Building STEAM with Día! Toolkit

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Written for the Association for Library Service to Children by Amy Koester

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What Is STEAM and How Does Diversity Fit into the Conversation?

STEAM is an educational initiative more than thirty years in the making. In 1983, the National Science Board reported on the serious educational deficiencies of American students in the subject areas of STEM: science, technology, engineering, and math. In addition to outlining American students' lack of competencies—in particular, compared to their peers in other countries—the commission also proposed the creation of STEM curricula that was both revised and intensified. The impetus for their curricular recommendations, according to the commission, was to ensure that American students would be competent and competitive in STEM areas by 1995, equipping the twenty-first-century American workforce to be among the strongest in the world.

Administrators and politicians picked up on this rallying cry. In 1989, George H. W. Bush convened a National Education Summit where he and fifty governors worked to set six national education goals (New York State Archives, n.d.). These six goals were later expanded to eight with the input of Congress, and the final list was signed into law in 1994 by Bill Clinton as the Goals 2000: Educate America Act. One of the goals included that, "by the year 2000, United States students [would] be first in the world in mathematics and science achievement" (Sec. 102.5.A). A significant goal, and one in line with the original recommendations from 1983.

It was around this time that an increasing number of educators, innovators, and business leaders in STEM fields began to propose the evolution of STEM. Competency in these subject areas, the voices argued, is sufficient for making American students and workers competent, but more is needed for American industry to maintain its place of eminence in the competitive world marketplace. The argument was proposed that STEM become STEAM, with the A standing for arts, representing the creativity and innovation inherent in artistic thinking. One of the first major voices recommending this fundamental tying together and revitalization of sciences and arts was Mae Jemison, a physician, a dancer, and the first African American woman in space. In a 2002 TED Talk, Jemison argued that science and arts, two sides of the same coin, are together "avatars of human creativity"; when individuals possess both knowledge and the ability for creative application, they can make intuitive leaps and innovations that define scientific development and success.

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Even as more and more educators, administrators, and others evolved their support of STEM into the support of STEAM, the educational goals set forth by Clinton and his administration were very evidently not being attained. One reason for this failure to meet the goal of being first in math and science was, in part, because it did not take into consideration the full spectrum of American students. By the time George W. Bush signed the No Child Left Behind Act into law in 2002 and Jemison was advocating for what would become known as STEAM, the educational landscape and diversity of students looked vastly different than, and competencies not much improved from, when the need for strong STEM education had first been proposed in 1983.

In 2007, the Committee on Science, Engineering, and Public Policy (a joint committee of the National Academy of Sciences, National Academy of Engineering, and the Institute of Medicine)

sounded yet another call for improvement in STEM areas for K–12 students. Yet four years later, in 2011, these same institutions asserted that improving existing STEM education was insufficient; historical strategies for bolstering STEM competency have not taken into account the full diversity of American students, in particular minorities who have long been underrepresented in STEM fields and careers. These underrepresented minorities, or URM students, "are defined by the National Institutes of Health as individuals who self-identify with one or more of the following groups: Black or African American, American Indian, Native American, Hispanic, Latino American, Native Hawaiian, Alaskan Native, or Pacific Islander" (Fraleigh-Lohrfink et al. 2013, 21).

Expanding Underrepresented Minority Participation (2011) identified several issues specific to URM students in terms of STEM competency acquisition and success: preparation, access, and motivation. In terms of preparation, URM students are less likely to have adequate and consistent STEM instruction, especially early in their educations (Hutchinson 2014). One recommendation of the 2011 report is the "need for strong preschool programs" to allow all children early access to fundamental STEM foundations (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine 2011, 5). In the library context, this recommendation means that youth materials, programs, and services relating to STEM or STEAM areas should be offered even for the youngest library customers.

When it comes to access, URM students are similarly less likely to have opportunities for engaging in formal and informal STEM education. Moreover, when these students do have access to quality STEM instruction, "they're more likely to be saddled with negative cultural stereotypes and assumptions about their lack of intellectual ability in math and science" (Hutchinson 2014, 10); this embedded racism is certainly not conducive to supporting STEM knowledge and skill development. A recommended strategy for countering this lack of access is to "promote STEM outreach that specifically targets underrepresented minorities" (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine 2011, 6)—a model that libraries can certainly adopt in conjunction with existing outreach activities (i.e., storytimes, school visits, etc.).

Finally, and perhaps most significant, there is the issue of motivation for URM students to engage with STEM learning. Encouragement is certainly an important factor in providing motivation to any STEM student (Fraleigh-Lohrfink et al. 2013). Additionally, support and involvement of family—parents in particular—has been shown to be significant in impacting URM students' motivation to pursue STEM (Museus et al. 2011). Arguably the most important aspect of STEM motivation for URM students, however, is whether instruction is culturally relevant; that is, whether the instruction, activities, and examples connect in any way "to the experiences, cultures, and traditions of racial and ethnic minority students" (41). If URM students cannot connect instruction to their existing knowledge, STEM content will only ever be abstract; these potential future scientists require "an educational context that supports the traditions, knowledge, and languages of their communities as the starting place for learning new ideas and knowledge" (Pember 2010, 8).

URM students are less likely to have adequate and consistent STEM instruction, especially early in their educations

Additionally, URM students for whom English is not a native language may struggle with a communication barrier

in their interactions with STEM content. When instruction and activities are offered exclusively in oral or written English, nonnative speakers are at risk of losing motivation in STEM areas as their language capacities impact their ability to adequately demonstrate their STEM content knowledge; how frustrating to know the concepts being taught but not be able to express that knowledge. "Difficulty speaking English should not be confused with an inability to think scientifically" (Herr 2008, 508), and instructors with students who are English-language learners must adapt their approaches to teaching STEM content so that all students may not only learn but also demonstrate their learning.

In instructional contexts, including the informal education environment of the library, facilitating motivation means developing STEM opportunities that "stimulate interest in these fields through study, hands-on research, and the development of a cadre of students who support each other in their interests" (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine 2011, 10); that celebrate "the richness of the students' language, culture, and experience" (Museus et al. 2011, 40); and that "raise awareness of STEM careers through K–12 activities . . . and activities that promote STEM" (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine 2011, 6). Bilingual education opportunities are also significant in building motivation among URM students whose first language may not be English.

Facilitating and supporting transformative STEAM knowledge and development is certainly not easy; the trail of unmet educational goals since 1983 indicates as much. Providing children a path toward innovative careers in STEAM areas is difficult and demanding:

> There is potential for losing students along all segments of the pipeline from preschool through graduate school through inadequate academic training and student interest, as well as an overall misperception of what a career in STEM can provide for them. Plugging these leaks will require a comprehensive approach that focuses on education, motivation, and support (both academic and psychological) of students during every phase of their journey to a science career. (Fraleigh-Lohrfink et al. 2013, 18–19).

If STEAM education is hard, and diverse STEAM education is even harder, why bother? It all ties back to the original goals: for American students to be equipped to be the top of a world workforce in a global reality where innovation is key. If we—as libraries, as academic institutions, as a nation—want to achieve these goals, we must acknowledge that diversity tends to result in better innovations (Page 2007). Our understanding of this issue has evolved from recognizing the importance of STEM, to recognizing the importance of STEAM, to recognizing the importance of diversity in STEAM. We as libraries serving youth must recognize this reality as well.

Five Tips for Programs That Support Diversity and Are Culturally Appropriate

1 Offer programming that is engaging and participatory. Programs should be tied to interests—both the existing interests of the children you aim to serve and the potential new interests that library programs can allow them to explore. Take stock of your community; who are they, and what are their interests? For example, if you know that part of your program-going audience is interested in plants, engage them with a program on botany. Dynamic, hands-on programs are best, as they provide participants with opportunities to personally delve into a STEAM topic in a manner that is interesting to them. When there is interest, there is engaged learning.

2 Offer programming that is motivating. Offer STEAM programs that inspire active participation in an issue or a discipline. One of the best ways to do so is to make STEAM experiences meaningful to your community. Create programs that respond directly to issues or concerns within the community you serve. Is the community interested in drought and a safe water supply? Offer a program in which children learn how to take water samples and test them. The most motivating STEAM programs respond directly to what children care about, not necessarily to their cultural background (Williams 2013).

3 Highlight diverse STEAM. When you talk about STEAM professionals and discoveries, be mindful of highlighting accomplishments across the world. Traditional American science education tends toward the Eurocentric—that is, most of the major STEAM figures children are exposed to are white and male. STEAM programs that support diversity should include an exploration of the people and ideas who have contributed to scientific understanding. Programs should strive to include cultural wisdom outside of strict science as well; often this cultural wisdom has greatly influenced scientific discoveries, as is the case with Native American understanding of plant properties influencing modern pharmaceuticals (Madden and Joshi 2013). Whenever STEAM programs include context on a topic, ensure that context is appropriately diverse and nuanced.

STEAM Timeline

1983
Educating Americans for the 21st Century: A Plan of Action for Improving Mathematics, Science and Technology Education for All American Elementary and Secondary Students So That Their Achievement Is the Best in the World by 1995 released by the National Science Board Commission on Precollege Education in Mathematics, Science, and Technology

1989
Education Summit convened by President George H. W. Bush creates six national education goals, which are later expanded to eight by Congress

1994
Goals 2000: Educate America Act signed into law by President Bill Clinton

4 Use all the resources available.

Library staff who create programs for their libraries have three excellent resources for STEAM programs: library materials, families served, and personal interest. Excellent programs can be designed with the assistance of the wealth of materials the library possesses in print, in databases, and through other digital resources. Program attendees and their parents are also an excellent resource, and they can share information about their children's interests as well as recommendations for program content. Personal interest is also a tremendous resource in creating STEAM programming, as it not only translates to a heightened energy within the program but also demonstrates how STEAM can be personally relevant (Mensah 2011).

5 Create partnerships and collaborations.

Tap the expertise in the community to ensure that STEAM programs are as diverse, culturally appropriate, and motivating as possible. Include ethnic and cultural associations in program planning to ensure accurate and respectful programs (Naidoo 2014). Work with other informal learning institutions, such as museums, clubs and associations, and hobby groups, to bring their STEAM programming content to the library; for example, a science museum may have an education department prepared to bring science activities into the community. Finally, work with local businesses and diverse STEAM professionals so that library programs can include "real" scientists. In addition to leading hands-on activities, allow these individuals to explain their work and how they became STEAM professionals, so that children can see the reality of scientific careers.

2000 2005 2010 2015

2002

No Child Left Behind Act signed into law by President George W. Bush.

"Teach Arts and Sciences Together" TED Talk by Mae Jemison

2007

Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future released by the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine

2011

Expanding Underrepresented *Minority Participation: America's Science and Technology Talent at the Crossroads* released by the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine

Sample Program: Shapes We Eat

Target Age: Preschool
Program Length: 20 to 30 minutes

Supplies:

- *Round Is a Tortilla,* by Roseanne Greenfield Thong (Chronicle Books, 2013)
- 2 large mixing bowls (for flour and salt)
- 1 pitcher, drink dispenser, or carafe (for water)
- ½-cup measures and ¼-cup measures
- single-serving bowls for all attendees (to mix dough)
- Popsicle sticks (to mix dough)
- flour (½ cup per attendee, including some extra)
- salt (¼ cup per attendee, including some extra)
- water (¼ cup per attendee, including some extra)
- dough play materials, such as rollers and cutters (optional)
- plastic bags or plastic wrap (optional, so children can take dough home)

Program Itinerary:

1. Welcome attendees to the program with your favorite preschool hello song.
2. Ask the children to name some of their favorite things to eat. Have a white board or large sticky note on which you can write the foods they name. (Early literacy aside for caregivers: "When you write the words that your child says on a piece of paper, you are showing that letters and words on paper stand for real things and ideas.") Also ask the children if they know how their favorite foods are made.
3. Read the book *Round Is a Tortilla.* Encourage the children to use their fingers to draw in the air the shapes that they hear about and see in the book. (Early literacy aside for caregivers: "When you are reading with your child, make time to stop and talk about the illustrations on the page; many times there is more going on in the pictures than in the words, which gives your child plenty to talk about.")
4. Return to the list of favorite foods. Choose the first few foods and ask children if they can draw the shape of that food in the air with their fingers. Encourage everyone to name the shapes.
5. Invite the children and their caregivers to measure and mix their own dough for pretend play. Have the dough recipe clearly printed by the ingredients (½ cup flour; ¼ cup salt; ¼ cup water). Mix the ingredients together in a bowl using a Popsicle stick to stir. If the dough is too sticky, add a little more flour. If the dough is too dry, add a little more water.
6. Direct children and their caregivers to tables at which they can dump out their dough and play with it. (You may want to cover the tables with butcher paper or tablecloths first for easier cleanup.) Encourage children to use their dough to pretend they are making their favorite foods. Explain that children can use their hands to shape their dough, as well as dough play materials if available. Discourage eating the dough, although it is safe and nontoxic.
7. Encourage caregivers to talk with their children about the steps that go into making their favorite foods. (Early literacy aside: "Children learn through play. When you explain the steps to cook something and your child acts them out, they are learning about how that real food is made.")
8. After children have "cooked" their pretend foods, invite them to share their creations with the children around them. Sharing will allow children to hear about different foods and will encourage joint play.
9. Sing your favorite preschool cleanup or good-bye song to direct everyone's attention to the end of the program. Thank everyone for coming. Offer plastic bags or plastic wrap to children who want to take their dough home, and encourage everyone to help make their favorite food next time they have it at home.

Books on Display to Check Out:

- ***Bee-bim Bop!*** by Linda Sue Park (Clarion, 2005)
- ***The Cazuela That the Farm Maiden Stirred,*** by Samantha R. Vamos (Charlesbridge, 2011)
- *Dumpling Soup,* by Jama Kim Rattigan (Little, Brown, 1993)
- ***Hot, Hot Roti for Dada-ji,*** by F. Zia (Lee & Low Books, 2011)
- ***Noodle Magic,*** by Roseanne Greenfield Thong (Orchard Books, 2014)
- ***Pizza at Sally's,*** by Monica Wellington (Dutton Books, 2006)
- ***The Princess of Borscht,*** by Leda Schubert (Roaring Brook Press, 2011)
- ***A Sweet Passover,*** by Lesléa Newman (Abrams, 2012)
- ***We Had a Picnic This Sunday Past,*** by Jacqueline Woodson (Hyperion, 1997)
- ***Whopper Cake,*** by Karma Wilson (Margaret K. McElderry Books, 2007)

Diversity Starting Point

Build a program around a diverse book or two. Plan to read aloud from the book—the entire book, if short, or an excerpt—and have titles available for check out after the program. See the Building STEAM with Día book lists (http://www.ala.org/alsc/2015-building-steam-dia-book-lists) to find great diverse STEAM titles for ages 0–14.

Sample Program: Moon Myths and Science

Target Age: Kindergarten to Second Grade
Program Length: 30 to 45 minutes

Supplies:

- books or other resources that tell lunar myths from a range of cultures (make sure the tellings of the myths come from reputable sources and do not misrepresent cultures; talk to cultural leaders in your community if you have trouble locating reputable resources)
- projection equipment or a monitor hooked up to a computer to show the video "Moon Phases Demonstration" from the National Science Teachers Association (https://www.youtube.com/watch?v=wz01pTvuMa0)
- Paper plates (one per attendee)
- chocolate sandwich cookies with white filling (4 per attendee, plus extras in case of breakage)
- toothpicks

Program Itinerary:

1. Welcome attendees to the program and encourage them to sit facing the program leader.
2. Talk about science as something that people have always done throughout history. Even before the scientific revolution, different cultures studied how the world worked. They shared their discoveries in the form of stories, many of which became myths. These myths explain the scientific things that a culture knew about a topic—for instance, the moon—in a way that was easy and entertaining for people.
3. Read aloud or tell two to three moon myths from different cultures. After sharing the myths, ask the children to identify things in common with the stories. Talk about how the stories convey scientific information—such as the length of the moon's phases, or what the moon looks like at different times of the year.
4. Transition to talking about what we have been able to learn about the moon through the science of astronomy. Share the video "Moon Phases Demonstration."
5. Talk about some of the words introduced in the video to describe the phases of the moon: full moon, new moon, quarter, crescent, and gibbous. Also introduce the terms waxing, for when the moon is growing fuller, and waning, for when the cycle is approaching new moon. Use an illustration from a book like Gail Gibbons' The Moon Book to help illustrate this cycle.
6. Invite children to go to a table where they will have in front of them a paper plate with four chocolate sandwich cookies and some toothpicks. It is also useful to have an illustration of the moon's phases at each table, too, as a visual reference. The children will separate the halves of the cookies and make the phases of the moon out of the sweets. For example, with a single cookie, a child can separate the halves and, using a toothpick, make sure that all of the icing is on one half of the cookie and none on the other. These halves represent full moon (all of the icing) and new moon (none of the icing). Continue halving the cookies and using the toothpicks to make all the moon's phases. Set out the phases in order on the paper plate.
7. Encourage children to help one another in getting their moon phases in order and in practicing the names of the phases.
8. When the children have all finished with their cookie moon phases, thank them for attending and let them know they can take the plate home and check out any of the moon-related materials on display.

Books on Display to Check Out:

- ***Coyote and the Sky: How the Sun, Moon, and Stars Began,*** by Emmett "Shkeme" Garcia (University of New Mexico Press, 2006)
- ***Keepers of the Night: Native American Stories and Nocturnal Activities for Children,*** by Michael J. Caduto and Joseph Bruchac (Fulcrum, 1994)
- ***The Moon,*** by Christine Taylor-Butler (Scholastic, 2014)
- ***The Moon,*** by Seymour Simon (Simon & Schuster, 2003)
- ***The Moon Book,*** by Gail Gibbons (Holiday House, 1997)
- ***The Moon Changes Shape,*** by Kathryn Beaton (Cherry Lake, 2015)
- ***Moon Tales,*** by Rina Singh and Debbie Lush (Bloomsbury, 2000)
- ***Moontellers: Myths of the Moon from Around the World,*** by Lynn Moroney (Cooper Square, 1995)
- ***Thirteen Moons on Turtle's Back: A Native American Year of Moons,*** by Joseph Bruchac and Jonathan London (Philomel, 1992)

Diversity Starting Point

When exploring a scientific concept or principle, include as part of your exploration a look at how different cultural groups have thought about that scientific concept. Emphasize that all people, throughout history and in the present, with and without high-tech scientific tools, have sought to understand how the world works. Science isn't just a modern endeavor of professionals in lab coats; folk science, or the stories, explanations, and discoveries of all peoples, influence the development of new scientific thinking all the time.

Sample Program: Taste Explorations

Target Age: Third to Fifth Grade
Program Length: 45 to 60 minutes

Supplies:

- professional chef, cook, or baker (someone who can talk about how the science and sense of taste is part of their work, preferably a person of color)
- cotton swabs (4 per attendee)
- 4 small bowls
- lemon juice
- salt water (dissolve 1 tsp. salt in 1 cup warm water)
- sugar water (dissolve 1 tsp. sugar in 1 cup warm water)
- tonic water
- paper (1 sheet per attendee)
- writing utensils (1 per attendee)
- 6 medium bowls
- 3 bags of potato chips (1 regular, 2 flavored)
- 3 types of candy (preferably something uncommon, as from a specialty or international grocers)

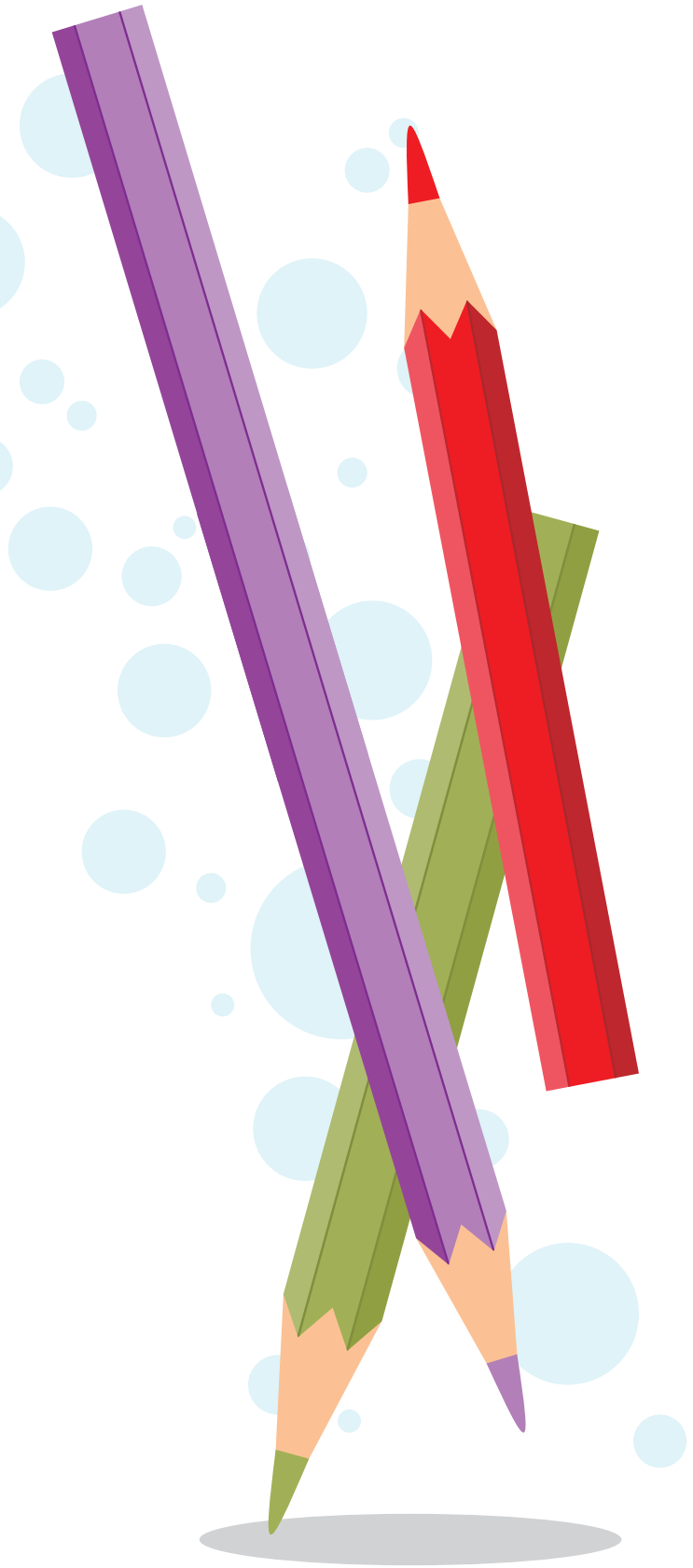
Program Itinerary:

1. In preparation for the program, pour the lemon juice, salt water, sugar water, and tonic water into four separate bowls. Set aside and out of easy reach.
2. Welcome attendees to the program and invite them to sit facing toward the program leader at the front of the room.
3. Introduce the guest chef, cook, or baker and allow the guest to talk about how cooking and baking use science skills. Focus the discussion on the importance of taste in creating foods, including the four main flavors (salty, sweet, bitter, and sour) and the foods they are typically found in and how they work together.
4. Invite children to gather around tables, each with a sheet of paper and a writing utensil. Ask children to draw their tongue on one side of the paper (e.g., an elongated U-shape).
5. Give each child one cotton swab to start. Explain that they will dip their cotton swabs in a liquid that is one of the four flavors and then rub the swab on their tongue. The goal is to try to figure out which part of their tongue is most sensitive to each flavor. Explain that as soon as a cotton swab has been in their mouth, it needs to go in the trash.
6. Take the bowl of tonic water (bitter flavor) from table to table and let the children dip their cotton swabs in the liquid to perform their tongue taste sensitivity test. Invite the children to mark on their tongue drawings where their tongues were most sensitive to bitter tastes.
7. Give each child a new cotton swab and then take the bowl of salt water (salty flavor) from table to table so that children can perform this taste sensitivity test.
8. Repeat step 7, first with sugar water (sweet flavor) and then with lemon juice (sour flavor).
9. When children have tasted all four flavors and marked their tongue drawings to show their sensitivity, encourage them to share their findings with one another.
10. Invite children to get a drink at a drinking fountain, if one is located nearby, to cleanse their palates before the next taste activity. While children get a drink, prepare the next activity by pouring the three types of potato chips into three different bowls (marked 1, 2, and 3) and the three types of candy into three separate bowls (marked A, B, and C). Make sure children cannot see the names or flavors of the chips and candies, but do have all ingredient information available so caregivers can make sure they do not contain allergens for their children.

Diversity Starting Point

Bring a STEAM professional into the program to share their passion and expertise. Make it a priority to partner with a professional of color from your community; children of color are less likely to see STEAM professionals who resemble them in everyday life and in pop culture, but seeing a diverse STEAM professional in a program can subtly reinforce that any child can pursue and succeed in any job.

11. Explain that the group will do a taste test of potato chips. Without knowing what type of chip is what, each child will taste three types of chips. They will use the back of their paper to make notes about their favorites and least favorites.
12. Take bowl 1 around the room so that each child may taste a chip. Encourage them to think about the crunch, the flavor, the mouthfeel, and whether the chip reminds them of anything they have tasted before. Repeat with bowls 2 and 3.
13. When all three chips have been tasted, have children write their order of preference on their paper, from favorite to least favorite.
14. Repeat steps 11 to 13, this time using the candy bowls A, B, and C.
15. When each child has their taste preference lists for both chips and candies, ask them to discuss with their neighbors what they liked best about their favorites.
16. Reveal the names and flavors of the chips and candies. Ask children whether they were surprised by the results of the blind taste test; did they choose a favorite chip or candy they have always liked, or is their favorite something they wouldn't have considered before?
17. Wrap up with discussion about how our tongues and taste receptors all work the same way, but that our tastes and preferences may be different because of the foods we are used to eating. Invite children to think about all the different tastes they will enjoy throughout the rest of the day. Also invite children to check out any of the books on display for further reading about taste and taste inventions.



Books on Display to Check Out:

- ***George Crum and the Saratoga Chip,*** by Gaylia Taylor (Lee & Low, 2006)
- ***Science Experiments with Food,*** by Alex Kuskowski (Super Sandcastle, 2013)
- ***Step-by-Step Experiments with Taste and Digestion,*** by Katie Marsico (Child's World, 2012)
- ***Sweet! The Delicious Story of Candy,*** by Ann Love and Jane Drake (Tundra, 2007)
- ***Taste,*** by Karen Durrie (Weigl, 2012)
- ***Unusual Traits: Tongue Rolling, Special Taste Sensors, and More,*** by Buffy Silverman (Lerner, 2012)
- ***What Is Taste?*** by Molly Aloian (Crabtree, 2013)
- ***The World in Your Lunch Box,*** by Claire Eamer (Annick Press, 2012)
- ***You Can't Taste a Pickle with Your Ear,*** by Harriet Ziefert (Blue Apple, 2014)

Sample Program: Highlights Map of the Library

Target Age: Sixth to Eighth Grade
Program Length: 60 to 90 minutes

Supplies:

- map of the library
- digital cameras, tablets, or smartphones
- cords to transfer photos to the computer
- computer with an internet connection
- free Google account
- account with a web-based photo-hosting site (Google+, WordPress, and Flickr are options; talk to your IT department about the best option for you)
- cords to connect the computer to a projector

Program Itinerary:

1. Welcome attendees to the program. Introduce the activity for the program: creating a map of the library using photos of the parts and places of the library that are most important to youth.
2. Share a map of the library—paper, digital, or both. Talk about the features that a mainstream, or general, map of the library might include—restrooms, shelves by genre, checkout desk, and so on. Pose the question of whether these map features are ones that children would include if they wanted the map to be useful to a friend who has never been to the library.
3. Pass out digital cameras or tablets or allow children to use their own devices with camera functions. Allow children to break into groups as desired.
4. Invite the groups to spend about ten minutes talking about the aspects of the library they would most want to capture on a junior-high students' map of the library.
5. When each group has a list of their top library sites, allow them to move about the library to take pictures that represent the areas they want to feature. If necessary, provide a reminder about library etiquette and noise levels if the children will be moving into zones of the library that are quieter. Set a time for the children to come back to the larger group. Log in to Google and any other relevant accounts on the computer while they are out.
6. When the groups have taken their photos, transfer the photos to the computer and upload to the program or account of your choice. Make sure each photo has a static URL.
7. In another window, go to Google Maps (https://www.google.com/maps). Click on the Menu icon on the left side of the search field, located in the upper-left corner of the window, select My Maps from the menu, and click on the Create icon.

8. In the new window that pops up, title this map by clicking on "Untitled map" in the upper-left corner.
9. Enter the name or address of the library in the search box. Use the zoom functions of the map to focus in on the library building.
10. The map images will be added using markers. To add a marker to the map, click the "Add marker" button underneath the search bar. Then click on the point of the map you intend to mark.
11. When a marker has been placed, an information box will pop up. Name the marker and then click the photo icon in the information box. To add a photo, use the Image URL function. Copy and paste the proper photo's URL from the account you uploaded it to earlier. Children may also want to add descriptions indicating why they chose to highlight a certain part of the library.
12. Repeat this process (steps 10 and 11) to add markers for all library highlights photos. As groups will add their markers to the map one at a time, have great books and other library materials for children to browse while waiting their turn.
13. When the map has been completed, connect the computer to a projector to show the map on a screen or wall. Explore the map together, giving each group the opportunity to share why they feel certain parts of the library are particularly important or worth knowing.
14. Share the map's URL with the attendees and make plans to have the link shared on the library's social media so other middle-school students can use it to explore the library.
15. Thank attendees for coming and invite them to check out any of the books on display.

Books on Display to Check Out:

- ***The Beginner's Photography Guide,*** by Chris Gatcum (DK, 2013)
- ***Creative Photography Lab: 52 Fun Exercises for Developing Self Expression with Your Camera,*** by Steve Sonheim and Carla Sonheim (Quarry Books, 2013)
- ***iPad and iPhone Digital Photography Tips and Tricks,*** by Jason R. Rich (Que, 2014)
- ***The World Atlas of Street Photography,*** by Jackie Higgins (Yale University Press, 2014)
- Titles from the Building STEAM with Día sixth-to-eighth-grade book list (http://www.ala.org/alsc/2015-building-steam-dia-book-lists), YALSA's Teens' Top Ten books (http://www.ala.org/yalsa/teenstopten), or in-house or state awards lists

Diversity Starting Point

Directly involve youth in the process of "doing" STEAM. Hands-on learning is great, as it emphasizes that every person is capable of doing science, technology, and so on. Even better is collaborative work, especially for older youth, which allows them to work together to create a product greater than they could accomplish on their own; this is often called "citizen science." Hands-on activities also allow youth to prioritize the things they enjoy and find interesting in a program.

Sample Programs from Dollar General Building STEAM with Día Grant Winners

The following programs were submitted by recipients of the 2015 Dollar General Building STEAM with Día grant. The sample programs and supplemental materials are described as presented by participating librarians. Substitutions of featured books and materials may be necessary depending on available resources.

Sample Program: Children's Day/Book Day Celebration

This program was created by Claire Bartlett and offered at the Mount Prospect (IL) Public Library in spring 2015 through the Dollar General Building STEAM with Día grant.

Target Age: All Ages (Families)
Program Length: 90 minutes

Supplies:

Performer to offer a 45-minute show for families (optional)
Science station interactives, potentially including:

- color paddles
- magnifying glasses
- discovery bottles (http://familylicious.com/how-to-make-science-discovery-bottles/)
- tactile balls
- fabric samples from different countries (provided by staff)
- smelling bottles (filled with aromatic spices and extracts)
- Boomwhackers
- musical instruments

Technology station interactives, potentially including:

- 6 Bee-Bot robots
- iPads loaded with the following multicultural apps:
  - Collins Big Cat: Around the World Story Creator
  - A Day in the Market
  - Kiwi and Pear's World Adventure
  - Pacca Alpaca
  - Pedro and Marg
  - Up and Down
  - One Globe Kids: Children's Stories from Around the World

Engineering station interactives, potentially including:

- Magna-Tiles
- Duplos
- Tinkertoys

Math station interactives, potentially including:

- 3 weight sets
- coins from around the world (collected by library staff)
- masking tape to make hopscotch games on the floor (http://anwalsh3.myweb.usf.edu/LIS/hopscotch.html)

Art station supplies, including:

- paper in different shapes
- glue
- scissors
- crayons
- books to give away in languages spoken in your community
- snacks:
- assorted Polish cookies
- horchata
- garlic and plain naan bread
- mango
- papaya
- pineapple
- assorted melons
- dates
- rice crackers
- Pocky
- jalebi

Diversity Starting Point

Create a family event that reflects the diverse cultures and backgrounds in your community through different stations. Incorporate multicultural elements—like cultural patterns on fabric, folktales from many cultures, and a welcome message in languages spoken in your community—throughout a self-directed carnival of activities. The self-paced nature of the event encourages families to talk and participate together, which allows everyone to experience the program in their native language.

Program Itinerary:

1. In advance of the program date, assign different library staff responsibility for collecting materials and creating activities for the various stations; focus on activities that are culturally relevant and appropriate for preschool-age children but appealing for all ages. Arrange for staff to set up their stations on the day of the program, including pulling books for display at their stations.
2. Designate three main spaces for the program. The performance, book giveaway, snacks, technology, and math stations can take place in the largest space. Set up the science and engineering stations in a second space (while it may seem easier to put some of these stations on tables, the touch station with fabrics is the only one to require a table). The art station is in a space of its own, and it requires tables for families to engage in the activities. In the art space, set up one table with example crafts and related books to check out; include glue sticks, scissors, and crayons at each table in the art space.
3. Kick off the event with a forty-five-minute show by the performer.
4. As attendees arrive, give children a ticket to show at which station they should begin; this ticket can later be exchanged for a book. Allow children and families to rotate between activities however they choose after starting at their designated station; this format helps to spread out the attendees between stations so that more people have a chance to fully interact with materials.
5. For science, have stations that explore the senses. The sight station can have color paddles that demonstrate color mixing, magnifying glasses to inspect items, and discovery bottles that contain I Spy activities, color mixing, and bottles with items to shake up. The touch station can include tactile balls and fabric samples from around the world (have a staff member present to demonstrate the different textures of fabric and talk about how they were made and how they were used). The smell station can include salt and pepper shakers with different spices and smells for children to explore and compare. The hearing station can include instruments children can explore, from Boomwhackers to maracas, drums, and rhythm sticks. Taste can be incorporated into the snack station, with food from around the world that children can sample.
6. For the technology station, make available six iPads loaded solely with multicultural apps. Include six Bee-Bot robots for children to experiment with simple programming.
7. For the engineering station, provide children with different types of building materials (e.g., Magna-Tiles, Duplos, and Tinkertoys) so that they can experiment with building and how different types of buildings are designed.
8. The math station can include coins from around the world and weight sets so children can compare coins by size, weight, color, and so on. Also include two different types of hopscotch as played in other countries for children to practice counting.
9. The art station can provide paper in different shapes and colors that children can use to make art. Provide examples of art from around the world that uses patterns and shapes.
10. Finally, stock a book giveaway station so that each child may receive a book. Include books available in Spanish, English, Polish, Korean, Gujarati, Hindi, or any other languages to reflect the predominate languages spoken in the community.
11. Each station should have books available for families to read during the program or to check out. Books should relate to the subject of each station and, when possible, include cultural elements or be written in different languages spoken in the community.

Books on Display to Check Out:

Provide copies of the Building STEAM with Día book lists at the program, along with a wide variety of books at each station.

Sample Program: Tabletop STEAM

This program was created by Erin Warzala and offered at Allen County (IN) Public Library in spring 2015 through the Dollar General Building STEAM with Día grant.

Target Age: Preschool to Fifth Grade
Program Length: All day (passive program on Saturdays and Sundays as well as school holiday weekdays; offer a different activity for each weekend and each day of the week during school holidays)

Supplies:

Paper-Folding Minecraft Creepers
- Minecraft Creeper template (http://www.fps-x-games.com/2013/04/large-minecraft-creeper-free-papercraft.html)
- scissors
- glue or tape

Pi Skyline
- graph paper
- Number of Pi printout (http://www.10minutemath.com/2011/05/free-pi-posters.html)
- colored pencils
- instructions (www.whatdowedoallday.com/2014/03/math-art-for-kids-pi.html)

Dino Dig
- dinosaur puzzle (http://www.allkidsnetwork.com/crafts/detail.asp?fil=/crafts/animals/dinosaurs/templates/dinosaur-fossil-dig-template-2.jpg&cat=Dinosuarss&nam=Dinosaur-Fossil-Template-2)
- trays filled with rice and beans
- instructions (http://www.allkidsnetwork.com/crafts/animals/dinosaurs/dinosaur-fossil-puzzle-dig.asp)

Build a Tower Out of Index Cards
- index cards
- Origami
- origami paper
- books on origami

Banderitas (Flags)
- tissue paper in a variety of colors
- scissors
- straws
- glue
- instructions (http://spanglishbaby.com/finds/papel-picado-flags-to-celebrate-hispanic-heritage-month-craft/)

Program Itinerary:

1. Set out the day's designated supplies and instructions on tables that are strategically placed near a high-traffic youth area of the library, such as a children's computer lab.
2. Assign a staff person near the STEAM station tables (e.g., at the children's computer lab sign-up desk) to keep count of how many children and adults partake in the activity.
3. Clean up at the end of the day and record participation statistics.

Additional Information about the Program

There are many benefits to offering a Tabletop STEAM program. Benefits include, but are not limited to:

- It is a simple program that requires little prep work but yields huge returns in the amount of participation and enjoyment.
- It attracts a wide variety of children, both young and older, particularly those who are too shy or otherwise unwilling or unable to attend a regular program.
- It promotes creativity, problem solving, and cooperation.
- It's an easy way to offer programing on a day when the library is short staffed and busy.
- It's flexible and can be adapted to fit seasonal, cultural, and regional themes.

Books on Display to Check Out:

If there is room at the STEAM station, display books relevant to the activity of the day. If there is no room for displaying books, consider locating the activities close to the nonfiction collection for easy browsing.

Diversity Starting Point

Instead of designing a formal standalone program, designate a space in your library for ongoing passive activities that kids can do themselves. An ongoing passive program is accessible to kids who may not be able or willing to attend registered, formal programs, allowing you to reach new audiences. A designated space means you can rotate new activities to the station over time, allowing you to offer a range of activities that appeal to the diverse interests of your target audience.

Sample Program: Building STEAM with Día Family Book Club: The Most Magnificent Thing

This program was created by Olga V. Cardenas and offered at the Oakdale branch of Stanislaus County (CA) Library in spring 2015 through the Dollar General Building STEAM with Día grant.

Target Age: Kindergarten to Third Grade
Program Length: 50 to 75 minutes

Supplies:

Book

- 12 to 15 copies of The Most Magnificent Thing, by Ashley Spires (Kids Can, 2014), to be given away, 1 each to participating families.

Technology

- iPad
- projector
- cords to connect iPad to projector

Speak to Me Project Materials (instructions found at http://www.cmhoustonblog.org/2011/06/06/speak-to-me/)

- 2 wire cutters
- 2 stripper cutters
- 48 CMS Neodymium magnets ¾ " x 1/8 "
- 1 pack sandpaper
- 48 8-oz. paper cups
- 48 male-male stereo audio jacks
- 2 pliers
- magnet wire (program creator's note: I purchased it from RadioShack and precut it into 5' strips; once I had the strips, I coiled it by making loops and using masking tape to hold the coil together)
- sound generator (e.g., smart phone, tablets, audio player)

Snacks

- 5 lbs. tangerines
- 5 lbs. bananas
- 48 bottles of water
- granola bars

Program Itinerary:

1. Room setup: Arrange chairs in a semicircle facing the chair from which the reading will take place. Test iPad, projector, and all technical equipment that will be used during the demonstration of the project (show video of a live demonstration at the Children's Museum of Houston after reading and discussing of The Most Magnificent Thing). In the back of the room, set up three to four tables with all of the materials except magnets, stripper cutters, and pliers; these will be handed to participants' accompanying adults, particularly if younger children are present, and only after going over safety precautions and choking hazards.
2. The program leader and volunteer stand at the door to greet families as they walk in, invite them to enjoy refreshments, give each family a copy of the featured book, and invite them to take a seat.
3. Welcome attendees and make upcoming program announcements. Introduce the book and craft.
4. Read the featured title and then ask questions about the story:
   - Was the girl successful in making "the most magnificent thing" on her first attempt?
   - How did that make her feel?
   - What do you do when you feel frustrated?
   - How do inventions come about? What steps does it take to create something?
   - At the end of the story, was she able to create the most magnificent thing?
   - What would your most magnificent thing do or look like?
   - Other question ideas can be found at http://www.unleashingreaders.com/?p=3822 or http://www.scholastic.com/teachers/top-teaching/2014/10/design-thinking-lesson-connects-classmates

5. Introduce the Speak to Me homemade speaker project: "Today you will be attempting to make a homemade speaker. Just like in the story of the girl showing persistence, you, too, will need to be persistent. You might not be successful on the first try and will need to try again to make your homemade speaker work."
6. Explain that first they will watch a video explaining the science behind speakers and explaining the project. Then they will follow printed instructions to make their projects.
7. Stream the video at http://www.cmhoustonblog.org/2011/06/06/speak-to-me/.
8. Answer any questions that might arise.
9. Explain the materials, show the players how to test their speakers, and talk about safety and choking hazards. Hand the magnets to adults and instruct children to find the rest of the materials at the tables and begin work. Remind everyone that the written instructions are on the table. The volunteer and presenter should assist participants as needed.

Diversity Starting Point

Build a program or series of programs around family book discussion—the Día Family Book Club Toolkit (http://dia.ala.org/sites/default/files/resources/Dia13_Toolkit_print_0%20%281%29_0.pdf) can serve as a starting point. Strive to feature books that act as both mirrors and windows for your community so that readers can see both themselves and people different from them in the characters of books.

Books on Display to Check Out:

- ***Ashley Bryan's Puppets: Making Something from Everything,*** by Ashley Bryan (Atheneum, 2014)
- *Awesome Dawson,* by Chris Gall (Little, Brown, 2013)
- ***The Berenstain Bears Fly-It! Up, Up, and Away,*** by Stan Berenstain and Jan Berenstain (Random House, 1996)
- ***Junkyard Wonders,*** by Patricia Polacco (Philomel, 2010)
- ***Lights Out,*** by Arthur Geisert (Houghton Mifflin, 2005)
- ***Marveltown,*** by Bruce McCall (Farrar, Straus & Giroux, 2008)
- ***Neo Leo: The Ageless Ideas of Leonardo da Vinci,*** by Gene Barretta (Henry Holt, 2009)
- ***Now and Ben: The Modern Inventions of Benjamin Franklin,*** by Gene Barretta (Henry Holt, 2006)
- ***On the Go with Mr. and Mrs. Green,*** by Keith Baker (Harcourt, 2007)
- ***Papa's Mechanical Fish,*** by Candace Fleming (Farrar, Straus & Giroux, 2013)
- ***Rosie Revere, Engineer,*** by Andrea Beaty (Abrams, 2013)
- ***Sleepy Time Olie,*** by William Joyce (HarperCollins, 2001)
- ***Timeless Thomas: How Thomas Edison Changed Our Lives,*** by Gene Barretta (Henry Holt, 2012)
- Titles from the Building STEAM with Día book lists

Additional Information about the Program:

This program was one of five monthly book clubs. Each program featured the reading and discussion of a book from ALSC's Building STEAM with Día book lists and an experiment or craft or both. Our monthly meetings became so popular, our Friends group decided to continue funding it for the rest of the year!

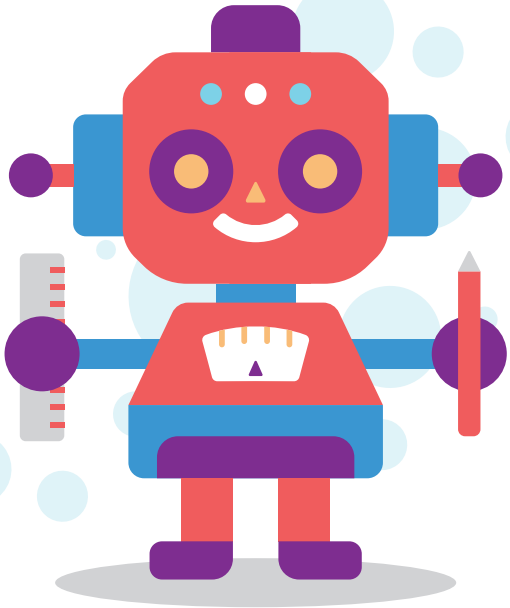
Sample Program: ArtBots

This program was created by Lisa Donaldson and offered at Henderson County (NC) Public Library in spring 2015 through the Dollar General Building STEAM with Día grant.

Target Age: Kindergarten to Fifth Grade
Program Length: 30 to 45 minutes

Supplies:

- markers (at least three per ArtBot)
- electric toothbrush for each ArtBot (Luminant from Dollar Tree are cheap and easy to take apart)
- masking tape
- needle-nose pliers (to take apart toothbrushes)
- foam pool noodle with hollow center or plastic or Styrofoam cups with hole cut in bottom for motors
- materials to decorate ArtBots, if desired (stickers, wiggle eyes, feathers, etc.)
- large pieces of paper or a roll of paper
- ArtBot tutorial (http://www.digitalharbor.org/2014/03/10/tutorial-artbot/ or http://www.instructables.com/id/ArtBot/) **[this link doesn't work]**



Diversity Starting Point

Instead of creating a new program from scratch, think about ways to market an existing program to a new audience you want to use the library. For example, if your target audience is the Latino population in your community, translate program flyers and promotions into Spanish and reach out to local Latino groups to help spread the word about what the library offers for youth.

Program Itinerary:

1. Set up the program space with small tables with supplies (multiple children will work at the same table) and another table to test the ArtBots. Cover the test table with several large sheets of paper.
2. If offering the program with younger children, remove the motors and battery packs from the electric toothbrushes in advance of the program, making sure to explain where they came from at the start of the program. With older children, allow them the option of taking apart the electric toothbrushes with needle-nose pliers to harvest the motor and battery-pack components.
3. Before starting construction, discuss what the motor will do in the ArtBots.
4. Construct the ArtBots following the steps listed in either of the tutorials (above).
5. Allow kids to decorate their ArtBots. Attach the markers to the sides of the ArtBots with tape so that each bot can stand on its own.
6. Once ArtBots are constructed, allow kids to test their ArtBots' drawing capabilities on the large paper. Prompt discussion about how the motors allow the ArtBots to draw on their own.
7. Allow kids to keep their ArtBots. Display the ArtBot art in the library.

Books on Display to Check Out:

- ***From Bugbots to Humanoids: Robotics,*** by Laura Layton Strom (Children's Press, 2007)
- ***How to Build a Robot (with Your Dad),*** by Aubrey Smith (Michael O'Mara, 2013)
- ***The Robot Book,*** by Bobby Mercer (Chicago Review, 2014)
- ***Robots,*** by Clive Gifford (Atheneum, 2008)
- Building STEAM with Día book lists and books were also available

Sample Program: One World, Many Stories Firefly Storytelling

This program was created by Phyllis Thode and offered at East Lansing (MI) Public Library in spring 2015 through the Dollar General Building STEAM with Día grant.

Target Age: Kindergarten to Sixth Grade
Program Length: 90 minutes

Supplies:
- Día bookmark
- copies of the book The World Is Waiting for You, by Barbara Kerley (National Geographic, 2013)
- pizza, beverages, and cookies (optional)
- participants may bring their own props, if needed
- participation awards

Program Itinerary:
1. Several weeks in advance of the program, work with local schools to hold storytelling workshops and auditions for students interested in telling a story of personal adventure. Select approximately twelve children to participate in the Firefly Storytelling event at the library; share information about the performance date, time, and format.
2. Program room should be set up with a stage or cleared area in the middle and chairs theater style for optimal viewing of storytellers.
3. Pizza, beverages, and cookies may be provided to program attendees.
4. At the beginning of the program, show a slide show presentation of the featured book, The World Is Waiting for You, by Barbara Kerley, with pictures of the auditions for the Firefly Storytelling event.
5. Briefly introduce storytelling techniques that previously were shared with elementary schools where auditions were held. Introduce the judges and the One World, Many Stories Committee who put together the program.
6. Allow storytellers to tell their personal stories of adventure.
7. After the stories are told, allow the judges to discuss the stories and give all storytellers participation awards.

Books on Display to Check Out:
- ***The World Is Waiting for You,*** by Barbara Kerley (National Geographic, 2013)
- Books from the Building STEAM with Día book lists

Additional Information about the Program

The One World, Many Stories Committee chose Firefly Storytelling to help families plug into one another's stories rather than plug into their technology. We also decided to have tryouts so the program would be the top stories we heard. In preparation for this program, we made school visits to share storytelling techniques, and feedback was provided to participants to help shape or improve their stories for the final program. There will be two Firefly Storytelling sessions this summer due to the popularity of this program.

Diversity Starting Point

Tap into the first-person experiences of your diverse community by organizing a storytelling event. Choose a broad theme for the program, such as "family," and encourage community children to share stories of their experiences with family. Sharing stories builds a sense of community, and hearing the experiences of others builds empathy.

Additional Resources for Planning Diverse STEAM Programs

Celebrate Urban Birds from the Cornell Lab of Ornithology
http://celebrateurbanbirds.org

This year-round project was founded with the primary purpose to reach diverse urban audiences who do not already participate in science or scientific investigation. The project works with community organizations and distributes educational kits that can assist participants of any age in identifying birds in the areas in which they live. The project uses the data collected by participants to understand how different environments influence the location of birds in urban areas.

The Great Nature Project from National Geographic
http://greatnatureproject.org/about

The Great Nature Project is a worldwide celebration of the earth's biodiversity and natural wonders. People of any age and from anywhere in the world may participate as citizen scientists. Participants are encouraged to look for living organisms when outside; to take digital pictures of those organisms; and to upload the pictures to the Great Nature Project website. These crowd-sourced images create a global snapshot of the world's amazing array of life, and trained scientists help to identify the organisms and use knowledge of their whereabouts to contribute to understanding the diverse life on Earth.

The Lunar and Planetary Institute Explore Program
www.lpi.usra.edu/explore

Explore provides step-by-step instructions for hands-on activities connected to earth science, space science, and engineering topics. Each module includes background information for facilitators, details on how activities correlate to National Science Education Standards, and lists of related books, websites, handouts, and other resources. The materials have been developed and compiled for use in libraries with children and their families throughout Explore's 15-year history, and all activities are designed to be flexible and can be integrated into existing or new programs. No prior science experience required.

Public Lab
http://publiclab.org

The Public Laboratory for Open Technology and Science (Public Lab) develops and applies open-source tools to allow citizens of every age to engage in environmental exploration and investigation. Using inexpensive and accessible DIY environmental science techniques, the Public Lab is focused on increasing the ability of underserved communities to "identify, redress, remediate, and create awareness and accountability around environmental concerns."

SimplySTEM
http://simplystem.wikispaces.com/

This resource, created in conjunction with an ALSC online course called "S.T.E.M. Programs Made Easy," led by librarian Angela Young, includes a range of preschool, school-age, and all ages or family programs focused on STEM learning and created by youth services practitioners across the United States. Each program plan includes detailed information about supplies, step-by-step instructions, and links to relevant resources to allow any library to replicate or adapt the program in their own space.

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