix D: Alignment to NGSS (Next Generation Science Standards)

When building a STEM program, it is important to think about aligning program activities with goals and outcomes defined by community partners. Below are some suggestions for aligning programming to the Next Generation Science Standards.

NGSS Connections to Excite Programming

The activities that youth take part in as a part of Excite programs may connect to one or more of the Next Generation Science Standards Framework Dimensions.

Dimension 1: Scientific & Engineering Practices

- Asking questions (for science) and defining problems (for engineering)
- Planning and carrying out investigations
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating and communicating information

Dimension 2: Cross-cutting Concepts That Have Common Application Across Fields

- Patterns
- Cause and effect
- Systems and system models

Make notes

Explore Programming

Overview

Explore programs focus on a specific STEM content area or address a topic through a STEM process in an active learning setting (inquiry-based learning, problem-based learning.) Like Excite, Explore programs raise awareness of STEM concepts and connect youth's interest to STEM topics. In these events, it's important to consider what can be accomplished in a one-session program that provides opportunities to learn and engage with materials while at the same time giving youth the chance to fully complete an activity. Taking into account that you will include a community builder for the full group, time for youth to talk about what they work on and at least one reflective component, a 90 minute Explore program may have less time then you originally envision for this type of hands-on inquiry activity. You may discover an Explore idea you and youth come up with may be better suited for an Engage program (see Engage program information below.)

What Makes a Good One-Time Program?

Consider if your Explore program planning fits the one-time only model by:

- Including hands-on, inquiry-based activities that can be completed within a set time frame
- Including collaboration, planning and decision-making
- Closing with time for reflection on learning
- Focusing on youth-driven learning instead of librarian-led learning
- Focusing on prior learning and knowledge of youth involved. For example, a one-time Minecraft focused Explore program will be more successful when youth have previous Minecraft experience.
- Including a beginning, middle and end, but does not require steps be followed in a linear order to fully complete a challenge

Outcomes & Indicators

Outcomes Through STEM afterschool programs, children and youth ...	Indicators You know or can see that children and youth demonstrate ...
Develop an interest in STEM and STEM learning activities. "I like to do this."	Active participation in STEM learning opportunities
	Curiosity about STEM topics, concepts or practices
Develop a capacity to productively engage in STEM learning activities. "I can do this."	Ability to productively engage in STEM processes of investigation
	Ability to exercise STEM-relevant life and career skills

Full chart on Pages 22-23

Setting Up

Program content will vary based on the theme. Before the day of the program decide:

- Will the youth work on their own or in small groups?
- How will the room will be set up to enable tinkering and working on the project individually and/or in small groups?
- How will STEM learning integrate into the activity and provide opportunities for youth to talk about STEM aspects of their learning?
- How will opportunities for youth to talk about what they are working on, what they create and get answers to questions be provided?
- What do you need to go over before youth start to work on their own? (For example, if you are working with circuits, what do you need to show youth about circuits before they start?)
- What materials, besides the technology, do you need to have available for youth? (There may be extra challenges, analog materials such as pens, paper and index cards.)
- When and how will facilitators connect with the goals and framework for the program?

Plays

The following sections are suggested plays that could make up an Explore Program. Remember you can use the different elements of the Explore section of this Playbook to put your own Play Package together. As you develop and plan your Explore program think about which community builder, challenge, reflection and so on are just right for your audience and stated outcomes. See Appendix for Planning and Play Packages templates.

Welcome

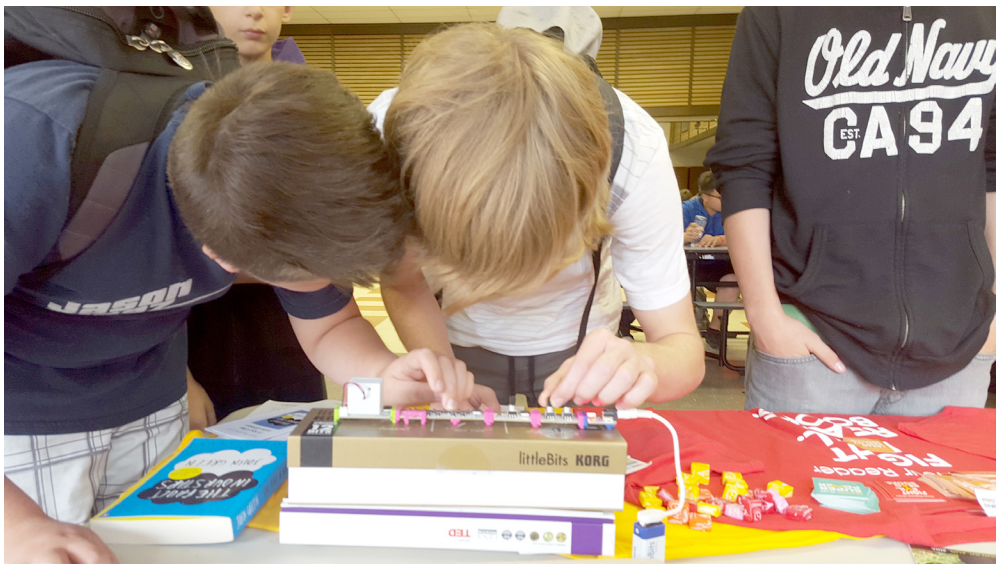
Start every program with a welcome. For example: Hi everyone, welcome to today's program *{insert name of program}*. We are going to spend the next 90 minutes working on *{insert what the youth will be working on}*. By the end of the program, you will have *{insert info. on what the youth will complete by the time the program is over}*. Any questions before we get started?

Community Builder

When hosting an Explore program, you can tailor the opening activity to the topic. Don't forget, all facilitators should take part in the community builder to help youth feel comfortable with everyone in the room. Facilitators should revise the community building activities to suit their audience and intended outcomes. Also, it's possible to revise opening activities so that what might seem to work only for a video game creation session might actually work, with some small changes, for a programming focused session.

Materials & Challenges

Start Explore programs by showing youth what they will be working with and the information they need to get started. You don't need to give step-by-step directions. Rather, show them briefly how the tools they may use work and what they are going to be doing with those tools. As the youth work on the primary activity, facilitators can help go through the process of using the various tools.



Explore programs are a great opportunity to learn from and with youth about the topics that they are most interested in and will lead into the Engage program series.

The following are some sample ideas as you get started with one session Explore programs:

Video Game Design with Kodu Software

It's not really possible to create a one session Kodu game design program that starts from scratch. Instead, before the session, create or download (from the Kodu site) a world that youth will work from. Following the community builder have the youth open the world that you have available and ask them to tell you what they see. Give the youth an overview of the different tools they can use in Kodu and ask them to talk as a group about what they think they might do to create a simple one person game. Have the group decide their top two or three ideas and then have the youth either individually or in small groups create one of the ideas selected. Make sure to give youth time to show what they are working on, to ask each other questions and tell each other one thing they learned while trying to create a game in a short amount of time.

Paper Circuits

Start with a conductive square you have created on a piece of paper and show youth how it lights up. Have youth, individually or in small groups, create their own light-up square. Next, ask them to add one more part to the square that also lights up. Have the youth brainstorm with others in the group about what they might create. As they start expanding on what they make, have them show each other new techniques and ideas. To learn more about this see the paper circuit activity at The Tinkering Studio — **tinkering.exploratorium.edu/paper-circuits**

Moviemaking: Stop Motion Animation

Begin by asking youth to tell you what they know about stop motion animation and what they'd like to learn. Fill in any blanks and show the youth some examples. Ask them to talk about what they think is cool, interesting, different, etc. about what you show them. Divide the youth into groups of 3-5. Teen interns or volunteers can help you to gather materials (Legos, paper, pencils, action figures, etc.) prior to the Explore session. Have the youth talk about what materials they need to use in their film and then gather the items they decide on; you may need to give the youth a limit in the number of items they can take. In teams, draw or write out a beginning, middle and end for their movie, then pair groups up to talk about what they are planning and get ideas and feedback. While the groups work on their movies, facilitators

should walk around and help the youth. Give youth time at the end of the session to show what they worked on and to talk about the story they created and the challenges and successes they faced.

Storytelling with Minecraft

Many youth are familiar with building in Minecraft and playing Minecraft with others. In this session, youth work to develop a Minecraft character that they would include in a Minecraft story they would like to build. Youth should work in groups to brainstorm a group of characters they want to work on together with the intent of having the characters part of a story/environment that they might build at another time. The group can then create their characters for Minecraft. Ask the group to work together to write an overview of how the characters are connected, then have each group talk about their characters, why they made the decisions they did about the characters and what they want to do next in order to integrate the characters into Minecraft.

Audio Recording with Audacity

A good way to start teaching youth about audio recording is to have them work in small groups and create a set of sound effects for a particular storyline and then add those sound effects to the story. Prior to the workshop facilitators should record a selection of 3 to 5 minute stories. These will be the stories that the youth work with. The stories should lend themselves to adding sound effects of different types. At the beginning of the session, play the stories for the youth, divided into groups and have them select the story they want to add sound effects to. Show the youth how to record sound effects and then have the different groups work together to decide what sound effects they would like to use and where they would use those effects in the recording. Have the groups record their sound effects and then play them for the others in the room. Have the youth talk together about any changes they might make to the sound effects and what they like about each recording. After showing the group how to add sound effects to their recorded stories, have them work on that part of the project. Facilitators should walk around the room to help as needed. When the recordings are complete, have each group play their story with the sound effects and talk about what they would still like to do to the story to make it even better. Give everyone a chance to provide feedback.

Building with Snap Circuits, Makey Makey & LittleBits

Snap Circuits, Makey Makey and LittleBits all provide youth with the opportunity to see how electricity works. Makey Makey uses conventional objects — bananas, paper, pencils, etc. — to create an electrical current that powers a computer keyboard. LittleBits and Snap Circuits give youth the chance to snap pieces together, similar to snapping Legos together, in order to power an object — robots, space vehicles and more. Ultimately, all of these kits help youth to learn about circuits, electricity and connectivity.

With all three types of kits you can have youth work on a similar project. Start by showing the youth the three types of kits — Snap Circuits, Makey Makey and LittleBits. Explain briefly how they work and give the youth a chance to walk around and see what's already been created with them. Give them a chance to ask questions about how the kits work and how the creations were put together.

Divide youth into groups based on the number of kits you have. Have each group use the kit they start with to do the same thing. For example, each group can work towards putting together a circuit so that a sound is made or they can put together a circuit where they shoot something out of a launcher.

After they create their circuits with the different kits, have them show each other what they've created and talk about what worked and didn't work and what they would like to try next time.

Legos

It's likely all the youth you work with already know how Legos work. This session focuses on a set of challenges that give youth in small groups the chance to try out scientific principles. A set of challenges you could work with are:

- Build a catapult and see which group can send their object flying the farthest
- Build a balloon-powered car and see which groups car travels the farthest and/or fastest
- Build a bridge and see which group's bridge can hold the most objects before breaking
- Create your own challenge and have groups work together to create challenges for the other groups to try, then mix and match the challenges and give everyone a chance to try each other's out

At the end of each challenge, give youth the chance to talk about what they created, what worked and didn't work and what they might do differently. It is also possible to integrate fewer challenges and have the youth focus on making improvements to what they have already created — or have other groups improve each other's creations.

Reflection

Each of the program activities listed previously include ideas for how you can engage youth during and after the program to talk about what they worked on, learned, etc. You will find more ideas for closing reflection activities on page 46. Make sure to leave ample time at the end of a session for youth to think and talk about what they learned and what they would like to learn more about.

How Reflection Fits with Explore Outcomes Assessment

For Explore programs, you want to learn how the youth that participate are learning about STEM and gaining comfort with STEM ideas. Remember the set of outcomes described on page 40. Look at the reflection that youth take part in as a part of the Explore program and consider:

- **STEM ideas** — How does the reflection show you that youth have expanded their knowledge of STEM ideas and vocabulary? How do they use STEM terms and phrases when they reflect

on the activity? Do their projects show an understanding of STEM ideas? How do any images they create as a part of the reflection show an understanding of STEM? How do they talk about how to take what they did at the program and use it in a different setting?

- **Comfort** — In what ways do youth show they are comfortable talking about what they did during the program? How do they show they are engaged with the materials and the ideas? What do you notice in their body language?
- **Interest in STEM** — As youth reflect, what do you notice in their language, excitement and engagement? How do you see that they learned and were engaged in what they did during the program? What do you notice about how they talk about learning more?

Moving from Explore to Engage

As youth participate in Explore programs, learn more about what they would like to work on in more depth. The information you gather from opening activities, discussions around the room during programs and reflection can help in this process. Don't miss the chance to ask youth to help decide what comes next by gathering their ideas and facilitating consensus building activities. You might:

- Talk with youth about what they like best in each Explore session and what they would like to learn more about. Let them explain their decisions and ideas and ask if they would be interested in coming to a series of programs that gave them the opportunity to learn more in-depth about the ideas explored in the Explore program.
- After each Explore session, brainstorm what else they might learn about the topic covered. For example, at a session on video game design, brainstorm the different things they might want to learn about designing games. At a Minecraft program, ask them to talk about all the different things they want to learn about building in Minecraft. Write down the ideas and use them as a jumping off point to build an Engage programming series with teen volunteers and interns.

Make notes

Share

Community Builder Activities

Explore Topic	Sample Opening Group Activity
What I am good at. What I want to learn.	For this community builder, you help youth to learn about each other and the different skills of each program participant. Start by explaining that for the community builder youth will say two things — what they are good at and what they want to learn. A teen intern or volunteer can start with an example, then have the youth go around and say their own good-at/want-to-learn statements. Make sure to give everyone time to talk about what they are hearing. During the program, give youth the chance to use their skills and/or connect with each other about learning from one another.
Design	A lot of the work that youth will do as a part of an Explore program is to design something. They might design a Minecraft character or environment. They might design a game, create an e-fabric or design a video story. Any program that has a design element might include a design community builder. Have youth work as a full group and design an obstacle course in the program room using only the materials available — blocks, chairs, books, etc. Ask the teen intern or volunteer(s) to leave the room while the designing is going on and then have them come back — blindfolded — and try to make it through the obstacle course. One or more of the youth designers can help the teen navigate the course by giving simple clues or instructions. After the obstacle test is completed talk with the youth about what it took to design something and then lead that discussion into a discussion about what they are going to be working on in the Explore program.
Storyboarding	Storyboarding is a design skill that youth will be able to use in a variety of STEM-based activities from video game design to movie making to Minecraft. That's why storyboarding can be a good community builder for many different Explore programs. (Or you might host a storyboarding workshop as its own one-off.) For this activity, start by asking youth to tell you about a favorite movie, book, game, or other similar resource. Then, hand-out the storyboarding template (See Appendix F) and explain to them what storyboarding is. Have the youth recreate a scene from what they talked about as their favorite book, movie, game, etc. Then facilitate a conversation with the youth about how they think storyboarding is used in different activities that they take part in. Segue from this conversation to the main activity of the day.
Video game design	Ask everyone their favorite video game is and why it's their favorite. After everyone has a chance to talk about their favorite game, segue by talking about how the day's program gives youth the chance to learn what it takes to build a game like the ones they like to play.
Minecraft	Ask the youth to talk about or draw a picture of something they've created in Minecraft that they are really proud of. Give everyone the chance to talk about why they like what they created. Then, as you move into the program make a connection between the youth's Minecraft creations and what they are going to work on during the Explore program.
ETextiles	Have the youth draw a picture of the craziest thing they can think of as an eTextile. Give them some examples to start with and then give them about five minutes to draw their image. After the drawings are complete, have the youth talk about their ideas and show their drawings. If there is space, they can put their drawings on a wall. After talking about their eTextile ideas, transition to what they are going to be doing in the program.

Explore Topic	Sample Opening Group Activity
Robots	Start in groups of two or three and ask youth to brainstorm what they think would be the best way to use robots to make their lives better. Give them five minutes to talk in small groups and then bring the full group together to talk about their ideas. Make sure youth have a chance to ask each other questions and talk about what they came up with. After the conversation is over, explain how their ideas connect with what they will work on during the session.
Moviemaking	Before the session, select Vine videos that teen interns or volunteers have told you are popular. Show the videos, a then talk with the youth about what it's like to create a 6-second video and how that is different than creating a longer film. Close the conversation with information about the Explore program and what they are going to be doing with movie making.
Audio Recording	Ask the youth to throw out the names of songs they used to sing and/or hear when they were younger. As a group, select one to record. Using the software program you'll use in this Explore program, record all of the youth singing that song. Once recorded, playback the song and ask the youth to talk about what they noticed. Was it too loud or quiet? Too fast or slow? Something else? What would they like to change about the recording? Then, transition into what youth are going to do and learn with audio recording during the Explore program.
Circuits	In two minutes, as a full group, have youth come up with a list of how/where they encounter electricity during a 24-hour period. Write down what the youth call out. When the brainstorming is done, mention some of the things they didn't note — did they think about their toilets? The water running through their pipes? A bus, car or airplane? A doorbell? The school PA system? Talk about the ways that electricity is a "hidden" part of our lives, then transition to the circuit activity they will be working on.
Legos	Divide the youth into small groups, three or four people per group works well. Give them a stack of Legos and have each group build the biggest or tallest object that they can in 3 minutes. After the 3 minutes, ask the youth to look at each group's object and talk about what they think worked and didn't work in each. Which is the biggest/tallest? How did the team worked together in order to be successful?
Programming	A great way to help youth get started thinking about programming, and at the same time getting to know each other, is to have them program one another. Divide the youth into pairs and explain that one person in the pair will be blindfolded and the other member of the pair will give the blindfolded youth directions on how to walk in the shape of a square. For example, take three steps forward, turn left, take three steps forward, etc. The youth can't walk into anyone or anything else when they make the square and when complete the pair changes places. Once the youth are done, ask them to tell you what it was like to give the directions — What was hard? What was easy? What was surprising? Then, transition the conversation, talking about how learning programming is basically learning how to give directions to accomplish a task.
General STEM-based Activities	You may work with youth on STEM-based activities that are not listed above. It's likely you can use a general design community builder for that program. Or, you might start by asking youth to talk in small groups and come up with a list of five things that they all encounter every day that is STEM connected. For example, they might list a smartphone, car, scooter, TV or the intern or volunteer. Have each of the groups talk with each other about where they encounter STEM daily. Then, have them talk as a full group about what's on their list and the STEM connections. You could turn their lists into a STEM poster for the library and ask youth and/or teen intern or volunteers or volunteers to draw images that relate to the ideas listed.

Share

Reflection Activities

Like/Didn't Like	For any Explore program, you can give youth the chance to talk about what they liked and didn't like about the program. This can either be in a full-group or on post-its which youth put on the wall — one wall for like and another wall for didn't like. No matter which you choose, provide a few minutes for those youth who would like to exchange their ideas with the group.
New to Me	One of the outcomes you want to achieve with Explore programs is to increase youth's knowledge of STEM ideas. In a group, ask youth to talk about one new thing they discovered during the Explore program. One of the teen interns or volunteers can act as a recorder and make a list on flipchart paper of all of the new things youth learned and what they want to learn next. This can be kept on the wall of the program room as a continual reminder of STEM concepts.
Can I Use It?	Helping youth understand how STEM learning can be used in other parts of their lives is an important outcome of Explore. Have the youth work in small groups to come up with three ways they might use what they learned in the program in another part of their lives. Have each group select their favorite idea and report that to the full group.
Video Game Design	Ask youth to raise their hand if they think, based on what they've done so far with Kudo, they might like a career in creating video games. Then, ask them to talk about why they would or wouldn't like to have a career in video game design.
Paper Circuits	Have youth create a gallery walk to showcase and celebrate what they've created. Have them fill out an index card to put next to their object and briefly explains what the object is, what they learned about circuits and lights by creating the object and what they would want to change next time around.
Minecraft Character Design	Have each group post their write-up about their character and create a drawing or print-out of the character they made on the wall. Ask all of the youth to take a look at the write-ups. What do they notice that is the same and different in each group's creations? What do those similarities and differences tell them about how story characters are created and developed?
Building with Circuits	Ask the youth to think about all the things they encounter every day — phone, computer, doorbell, school bell, light switch, etc. — and talk about how those might work knowing what they now know about electricity from using Makey Makey, Snap Circuits, and LittleBits.
Moviemaking	When the youth have looked at each of the group's movies, ask them to talk about what they think is similar or different between making stop-motion animation and live-action films. Which do they think is easier or harder and why? What would they be more interested in being a part of as something they spent their career in? Why?
Audio Recording	Have youth talk about their favorite songs, TV shows, movies, etc. Ask them how they think sound effects are used in those and what they have or haven't noticed about sound effects in what they view and listen to. Ask them to consider what they might now pay attention to differently, now that they've seen how one can add sound effects to recordings of all types.
Legos	In small groups, have the youth talk about the craziest, wackiest, most difficult thing they could build with Legos. Bring the groups back together and ask them to talk abouttheir ideas, then vote on what they think is the most difficult of the ideas and talk about why that one is more difficult than the others.

Do worksheet

Room Setup

Play Package

Program description:

Outcomes:

Indicators:

Supplies:

Plays	Your Play	Youth Roles	Notes	Time
Welcome				
Community Builder				
Introduction to Materials				
Challenge 1				
Check in with Groups				
Challenge 2				
Showcase				
Reflection				

Reflection Outcomes	Notes

Appendix A: Explore Playbook Packages

Below, find samples of how to put Plays together for an Explore program. Note: All times are estimates.

Lego Explore Program (about 2 hours)

Plays	Your Play
Welcome	5 minutes
Community Builder	In small groups, build the tallest object they can in 3 minutes using the Legos they have in front of them. Have groups look at each other's structures and talk about why some work better than others — 10 minutes
Challenge 1	Build a balloon powered car — 10 minutes
Check in	Groups race their cars and talk about what changed and what works better or worse — 10 minutes
Challenge 2	Make a better balloon powered car — 10 minutes
Reflection	Groups race their cars and talk about what changed and what works better or worse — 15 minutes
Challenge 3	Groups develop a challenge for the other groups to try — 15 minutes
Challenge 4	Groups try one of the other team's challenges — 15 minutes
Showcase	Groups show each other how they did with the challenges and what was easy or hard to do and why — 15 minutes
Reflection	Craziest thing to do with Legos and voting — 15 minutes

ETextiles Explore Program (about 2 hours, 10 minutes)

Plays	Your Play
Welcome	5 minutes
Community Builder	Draw the craziest light-up eTextile you can think of — 20 minutes
Introduction	Overview/demonstration — 20 minutes
Challenge 1	Youth create their own paper circuits — 20 minutes
Check in	Show paper circuits and talk about challenges and successes — 20 minutes
Challenge 2	Add at least one thing to your paper circuit — 20 minutes
Reflection	Youth make a gallery of creations, add an index card overview of what they created, what was challenging and what they are proud of. Host a gallery walk with all participants — 25 minutes

Audio Recording Explore Program (about 2 hours)

Plays	Your Play
Welcome	5 minutes
Community Builder	What makes a great recording? — 15 minutes
Introduction	Overview/demonstration — 20 minutes
Challenge 1	Youth select a prerecorded story and record sound effects. Include time to plan sound effects before recording them. — 20 minutes
Check in	Youth play their sound effects and give feedback and ideas on how to improve or change them — 20 minutes
Demonstration	Adding sound effects to a story — 20 minutes
Challenge 2	Edit the recordings adding sound effects — 20 minutes
Reflection	Play the edited stories. What would they change? What did they like about what they did? — 15 minutes

Appendix B: Developing an Explore Program

Learn

Remember to consider your STEM community and youth voice:

- Who is your audience?
- What are their interests?
- How can you connect these interests to your STEM programming?
- Is anyone else doing this type of programming in your community?

Plan

Outcome and indicators:

- What are the program outcomes?
- What are some outcome indicators?

Youth voice

- How will you incorporate youth interest into the program?
- What are some ways for you to expand youth interest during this STEM program?

Content and material needs

- List program supply and material needs
- List any information or knowledge required to properly facilitate the program
- List any local resources or community members that can assist with program content

Reflect

Take time to reflect on your program. Ask yourself:

- Did you reach program outcomes?
- Did you select the right plays?
- What would you change?
- Ask co-facilitators for feedback
- How can you develop this topic further into an Engage program?

Make notes

Engage Programming

Overview

Engage programs are designed to give youth the opportunity to spend several sessions learning in-depth about a particular topic. It is an opportunity to bring STEM into programs that don't traditionally include STEM components. For example, a manga group might integrate Minecraft, Audacity or movie making into a project they work on. A writing group might integrate video game design or Minecraft stories into their projects.

Ultimately, Engage gives you and the youth the chance to delve into STEM and spend several hours building, creating and learning. These programs also rely on youth voice. The opportunity for youth to decide what they want to work on based on their own passions and interests is central to Engage programming.

Plays

Depending on the audience, youth interests and outcomes of an Engage series, the workshop series is likely to span between 4 and 6 weeks. While each session is a complete package with a beginning, middle and end, it is expected as youth go through the series they will scaffold their learning adding to knowledge gained the previous session in the current session. If part of a long-standing group – perhaps a manga or anime group – it will still be possible to create distinct series that incorporate the current interests of youth.

Keep in mind that Engage programs are a great opportunity to connect with community partners and experts. If youth are interested in developing a project that requires expertise not available at the library, work with the youth to find one or more experts in the community who can help in the project development and learning.

Outcomes & Indicators

Outcomes Through STEM afterschool programs, children and youth ...	Indicators You know or can see that children and youth demonstrate ...
Develop an interest in STEM and STEM learning activities. "I like to do this."	Active participation in STEM learning opportunities
	Curiosity about STEM topics, concepts or practices
Develop a capacity to productively engage in STEM learning activities. "I can to do this."	Ability to productively engage in STEM processes of investigation
	Ability to exercise STEM-relevant life and career skills
Come to value the goals of STEM and STEM learning activities. "This is important to me."	Understanding value of STEM in society
	Awareness of STEM professions

Full chart on Pages 22-23

Project Decision-Making

To get started incorporating youth voice, facilitate conversations with them about where their interests lie. By finding out what they are interested in, you can help them to develop a program series that supports their interests and engage them fully in the library activity. Try one or more of the activities on the next page to learn more about what the youth you are working with are interested in.

Putting Youth Interests Together

Once you've learned about youth interests, you can start working as a group to determine the best way to connect those interests to an informal learning experience. A next step is a conversation about how the various interests can be combined in order to collaborate and create. If the youth are part of an already existing program, you can integrate that

Share

Project Decision-Making

Framework	Potential Activities
Learning Youth Interests No matter what group you are working with — an Anime Club, a Book Discussion Group, a Gaming Club, a STEM club — it's good to check in and find out about the interests youth have that connect to and go beyond the activity they are involved in as a part of a library program.	**What I Am Good At/What I Want to Learn** — For this activity, you will help youth to learn about each other and you will learn about different skills of each program participant. Start by explaining that for the community builder youth will say two things — what they are good at and what they want to learn. A teen intern or volunteer can start with an example, the teen might say something like, "I am good at ..." and "I want to learn ..." Then have the youth go around and say their own good at/want to learn statements. As you find out about the skills of youth that connect to what others want to learn, encourage connections between those youth so that they have opportunities to share expertise and interests. Keep track of what the youth talk about and you can integrate what you learn when the youth start to plan their projects and decide what tasks to work on. **Photo Gallery** — Ask youth to walk around the library and take three photos — using their own devices or the library's — that best display their interests. You can help the youth get their ideas flowing by brainstorming with them about what they might photograph. Will they photograph the DVDs, the books, the computers, something else? Give the youth about 10 minutes to take their photos. Then have them come back and show their photos and talk about how the photos relate to their interests. **Interview** — Break the youth into pairs and have each pair interview one another about what they like to do in their spare time. Before the interview, ask the youth to brainstorm a series of questions that they will ask each other. If you have the equipment, you can have the youth record their interviews. If that's not possible, have the youth write down their answers. Once the interviews are over, come back and talk as a group about what they learned from the interviews. **Post-It** — Give each member of the group six post-its. Ask each youth to write one word on each post-it that reflects the kinds of things he or she likes to spend time on when not in school. Once the post-its are filled out ask the teens to put their words on a wall. Give the full group the chance to read all of the words. Then, bring the group together and talk about what they learned about each other from the post-its. **24-hour Dream** — As a full group, go around the room and ask each youth to tell everyone what is the number one thing they would choose to do if they had 24 hours to spend time with nothing else to do. Give everyone a chance to ask questions and talk about why what they are talking about is the thing they like to do the most.

program with an Engage program.

Many of the projects listed on the next page have digital components — particularly in relation to a final product. It's important to remember as youth plan out how they are going to accomplish their project, STEM and 21st century skills will come into play in other ways. For example, youth will:

- Use math skills in Minecraft, Audacity and stop motion video activities.
- Select technology to solve a particular problem. For example, if they have to write a script, what tool will be best to write, edit and collaborate?
- Integrate system thinking to develop the steps in completing single and full project tasks.
- Incorporate strategic thinking in the development of interest-driven projects and plans.
- Use project planning, decision-making and teamwork to implement various pieces of a project.

Share

Putting Youth Interests Together

Overarching Program Theme	**Connecting Interests to STEM Ideas for Getting Conversations with Youth Started** These are meant as ideas to brainstorm with youth to help them come up with a project that they want to work on. They are starting points for projects, not necessarily the exact idea of what youth will work on.
Manga	**Minecraft:** Creating characters and worlds that are based on favorite manga **Moviemaking:** Stop motion video re-enactment of a set of manga panels **WebComic:** Creating a manga review comic **Audio Recording:** Producing a manga review show/podcast
Book Discussion	**Minecraft:** Creating characters and worlds that are based on favorite books/chapters/etc. **Moviemaking:** Stop motion video re-enactment of an event in a favorite book **WebComic:** Creating a book review comic **Audio Recording:** Producing a book review show/podcast
Writing	**WebComic:** Developing a webcomic that includes columns, etc. related to youth's interests and ideas **Podcast:** Themed podcast based on youth's interests and ideas **Minecraft:** Create stories, characters, etc. that can be "made real" in Minecraft (these can also be made real using LittleBits, Makey Makey, and Snap Circuits)
Art/DIY	**E-Textiles:** Design and make clothing and/or fashion accessories **Moviemaking:** Produce eTextiles and film a runway show for those projects **Photography:** Create a photo gallery/art show of what youth produce **LittleBits/Snap Circuits:** Create characters and accessories using LittleBits and/or Snap Circuits and use them either in a movie, photo essay or webcomic **LittleBits/SnapCircuits/E-Textiles:** Have youth create a scene — a city, traffic jam, restaurant, etc. — using various craft/art materials and electrify their scene using LittleBits and SnapCircuits
Music	**Makey Makey:** After recording beats or a song using Audacity, add Makey Makey to generate sounds using different kinds of objects — the computer keyboard, water in plastic cups, etc. See **http://makeymakey.com/lessons/musical-water-lesson/** for ideas **Minecraft:** Have youth create a musical accompaniment to add to a Minecraft world that they create
Gaming	**LittleBits:** Have youth develop and create their own board game and use LittleBits as electrified game pieces **Kodu:** Have youth develop their own video game using Kodu as the gaming platform

Community Builder

Animal Imitation	Have youth sit in chairs on the back of which you have placed the name of an animal. On the count of three, have the youth make the sound of the animal. Then, have them move to the chair on the right and repeat. Continue until everyone has had a chance to make each animal sound. Facilitators can record each of the rounds and play them back and/or for the next meeting, create a montage of the sounds.
Is it Me?	Give each youth an index card and ask them to write something on it that they think others don't know about them. You might give some examples — how many siblings they have, what month their birthday is in, what pet they would love to have and don't, where they would like to travel and have never been, etc. Once the index cards are complete, shuffle them, then read them and ask youth to figure out who wrote which one.
Engage Excitement	Have youth write one thing that they are really excited about as a part of the Engage program on an index card. Have them turn to the left or right and talk about what's on their card with the person next to them. Each pair talks for 3 minutes about what's on their cards, then repeats the activity on the left. Continue until everyone has read their card and talked to everyone. When the group is back, facilitate a conversation about the different things everyone is excited about.
Best Thing Today	Go around the room and ask the youth the best thing that has happened to them today. You could also ask for the funniest thing or weirdest thing. Youth who want can act out their answers for each other.
Favorite Fruit	Line up based on favorite fruit. Don't give them any instructions, allowing them to decide how best to organize themselves. Give them 3 minutes to complete the task. You could also use TV show, song, movie, video game, book, etc. The key is to give youth the chance to figure out how to do what you are asking them to do.
Post-it Art	Select a theme — a song title, movie title, game title, singer, actor, famous person, etc. As a group, use a set of post-its to create something that reflects the theme visually. Give them 10 minutes to make their group creation.
Puzzle Piece	Before the program, take an image — a photo, drawing, etc. — and cut it into squares. Give each individual, or small group, one square along with paper and drawing materials. In 10 minutes, replicate what's on the square. Then, join together to put the squares together to recreate the image.
Recreate It	Before the program, use a set of Legos or blocks to create a structure in a location that is not easily visible to the youth. In groups, give youth the same materials you used to create the structure. Make sure they have enough to recreate what you made. One person from each group views the structure for 10 seconds, then returns to their group. Groups have 3 minutes to build a replica of your structure based on what the youth who saw it remembers. Repeat the process for a total of 10 minutes. Then, youth show what they created and talk about what it was like to try to replicate the structure.
Draw It	Before the session starts, draw simple images or shapes on separate pieces of paper that you will hand out. Divide into pairs and have each pair sit back-to-back. Give one member a drawing and the other a drawing utensil and a blank piece of paper. Have the youth with the drawing direct the other youth how to make the same drawing without telling him or her what it is. When the drawing is complete, have them trade places. After everyone has had a chance in each role, talk about the experience, what was hard, easy, fun, etc.

Coming Up with a Plan

Here are some ideas related to standard programming that will help you brainstorm with youth to develop a project that they want to work on. They are starting points for projects not necessarily the exact idea of what youth will work on.

Once youth decide what they are going to work on, the next step is to put the pieces in place for each aspect of the project. Facilitators will work with youth to:

- Assess what skills are needed and determine how youth will learn those skills. Do youth need some help in learning how to storyboard or lessons on stop motion animation? Who in the library or community can help?
- Determine the different parts of the project. For example, for a stop motion animation of a scene from a Manga, youth need to storyboard, gather and create materials for the video, find music and practice the video technique.
- Create a timeline for putting the pieces together. What has to happen first and when, what's next and when and so on. Make sure to also include time to talk as a group, give each other feedback and help make changes and improvements. Also, include continued opportunities to reflect on the work they are involved in. Make it clear that the timeline is flexible, as youth work on the project it might change.
- Assign tasks and roles for the project. For example, who is going to collect and create materials? Who is going to storyboard? Who will actually do the filming?
- Decide what type of celebration will be held once the project is complete. How will youth show and talk about what they created? Will they host an event? Will they write an article for a local or school newspaper? Will they post what they created on the Library website? What's their choice?

Implementing the Plan

Now that you and the youth have a plan of action, it's time to implement it. That doesn't mean saying to youth, "OK, go for it." It means facilitating the process and helping youth go through the steps. Each time the group meets to work on their project, there are some activities you can embed into the session to help keep things on track and moving forward. Make sure to help youth revise along the way. If something isn't working as expected, assess what needs to change, reflect on the why and how and keep moving forward.

Share

What Is Youth Voice?

Youth voice is the perspectives, ideas, experiences, knowledge and actions of young people. Youth voice doesn't mean talking loudly or shouting to be heard and it is not about drowning out other people's voices, including adults. Youth voice is about considering the perspectives and ideas of young people, respecting what everyone has to say, taking risks, listening, sharing and working together.

Free Child Project:
freechild.org/youthvoice.htm

Community Builder

Even though youth have a detailed project to work on, it's still a good idea to bring the group together at the beginning of each Engage session to facilitate a group activity. By doing that, you continue to help the youth build collaboration, teamwork and socialization skills. Since the youth in this program will, over time, get to know each other, the activities you start with can be in-depth and focus on collaboration and team-building. Don't forget to consider using teen interns or volunteers to select and facilitate the community builder and to participate in any of the work required prior to the session.

When you finish the community builder, ask everyone to give an update on where they are in their Engage project. Give them a chance to talk about what the challenges and successes are in their work and what they could use help with.

Reflection

As every session should start with a community builder, so too should it end with a reflection on the work accomplished during the session. This is also a time for youth to discuss what they might need help with, make sure things are on track and review supplies needed for the next session.

How Reflection Fits with Engage Outcomes Assessment

For Engage programs, you want to learn how the youth that participate are learning and gaining comfort with STEM. Look at the reflection that youth take part in as a part of the Engage program and consider:

STEM — How does the reflection that youth participate in show you that they have expanded their knowledge of STEM ideas and vocabulary? Do they use STEM terms and phrases when they reflect on the activity? Do their projects show an understanding of STEM ideas? How do any images they create as a part of the reflection show an understanding of STEM? How do they talk about ideas about how to take what they did at the program and use it in a different setting?

Comfort — In what ways do the youth show they are comfortable talking about what they did during the program? How do they show they are/were engaged with the materials and the ideas? What do you notice in their body language?

Interest in STEM — As youth reflect, do you notice engagement and excitement in their language? Do you see them learn and engage in what they did during the program? What do you notice about how they talk about learning more?

Share

Reflection

Mind Map	Give youth a set of post-its and have them either in small groups or individually create a mind map of what they worked on during the program session. You can help them to get started by suggesting that the middle of the map is the goal they reached by the end of the program. Have each group or individual talk with the rest of the group about what's in the mind map. Facilitate the discussion asking questions about what worked and didn't work, etc. as they spent time on their project.
Rate It	Give each youth a post-it and have them write down how they would rate what they were able to accomplish and learn during the session. One meaning "I didn't really get much done today," and 10 would be "I did a lot of awesome stuff today." Have all of the youth put their ratings on wall in order 1 to 10 and then talk with them about what they notice in the rating wall. Why do they think there are so many 1s or 5s or 10s? What might they do differently to give themselves a higher rating, etc.
Interview Reflection	Break the group into pairs and have each pair interview each other about what they worked on during the session. Before the interviews begin, brainstorm some potential questions to ask as a full group. If the equipment is available have the youth record — video or audio— their interviews. If equipment is not available, have the youth write down notes about each interview.
Showcase	Have the youth show each other what they worked on during the session and talk about what they like and don't like about what they have accomplished so far. Facilitate a conversation so that the group can give each other suggestions about next steps.
Scrapbook	This is a reflective activity that youth can work on throughout the entire series. Give each youth participating the opportunity to create a scrapbook of their process. You can do this by giving each youth a blank notebook and giving them the chance to take photos, notes, etc. about their process during each session. Or, if possible, youth can use Google Drive to keep a scrapbook either as a Doc or a presentation.

Make notes

Appendix A: Developing an Engage Program

Learn

When pre-planning, remember to think about your STEM community and youth voice.

- Who is your audience?
- What are their interests?
- How can you connect these interests to your STEM programming?
- Is anyone else doing this type of programming in your community?

Plan

Outcomes and indicators

- What are the program outcomes?
- What are some outcome indicators?

Youth voice

- How will you incorporate youth interest into the program?
- What are some ways for you to expand youth interest during this STEM program?

Content and material needs

- List program supply and material needs.
- List any information or knowledge required to properly facilitate the program.
- List any local resources or community members that can assist with program content.

Reflect

Take time to reflect on your program. Ask yourself:

- Did you reach program outcomes?
- Did you select the right plays?
- What would you change?
- Ask co-facilitators for feedback.
- How can you develop this topic into other STEM programming?

Appendix B: Sample Engage Program; A Book Discussion Group Podcast

Six, two-hour weekly sessions. This program focuses on producing a book review podcast. Many of the general activities each week can be re-created and used for other types of Engage programs.

Week 1 (about 2 hours)

Community Builder: Begin building the youth's interest in and ability to collaborate with the "Best Thing Today" — 15 minutes

Learning Youth Interest: Talk about the focus of the program and start to plan a project to work on together. Explain the idea of the "photo gallery" activity and take 15 minutes to take personal interest photos. When youth return, have them show each other their photos and then facilitate a conversation about how the interests can relate to a program activity. For example, an interest in music might relate to learning how to record music and adding it to a film the group might make. — 45 minutes

Project Brainstorm: Segue the conversation on personal interests into a conversation about the project the group might work on. Brainstorm the possibilities with the group and vote on what they would like to work on together. — 30 minutes

Coming Up with a Plan: Plan for what the youth have to work on at the next program which should include setting up a timeline and tasks, assigning roles, etc. — 15 minutes

Reflection: Start on Engage Program scrapbooks. Have youth add pictures, notes, drawings, etc. and explain that they will be adding to it every week of the program. — 15 minutes

Week 2 (about 2 hours)

Community Builder: Favorite Fruit — 10 minutes

Review: Recap the decisions from the previous week — what project they are going to work on and how that fits all of the youth's interests. Talk about what they are going to be working on during this program session. — 10 minutes

Coming up with a Plan: Have the youth write on index cards all of the things they think need to happen in order to get the project done. You can have them work in small groups on this. Make sure to give them some examples of the tasks that they will need to work on. Types of activities might include deciding on podcast format, planning content, script writing, learning technology tools, selecting on-air talent, practice, recording and editing. (Make sure to talk about a celebration during the final week so that youth include that in their timeline and task lists.) — 30 minute

Creating a Timeline: Display the index cards randomly on a wall and have the full group work together to put them into a timeline. Which tasks happen first, next and so on? They may need to group tasks and some tasks may repeat. Facilitate a discussion and guide them through the timeline to help them organize the pieces successfully.

Once the timeline is together have the youth select the different parts they want to work on by putting their name on the index cards they are interested in. As they put together their cards, have them think about why they want to take on that task and encourage them to sign up for some tasks as a way to learn more about it. Review all the cards to make sure each task is covered, then take a photo of the timeline and make it available to youth throughout the process. If the timeline can be kept intact throughout the series, it allows for revisions along the way. — 45 minutes

Review: Bring the group together and talk about what they have to be ready to work on at the next program. Are there materials they will need? Do they have to bring anything to the next program to be ready? — 10 minutes

Reflection: Have the youth continue to work on their scrapbooks. Include pictures, drawings, notes, etc. — 15 minutes

Week 3 (about 1 hour, 50 minutes)

Community Builder: Engage Excitement — 10 minutes

Review: Review the tasks that need to be completed this week and make sure everyone is ready to work on what they signed up for, or if they want to try something else, work with them to get all the work teams in place. — 10 minutes

Coming Up with a Plan: Listen to a variety of podcasts and talk about what they notice. What makes a good podcast? What don't they like about podcasts? Have the youth brainstorm as a full group what they want to include in their podcast. — 15 minutes

Implement the Plan: Help facilitate the work of group by moving around and asking them how things are going, what they need, if they have questions, what they are struggling with, what they are succeeding with and so on. As they start to work on different aspects of the podcast, help them think about the tools and materials they might need to complete their tasks. For example, will the scriptwriters need to use Google Doc or something else? — 65 minutes

Review: Bring the group together to talk about what they were able to accomplish during the session, what they need to follow up on before the next session, how the timeline and tasks might need to be altered and so on. Ask them to rate how well they think they did. — 10 minutes

Reflection: Continue working on their scrapbook adding text, images, updates, etc.

Week 4 (about 2 hours)

Community Builder: The Best Thing Today — 10 minutes

Review: Review the task list, timeline and what youth will be working on during the session. Ask them if they think there needs to be any changes or additions to the list. — 10 minutes

Coming Up with a Plan: Using Audacity, or a similar recording program, show them how they will record and edit their own podcast. Give them time to talk about what they still want to know in order to produce their own podcast. Youth should be able to start recording their podcasts by the next session. This is also a perfect time to talk with youth about intellectual property and copyright and how they might play a part in what they are working on. Give them a chance to also talk about Creative Commons and whether they want to give that license to the podcast they produce. — 15 minutes

Implement the Plan: Continue to work on the different activities and facilitate conversation and provide support as needed. Help youth move forward and make any decisions that need to be made as they work on their pieces. Make sure to help youth working on different aspects of the project with their specific work. For example, if there is a group working on music and/or sound effects for the podcast help them to research and find and/or record the music or sound effects they will use. — 65 minutes

Review: Bring the group together to talk about what they were able to accomplish during the session, what they need to follow up on before the next session, how the timeline and tasks might need to be altered and so on. Ask youth to rate how well they think they did as a part of the session in moving forward with their task. — 10 minutes

Reflection: Continue working on scrapbooks adding text, images, updates, etc. — 10 minutes

Week 5 (about 2 hours)

Community Builder: Is It Me — 10 minutes

Review: Review the task list, timeline and what youth will be working on during the session. Ask them if they think there need to be any changes or additions to the list. Make sure to talk about the time left in the series and what they need to accomplish for next session's celebration. — 10 minutes

Implement the Plan: Give youth the bulk of the session to work on the tasks they still have left. Be ready to support either through helping them with technological needs, working through barriers, etc. — 90 minutes

Review: Bring the group together to talk about what they were able to accomplish during the session, what they need to follow up on before the next session, how the timeline and tasks might need to be altered and so on. Ask youth to rate how well they think they did. — 10 minutes

Reflection: Continue working on scrapbooks adding text, images, updates, etc. — 10 minutes

Week 6

Divide this session into two parts. The first is finishing up any tasks that need to be accomplished in order to complete the podcast. The second is a celebration of what the group created. The celebration could take a few different forms. It might be a public event where family and friends come to listen to the podcast and celebrate what the youth developed. It might be a party for the youth who produced the podcast. It might be something else.

It is important to give youth the chance to celebrate their accomplishments. As a part of the celebration, make sure to let the youth talk about the experience. For example, as they play the podcast for each other and/or family and friends, ask each youth involved to talk about one thing they are proud of and one challenge they faced.

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